

# MALESIAN MALVACEAE REVISED

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## HISTORICAL SURVEY

The *Malvaceae* have always enjoyed a vivid interest from botanists, in particular on account of the fact that many species have showy flowers and are appreciated as ornamentals throughout the world. In addition many species are of outstanding economical value, e.g. in the genera *Gossypium* and *Hibiscus*. Finally several species are weeds which have been dispersed by human agency far beyond their original areas of distribution and thus have had more chance to attract the attention of collectors.

The wide variability of most species has offered annoying difficulties to botanists when trying to delimitate these species or their infraspecific taxa, resulting into an alarming accumulation of names. Despite the often painstaking studies by many botanists, either on the whole family in a restricted area, or of certain genera throughout the world, there is still a great deal of work to be done and no revision of the family has ever been made for the Malesian area.

In this chapter an enumeration is given of the important post-Linnean authors, who have taken part in the study of Malesian *Malvaceae*, or have strongly influenced it.

### 1753—1800

Linnaeus listed in 1753 and later publications already several Asiatic species, mostly weeds and cultigens, but as far as known none directly based on Malesian material, though many occur in Malesia. Directly connected with Malesia is the dissertation on the plants described by Rumphius, which he had defended by his pupil O. Stickman (1754, 1759); most Rumphian species were correctly interpreted; new species were not described. N. L. Burman (1768) also published some *Malvaceae* of tropical Asia, which were later often neglected or misapplied.

As the first specialist on *Malvaceae* must be considered A. J. Cavanilles (1785—1790,

1791—1801). His 'Dissertationes' dealt with Linnaeus's class *Monodelphia*, which comprised for the greater part *Malvaceae*, but included also representatives of *Sterculiaceae*, *Geraniaceae*, *Theaceae*, and other families. He described and pictured many new species, mostly based on specimens from tropical America and the Mascarenes, but also on specimens from Asia, e.g. collections of Commerson, Née, and Sonnerat in Java and the Philippines. He started his studies at Madrid, where the first instalment, dealing with the genus *Sida*, was prepared. The descriptions and figures in this part are less accurate and contain many errors. In 1776 he departed for Paris as a private teacher to the children of the Spanish Ambassador at Paris, the Duke of Infantado. The later parts were strongly influenced by his contacts with French botanists, as A. L. de Jussieu, A. Thouin, and J. B. de Lamarck, of which he studied the herbaria. Previous errors were corrected, and the descriptions and figures improved. He also studied living plants, cultivated in famous French gardens, e.g. that of the Trianon at Versailles. In addition he grew plants in the garden of his employer at Issy. In the second work mentioned, his 'Icones', only few species of *Malvaceae* were described.

In Germany *Malvaceae* were studied during these years by F. C. Medicus (1787), who was an opponent of Linnaeus with regard to the latter's sexual system. He developed a new system for the *Malvaceae*, mainly based on the characters of the fruit and created several new genera, e.g. *Abelmoschus* Medicus and *Wissadula* Medicus. His system was adopted by J. Gaertner (1791) and C. Moench (1794).

Of the other authors who published on *Malvaceae* at that period, I mention only J. B. de Lamarck (1783) and C. L. L'Héritier de Brutelle (1789).

#### 1800—1900

The German botanists C. L. Willdenow (1800, 1809) and H. F. Link (1822) described some new Asiatic, partly Malesian species.

In 1824 the first volume of the 'Prodromus' of A. P. de Candolle appeared, which included not only a nearly complete compilation of the *Malvaceae* then known, with short, often original diagnoses, but also many new species, among them several from the Malesian area, mainly Timor. The Malesian ones, however, proved later to be all conspecific with already known species. Taxonomically the *Malvaceae* were rather ill-treated, owing, no doubt, to a wrong choice of characters, for example the number of carpels and the leaf shape in *Sida*, or the number of epicalyx segments in *Hibiscus*. As a result many specific names nowadays considered synonyms of others were assigned to different sections.

C. L. Blume (1825) was the first author to give a descriptive account of the family as occurring in Java. Unfortunately he omitted author's names to his binomials of which several were doubtless of previous authors and other ones of himself. Furthermore he did not record the collectors of his specimens, who were, besides himself, Reinwardt, Kuhl, Van Hasselt, and Zepelius. Some of the localities mentioned do not match the labels of the obviously corresponding specimens.

Between Blume's work and the Flora of Miquel (see below) the publications of J. Decaisne (1834, 1835) and J. B. Spanoghe (1841) on the flora of Timor were issued.

In a way Decaisne's study paralleled the 'Prodromus' of De Candolle; he used for his descriptions many specimens, viz. those collected by Leschenault de la Tour and Riedlé of which De Candolle had had duplicates. The only new binomial of Decaisne, *Abutilon guichenotianum* Decne was later reduced to *A. auritum* (Link) Sweet. In the work of Spanoghe appeared four names which have been neglected in most later publications; two survived for recognized taxa, viz. *A. moschatus* ssp. *tuberosus* (Span.) Borss., and *Sida*

*subcordata* Span.; *Lebretonia cernua* Span. has been reduced to the synonymy of *Pavonia procumbens* W. & A., *Malva horrida* Span. to that of *Malachra fasciata* Jacq.

In this period J. K. Hasskarl (1844) published various new species, mostly based on plants grown in the Botanic Gardens at Bogor. Except for *Hibiscus grewiifolius* Hassk., all, as far as his material could be checked, have been reduced.

In addition A. Garcke, a world specialist on *Malvaceae*, commenced a series of unimportant papers, mainly on nomenclatural and taxonomical questions, some of which are mentioned below (1849, 1857, 1890, 1893).

In 1858 F. A. W. Miquel published the second part of his *Flora Indiae Batavae*, accounting for nearly all names given before to Indonesian taxa of *Malvaceae*, and part of those of the Philippines; in addition new species were described. Miquel had never been in Malesia, a disadvantage which showed itself in particular in this family. He listed some species twice, thrice or even four times under different names, e.g. *Sida subcordata* Span. which he also described as *S. thyrsoflora* Miq., *S. zollingeriana* Miq., and *Abutilon furellum* Miq. Most *Malvaceae* are extremely polymorphous, and individual plants change considerably in the course of their ontogeny, especially with respect to leaf shape and the density of the indumentum. In a *Supplementum* (1860—1861) he treated the *Malvaceae* of Sumatra.

F. von Mueller paid much attention to the *Malvaceae* in his studies on the flora of Australia, which were revised in G. Bentham's *Flora Australiensis* (1863). He also published on the *Malvaceae* of New Guinea (1876—1885) and described the first endemic arboreal *Hibiscus* species of that island, viz. *H. d'albertisii* F. v. M.

Two specialists on *Malvaceae* of this period were F. Alefeld, who is known among other things on account of his genus *Azanza* Alef. (1861), considered here a synonym of *Thespesia*, and M. T. Masters. The latter revised the *Malvaceae* of tropical Africa (1868) and British India (1875). The very critical revision of the Indian *Malvaceae* summarized the results of the collections made by Roxburgh, Wallich, Wight & Arnott, Griffith, Hooker f., and others. It was a basic work for the study of the *Malvaceae* of Malesia, because most Indian species also occur there. His species concept was wider than was customary among authors of that time.

Towards the turn of the century again some specialists appeared on the scene. First, K. Schumann, who studied with M. Hollrung (1889) and K. Lauterbach (1901, 1905) the *Malvaceae* of Kaiser Wilhelmsland. His main publications on the family were, however, his digest in Engler & Prantl (1890) and the elaborate revision which he composed together with M. Gürke (Gürke 1892; Schumann 1891) of the *Malvaceae* in *Flora Brasiliensis*. In both publications he used an improved subdivision into tribes and subtribes. Gürke (1893) published excellent monographs of the genera *Malachra* and *Urena*.

Meanwhile E. G. Baker (1890—1894) prepared a 'Synopsis' of the tribe *Malveae*, particularly with regard to the 'Index Kewensis'. Although still useful, it was rather a rough compilation, mainly of names and their supposed synonymy, acting as it were as a supplement to De Candolle's 'Prodromus'. Within the genera he made subdivisions partly according to trifling characters such as leaf shape and number of carpels, using a too narrow range of variability and also using geographical criteria. As a result many species were treated several times under different names, partly new ones. He did not examine the collections at Leyden, so that many errors crept in the evaluation of Blume's and Miquel's species. The 'Synopsis' was reprinted as a book (1894) with a new paging and a few addenda. Subsequently he published similar accounts for the genera *Thespesia* (1897) and *Malvaviscus* (1899).

Important local revisions of *Malvaceae* during this time appeared in the works of S. H.

Koorders & T. Valetton (1895) on Javanese tree species, of F. M. Bailey (1899) on the flora of Queensland, of G. King (1891, 1893) on the flora of Malaya, of H. Trimen (1893) on the flora of Ceylon, and of L. Pierre (1888) on Indo-Chinese tree species.

### 1900—1966

The twentieth century started with a monograph of the genus *Hibiscus* by B. P. G. Hochreutiner (1900), the first one of a long list of publications on *Malvaceae* by this specialist. The monograph on *Hibiscus* was intended as a continuation to E. G. Baker's 'Synopsis', but was more elaborate and critical. He examined more type material, but like Baker he omitted to examine the specimens at Leyden and those of Bogor. In 1901 he published a revision of *Urena*.

From 1903—1905 Hochreutiner was attached to the Botanic Garden at Bogor and engaged to prepare a new scientific catalogue of the garden (1904, 1910). Among other families the *Malvaceae* were treated. Apparently he had no opportunity to revise the material in the Bogor Herbarium. He identified only some specimens for C. A. Backer's 'Flora van Batavia' (1907). Besides several smaller publications in which also Malesian *Malvaceae* were discussed, he revised in 1924 the family as occurring in West New Guinea. His last important work was the revision of the *Malvaceae* of Madagascar (1955).

A very important publication is the monograph by George Watt (1907) of the genus *Gossypium*, with special regard to the cottons of the British colonies. The book contains extensive evidence on protologues and types of specific names of Linnaeus and other older authors. His species concept was extremely narrow. Some older names were misinterpreted as found by later specialists. Watt's monograph was used as a base for the treatment of *Gossypium* in many Floras, e.g. for those of C. A. Backer (& Bakhuizen van den Brink *f.*), that of 1963 included. Without doubt the intricate publications of G. Roberty (see below) have hitherto prevented a more modern treatment of the genus in Malesia.

C. A. Backer published in 1907 the first part of a 'Flora van Batavia', which contains detailed descriptions of common *Malvaceae*.

In 1908 appeared R. E. Fries's accurate, elaborate monograph of the genus *Wissadula*, of which two species occur in Malesia.

Of some influence upon the study of Malesian *Malvaceae* have certainly been F. Gagnepain's precursory studies of Indo-Chinese *Malvaceae*, which were finally compiled in Lecomte's 'Flore générale de l'Indo-Chine' (1910). He provided good keys and descriptions accompanied by figures.

Backer's 'Schoolflora voor Java' of 1911 showed the first treatment of all Javanese species since Miquel's Flora, if we pass his 'Voorloper' of 1908, which is neglected in the present publication. Unfortunately several species were incorrectly named; moreover many species which have never been found growing wild or naturalized or in regular cultivation were anticipatorily incorporated. Subsequently S. H. Koorders (1912) gave a survey in his uncritical 'Exkursionsflora'.

In 1920 E. Ulbrich, a specialist in *Malvaceae*, published his revision of the genus *Pavonia* as occurring in Africa, which is of some importance, since the Asiatic species also occur in Africa.

Then there appeared again two important floristic works with surveys of *Malvaceae*, in 1922 the first part of H. N. Ridley's 'Flora of the Malay Peninsula', partly based on King's publications, and in 1923 the third volume of E. D. Merrill's well-documented enumeration of the Philippine flora. Merrill summarized in this list his numerous own studies, together with those of his contemporaries and older authors including the older



Spanish authors as M. Blanco c.s. Merrill's species concept was rather narrow, which is manifest in particular in his treatment of the genus *Abelmoschus*.

In 1930 the instalment containing the *Malvaceae* of Backer's Flora of the weeds of the sugar-cane fields was published. Their naming was much improved in comparison with the 'Schoolflora', and the descriptions were accurate. In 1939—1940 appeared the corresponding instalments of the Atlas with excellent drawings. Good pictures with extensive descriptions of *Malvaceae* were published in O. Degener's 'Flora Hawaiiensis' (1932—1940), many of which also occur in Malesia. Degener had a particular interest in *Malvaceae*, although he cannot be considered a specialist in the family.

Ulbrich, who mainly dealt with African and American *Malvaceae*, described occasional *Hibisceae* from New Guinea (1935, 1939).

During these years G. Roberty (1938, 1942, 1946, 1950) started a series of more or less concentric papers on *Gossypium* (see also under that genus), which are extremely complicated, with subdivisions based on genetical principles. He was not followed in any local Flora. The simplified subdivision of this genus by J. B. Hutchinson, Silow & Stephens (1947) offers a more suitable base.

In 1942 an exquisite monograph of the American genus *Malvaviscus*, of which two varieties of one species are cultivated in Malesia, was published by R. W. Schery.

A new survey of Javanese *Malvaceae* by C. A. Backer appeared in 1943 in his stencilled Flora. A printed version with nomenclatural improvements by Backer & Bakhuizen van den Brink *f.* was published in 1963. It is regretted that synonyms from former Floras of Backer were not inserted. Gagnepain (1943—1945) provided supplementary dates to his revision of the Indo-Chinese species.

New critical revisions of African *Malvaceae* were prepared by A. W. Exell & F. A. Mendonça (1951), based on studies of Exell & D. Hillcoat, and by Exell & A. D. J. Meeuse (1961); they are important, because many African species also occur in Asia. These revisions are very accurate and useful, although they show in my opinion a too narrow concept of genera and species. As already mentioned above Hochreutiner (1955) revised the *Malvaceae* of Madagascar.

Miss S. Hu (1955) published an elaboration of the Chinese *Malvaceae*, summarizing the collections of Lévillé, Handel-Mazzetti, Merrill, Chun, and others. Her species concept is extremely narrow.

In 1957 there appeared the first part, up to now the only one, of a monograph of the genus *Sida* by I. D. Clement, in which only one species occurring in Malesia is treated, viz. *S. ciliaris* L.

Finally it may be noted, that also the many publications of T. H. Kearney, A. Kravovickas, A. P. Rodrigo, and H. da Costa Monteiro Filho on American *Malvaceae* have rendered service in dealing with Malesian *Malvaceae*.

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#### TAXONOMICAL CONSIDERATIONS

##### The delimitation of the *Malvaceae*

Next to the delimitation of the species and infraspecific taxa, a revisor is challenged with the question whether the group he studies has a natural delimitation. As he has generally far more intimate knowledge of his own subject than that of allied ones, he should be reticent in his opinions, especially in cases where he cannot trace a sharp demarcation. He should avoid a too hurried conclusion to merge in such cases and widen the circumscription until a more suitable delineation is reached, as by such action related taxa representing natural entities may be swamped and nullified on insufficient, one-sided considerations. I believe it then better to stick, for the time being, to the current delineation, to point out the situation as far as known, and leave it to future workers to reach a more balanced opinion by gathering more facts, especially by making use of auxiliary disciplines. Such a case is presented by the *Malvaceae*.

The *Malvaceae* are a rather homogeneous family in contrast to other families of the order *Malvales*, viz. the *Sterculiaceae*, *Tiliaceae*, and *Bombacaceae* (sometimes other families are split off from these). Against the *Sterculiaceae* and *Tiliaceae*, the *Malvaceae* can be defined by the combination of some characters of the flower, viz.: calyx always valvate, stamens always united into a staminal column, monothechal anthers, pollen always echinate, ovaries always septate. A sharp delimitation against the *Bombacaceae* is, however, difficult or impossible. Many authors, e.g. those of older Floras of British colonies, who followed Bentham & Hooker, treated the two families, therefore, as one family *Malvaceae*, but nowadays they are generally kept apart.

The most important characters by which the *Bombacaceae* in a very strict sense may differ from the *Malvaceae* are: Stamens free or shortly connate; anthers consisting of two or more thecae (polythechal anthers); pollen smooth. The family as conceived by K. Schumann (1890)<sup>1)</sup>, which was followed by Bakhuizen van den Brink

<sup>1)</sup> SCHUMANN, K. 1890. *Bombacaceae*. Die natürlichen Pflanzenfamilien 3, 6: 53—68.

(1924)<sup>1</sup>), is subdivided into three tribes, viz. the *Bombaceae* (*Adansonieae*), the *Matisieae*, and the *Durioneae*.

The *Bombaceae* (mainly American, also in the Old World) show all transitions between free stamens and a distinct staminal column, have monothechal (*Adansonia*, *Bombax*) or polythechal anthers and smooth pollen. Therefore I do not consider them *Malvaceae*.

The *Matisieae* (all American) show a similar picture, with the difference that the stamens are mostly free or shortly connate only. *Montezuma*, formerly placed here, has correctly been transferred to the *Malvaceae*, and is in my opinion congeneric with *Thespesia* (see there).

The *Durioneae* (all Asiatic, mainly Malesian) have free or shortly connate stamens (e.g. *Durio*, *Neesia*, *Coelostegia*), or a more or less distinct staminal column (*Cullenia*, *Camptostemon*; and also *Papuodendron*, in case this genus is considered to belong to this family). Most genera show polythechal anthers and smooth pollen. *Camptostemon* (*Cumingia* included) and *Papuodendron* are the most interesting genera with respect to the problems of delimitation. *Camptostemon* possesses polythechal anthers, and is therefore excluded here from the *Malvaceae*, but *Papuodendron* has monothechal ones. Both genera have more or less echinate pollen.

Kostermans (1960)<sup>2</sup>) has united *Papuodendron* with *Hibiscus*, which can be easily defended, in particular after having taken cognizance of the structure and ontogeny of the staminal column in *Malvales* as described by Van Heel (1966)<sup>3</sup>). There can be no doubt that *Papuodendron* is at any rate the (only) link between the *Malvaceae-Hibisceae* and the *Bombaceae-Durioneae*. Geographically this is not so much remarkable, as this link is situated in Malesia, particularly East Malesia, where both tribes have a rich development which might reflect an ancient matrix.

The thorough study by Van Heel elucidates that our knowledge of the whole order, and thus of the means for a necessary new subdivision, is still restricted. Practical demands force me in this connection, to stick to a more or less traditional delimitation of the *Malvaceae* on the base of relatively superficial characters. When considering these characters I must conclude that there are some differences between *Papuodendron* and *Hibiscus*. The general habit of the leaves and the inflorescence is more similar to that often occurring in the *Bombaceae* (*Durioneae*) than that in *Hibiscus*. The stamens in *Papuodendron* are attached to the very apex of the staminal column, which differs from the general picture in *Hibiscus*, viz. a scattered occurrence of stamens over the whole staminal column or at least its upper half, but is also seen in *Camptostemon* and other genera of the *Bombaceae*.

I have not yet mentioned another character peculiar to the *Malvaceae-Hibisceae*, viz. the constant occurrence of 5 minute teeth at the very apex of staminal column. Such teeth are not found in *Bombaceae-Durioneae*. In *Papuodendron hooglandianum* (Kosterm.) Borss. Van Heel (1966, p. 233) recorded a staminal tube with a 'sterile extension with 5 about antesealous teeth, whereas in *P. lepidotum* C.T. White the tube terminates into filaments and is not extended in a sterile part'. This observation unfortunately defeats the taxonomical value of the presence or absence of such teeth. Though I have omitted *Papuodendron* from the present revision (cf. p. 84) there seems good reason for a future reconsideration.

<sup>1</sup>) BAKHUIZEN VAN DEN BRINK, R. C. 1924. Revisio Bombacearum. Bull. Jard. Bot. Btzg. III, 6: 161—240.

<sup>2</sup>) KOSTERMANS, A. J. G. H. 1960. Miscellaneous botanical notes. Reinwardtia 5: 233—254.

<sup>3</sup>) HEEL, W. A. VAN. 1966. Morphology of the androecium in Malvales. Blumea 13: 177—394.

### Species concept

In my opinion the *commiscuum* of Danser (1929, 1950)<sup>1)</sup>, defined as a group of plants which are mutually connected by the capacity of intermixing, presents a sound, general theoretical background for the species concept. Similarly, his *convivium*, being a part of a *commiscuum* isolated as a result of e.g. a geographical or ecological barrier, or a deliberate selection by man, is a good base for a concept of the subspecies (see also Van Steenis 1957)<sup>2)</sup>.

There have been few crossing experiments in which wild Malesian species were involved, so that there is no sufficient evidence to apply these concepts. Nevertheless I have kept, more or less in accordance with Danser's ideas, a rather wide circumscription for species of which much herbarium-material was available, as can be seen in my treatment of e.g. *Hibiscus tiliaceus*, *Abelmoschus manihot*, *A. moschatus*, *Abutilon indicum*, *Sida rhombifolia*, and *Urena lobata*. These wide species have been subdivided into subspecies, in cases of more or less evident geographical (*Hibiscus tiliaceus*), ecological (*Sida rhombifolia*), or altitudinal replacement (*Urena lobata*); I encountered also a case in which obviously man has isolated a group with more useful characters (*Abelmoschus manihot*). The species or subspecies have in some cases been split up into varieties. Usually subspecies of one species differ by more than one morphological character, whereas varieties can be mainly distinguished by one morphological character only.

In aggregates of which little material was available, e.g. the endemic species of *Hibiscus* and *Thespesia* in New Guinea, the circumscription of the species may be as yet somewhat too narrow but more material is needed to reach more definite conclusions.

I have not taken chromosome-numbers into account, because most wild species are insufficiently known in this respect.

### GEOGRAPHICAL AND ECOLOGICAL CONSIDERATIONS

The *Malvaceae* are a widely distributed family. Some genera show a small area of distribution, or a more or less distinct centre of development, e.g. *Abelmoschus* (SE. Asia), *Malvastrum*, *Malachra* (both tropical America), but many genera occur throughout the world or throughout the tropics, viz. *Hibiscus*, *Thespesia*, *Pavonia*, *Abutilon*, and *Sida*. It is true that some species of these genera owe a world-wide distribution secondarily to human agency, but those genera are certainly native to all continents as shown by endemic species. In some large genera certain of their infrageneric taxa are restricted to or mainly occur in the Old World, and others are bound to the New World. This is in particular manifest in the genera *Sida* and *Abutilon* (see there), but can also be traced in *Hibiscus* and *Gossypium*.

No infrageneric taxon is restricted to Malesia, but 20 species out of 95 wild ones can be called irrefutably endemics; they are found mainly in New Guinea. On the other hand many species of a wide distribution outside Malesia show restricted distributional areas within Malesia, which occur more or less disjunct from the areas in the mainland of Asia. These exacting areas are undoubtedly correlated with ecological conditions as will be dealt with below under category iv.

On the whole *Malvaceae* are light loving plants which hence show preference for

<sup>1)</sup> DANSER, B. H. 1929. Über die Begriffe Komparium, Kommiskuum und Konvivium, und über die Begrenzung der Arten im Allgemeinen. *Genetica* 9: 399—450.

— 1950. A theory of systematics. *Bibliotheca Biotheoretica* 4: 117—180.

<sup>2)</sup> STEENIS, C. G. G. J. VAN. 1957. Specific and infraspecific delimitation. *Flora Malesiana* I, 5: clxvii—ccxxxiv.

subtropical areas and semi-arid tropics and shun the gloomy equatorial rain forests. This holds true for Malesia where only relatively few species are forest dwellers. The family as such, may be assumed, never has had a primary developmental centre in these tropical rain forests.

The peopling of Malesia of which the present *Malvaceae* are the result, can be envisaged, on this background, to have taken place in several stages. First, the ancestral forms of all tribes of the family must have spread in the Tertiary or earlier. Observing the relative scarcity of *Malvaceae* in Australia on generic level, though with some small endemic genera in at least *Malveae* and *Hibisceae*, this early peopling has obviously come from continental Asia. The sprinkling of this earliest stock must have been fairly thin, as even under the ecologically favourable conditions only little evolution took place in the Australian continent, except for speciation in *Abutilon*, *Hibiscus*, and *Sida*.

Reckoned by geological time a fairly recent enrichment must have taken place in the Quaternary, to account for a number of species which came from Asia and are spread unaltered through Malesia to Australia and for which it cannot well be assumed that they were transported intentionally or unintentionally by aboriginal man, by proto-Malays in prehistoric time, by Malays in historic pre-Columbian time, or post-Columbian by modern traffic. The obvious timing for this connection must have been at a period when there was a much larger land surface available between Asia and Australia, as dispersal of *Malvaceae* with their fairly large, hard, smooth seeds cannot well be imagined to be very effective through vectors as wind, sea-currents, birds and other animals, except in a few specialized exceptions. Besides, dispersal of these modern, mostly herbaceous or fruticose species needed suitable ecological conditions on their way, that is periodical drought and light. A clue to this is provided by the theory developed by Van Steenis (1961)<sup>1)</sup> in his explanation of the areas of certain *Leguminosae* which for dispersal and ecology are similar to *Malvaceae*. He believes these to have extended from Asia through Malesia to Australia during the Pleistocene Ice Age, and of course vice versa. Of the 30 non-endemic species which have not escaped from cultivation and are found wild, there are 7 which are pantropical, 21 are shared by (sometimes also Africa) Asia and Malesia and 2 are shared by Australia and East Malesia. By their preference for sunny and dry localities they have of course invaded country opened up by man and behave largely as weeds. This has of course in no mean degree favoured their dispersal and led to a large increase in number of individual specimens. It is impossible to ascertain in which places they grew before the advent of man in Malesia and which localities must be ascribed to later anthropogenous extension.

See for more details under category iv.

The third accession of *Malvaceae* took undoubtedly largely place in post-Columbian time when modern transport facilitated and speeded up anthropogenous dispersal of many aliens as weeds. It is astonishing how soon after 1492 weeds and cultigens travelled far and wide and were already known to the earliest herbalists as Rheede, Hermann, and Rumphius, even of species belonging exclusively to New World genera, as for example *Gossypium barbadense* var. *acuminatum* (by Rumphius) from the Moluccas, *Wissadula periplocifolia* (by Hermann from Ceylon), and *Abelmoschus moschatus*, *Hibiscus surattensis*, *Sida acuta*, *S. rhombifolia*, and *Urena lobata* (all known to Rumphius).

Whether some were spread by proto-Malays from Asia to Malesia in prehistoric time remains unsettled and difficult to ascertain. Prehistoric introduction was assumed by

<sup>1)</sup> See note on page 13.

Hillebrand for the occurrence of *Hibiscus tiliaceus* and *Thespesia populnea* in the Hawaiian Islands<sup>1)</sup>, together with some two dozens of other useful plants.

Some post-Columbian introductions can be traced with certainty, as these adventives have little spread in the past centuries and are still present in the original 'landing place', as for example *Kosteletzkya batacensis* (Blanco) Fern.-Vill. in west northern Luzon. This is so far easy to explain because the genus is almost confined to Africa and America (especially Mexico) and Merrill<sup>2)</sup> has indubitably shown that many Mexican plants came to Manila by the Spanish galleon route, acting from 1565—1815. The only strange thing about it is that it has never been matched with a Mexican species. It is of course not impossible that the introduced alien was derived from some paramorph which later slightly changed in its new dwelling place and homogenized locally by selection in isolation into a genetically deviating paramorph, not present or rare in the Mexican mother population from which it was segregated. This represents a very similar case to that of the composite *Elephantopus scaber* L. which was doubtless introduced from Central America in post-Columbian time to Indo-Malesia but has never been traced among the native species of the New World.

Arguing along this line, the second Malesian species of *Kosteletzkya*, *K. wetarensis* Borss., described as a new species in this revision from the island of Wetar in the eastern Lesser Sunda Islands, can hardly be native in that island. However, for that the Pacific galleon route cannot be held responsible. In early time Wetar was under suzerainty of the Portuguese, and these had onwards of about the year 1500 a commercial route, continued for about 150 years from eastern Brazil to Goa and thence to other Portuguese possessions in the East, in Macao, Malacca, and the Moluccas. Here again it must consequently be accepted that *K. wetarensis* Borss. is an established, changed alien.

It may be that also the new species *Hibiscus cochleariferus* Borss., once found in Langkat, East Sumatra, on a river bank, belongs to such changed aliens, as it is close to *H. sororius* L. f. from tropical Brazil, and does not show affinity with any other Indo-Malesian species.

An unaccounted case is that of *Abutilon listeri* Baker f. from Christmas I. (Indian Ocean) which is in all probability an alien but has not been matched with any described species.

See further under category v.

The species occurring in Malesia can eco-chorologically be grouped in the following categories:

(i) **Endemic arboreous species occurring in forest.** To this category belong in the first place several species from New Guinea and adjacent islands, all of *Hibiscus* sect. *Azanza*. These are *H. d'albertisii* and its close relatives *H. aruensis*, *H. ellipticifolius*, *H. leeuwenii*, *H. schlechteri*, and *H. archboldianus*; in addition there are *H. sciadiolepidus*, *H. carrii*, *H. pleijtei*, *H. sepikensis*, and *H. pulvinulifer*. These species agree in having ovaries and capsules with five true and five false dissepiments. Moreover, there occur in New Guinea and neighbouring islands some endemic *Thespesia* species, viz. *T. patellifera*, *T. robusta*, *T. fissicalyx*, *T. multibracteata*, and *T. peekelii*.

In the rest of Malesia *Hibiscus borneensis* (from NE. Borneo), *H. pseudotiliaceus* (from Morotai), *H. teijsmannii* (from SE. Celebes), *H. floccosus* (from Malaya), and *H. camptosiphon* (from the Philippines) are endemics. The first four species of this series belong

<sup>1)</sup> HILLEBRAND, W. 1888. The Flora of the Hawaiian Islands: p. xvi.

<sup>2)</sup> MERRILL, E. D. 1954. The Botany of Cook's Voyages.

to sect. *Azanza*, and possess, in contrast to the *Hibiscus* species from New Guinea, only five true dissepiments and are without false dissepiments in their ovaries and capsules. *H. campylosiphon* belongs to sect. *Bombycidendron* (fig. 8).

Almost all species of this category occur at lower altitude, but some (*H. d'albertisii*, *H. archboldianus*) ascend as high as 2400 m.

(ii) **Arboreous species occurring both in Malesia and in the mainland of SE. Asia in forest.** The species of this group are *Hibiscus macrophyllus*, *H. decaspermus* (both of sect. *Azanza* without false dissepiments and not found in New Guinea), and *H. grewiifolius* of sect. *Bombycidendron* (fig. 8). *H. macrophyllus* is a rather common species in the whole of SE. Asia, Malaya, Sumatra, and Java (fig. 5). *H. tiliaceus* ssp. *similis* (see below), which is suspected to be a hybrid between *H. tiliaceus* and *H. macrophyllus*, has about the same distribution as the last-named species (fig. 5). *H. decaspermus* occurs scattered throughout Malesia (except for New Guinea) and the Indo-Chinese Peninsula, usually near the sea. *H. grewiifolius* occurs in the Indo-Chinese Peninsula, Hainan, Java, and the Lesser Sunda Islands (Sumbawa). All species prefer lower altitudes.

(iii) **Pantropical arboreous species of sandy coasts.** Two species, *Hibiscus tiliaceus* and *Thespesia populnea*, belong here. They owe their wide distribution mainly to the capacity of their seeds to float in sea-water and to retain germination capacity under that condition for a long time. For further ecological information is referred to the special treatment. Both species are variable in morphological characters. Of *H. tiliaceus* there are a number of local races, treated here as subspecies, of which ssp. *similis*, ssp. *celebicus*, and ssp. *crestaensis* never occur along the coast, but are found more inland. It is suspected that ssp. *similis* is a hybrid between the coastal *H. tiliaceus* and the inland species *H. macrophyllus*. The distribution of the latter more or less coincides with that of ssp. *similis* (fig. 5).

(iv) **Herbaceous or fruticose species of a wide, often circumtropical distribution.** This category comprises for the greater part weeds from fallow fields, road-sides, waste places, etc., that is, terrain influenced by human occupation, but also species found in less man-influenced vegetations as savannahs, young secondary forests, teak forests etc., e.g. *Thespesia lampas*, *Abelmoschus* sp. div. Most of these species have hard seeds which under normal conditions are not dispersed by animals, wind, or water. One species, *Urena lobata*, has mericarps with hooked spines which hitch on clothes and doubtless on the pelt of mammals or the feathers of birds. To this category also belong species of genera which have their centre of development in tropical America, e.g. *Malachra*, *Malvastrum*, *Wissadula*. They can have reached Malesia only in post-Columbian time by human agency.

There is a possibility, as suggested by Van Steenis (1961), that some species have travelled without the intermediary of man from the mainland of Asia through Malesia during the Pleistocene Ice Age when, as a result of a world-wide lowering of the level of the sea, West Malesia on the Sunda shelf was joined to the Indo-Chinese Peninsula. There are several species of wide distribution, which probably have their original centre of distribution in S. or SE. Asia. Apart from some arboreous species already dealt with above, viz. *Hibiscus macrophyllus* and *H. grewiifolius*, these are most species of *Sida* sect. *Sida*, all of *Abelmoschus*, several species of *Abutilon*, *Urena lobata*, and possibly also a few other *Hibiscus* species.

Of both groups, native and anthropochorous, the ecological behaviour is similar.



Van Steenis<sup>1)</sup> has proposed a classification of distributional areas in connection with the intensity of the dry season in these areas, illustrated with maps showing the distributional areas of some *Leguminosae*. The distributional patterns present, when arranged according to an increasing need of the occurrence of a dry season, a tendency to change gradually from one continuous area into two partial areas, one in the northwest and one in the southeast, separated by an interjacent disjunction. In the following survey I have attempted to arrange the *Malvaceae* of the present category according to Van Steenis's 'drought classes'.

a) *Species indifferent to climate*. These species do not need a dry season and mostly occur throughout Malesia. As evidence for a species to belong to this class I consider the fact that it is a very common species in the wet parts of West Java, e.g. Bogor and vicinity, where I studied *Malvaceae* in the field. Species very common in this area are in the first place *Sida acuta* (as far as ssp. *acuta* is concerned), *S. rhombifolia* (s.l.), and *Urena lobata* (s.l.), which occur in particular on road-sides and waste places etc. in towns and villages, often in places where organic waste is deposited. (Possibly they require a greater amount of nitrogen in the soil). In the vicinity of Bogor they flower and fruit throughout the year, and, though annual in character, may persist for two or even more years. In drier regions their growth will be terminated by the dry season. Of *Urena lobata* there exist two races, treated here as subspecies, of which one (ssp. *sinuata*) mainly occurs in the lowland, and the other one (ssp. *lobata*) in the mountains (fig. 20).

Other species belonging here are *Hibiscus surattensis* and *Abelmoschus moschatus*. Although not lacking in towns and villages, these are found more frequently in grass-savannahs, young secondary forests, teak forests and the like. *A. moschatus* ssp. *tuberosus* occurs in particular in vegetations periodically set on fire, but is not absent in everwet regions. It has like *A. crinitus* a tuber-like mainroot.

*Thespesia lampas*, a fruticose species, also prefers grass-savannahs. *Abelmoschus angulosus* is a montane species which only occurs in North Sumatra and Java (fig. 4), but I believe nevertheless that it belongs here, because it seems to prefer everwet conditions. *Sida cordifolia* and *Abutilon indicum* are common throughout Malesia, but prefer grounds near the sea, at least *A. indicum* ssp. *indicum* and ssp. *guineense*.

All species occur also in continental SE. Asia, and are, except for *Abelmoschus angulosus*, wide-spread outside Malesia. *Hibiscus surattensis* and *Thespesia lampas* do not occur in the New World.

b) *Species with preference for at least a feeble dry season*. Drought class 2. According to Van Steenis such a feeble dry season occurs locally in North Sumatra, North Malaya, West Java, and scattered localities in New Guinea and these enclaves permit the growth of plants adapted to this type of climate.

As members of this class I consider *Sida subcordata*, *S. mysorensis*, and *Wissadula periplocifolia*. These species occur in Sumatra and Malaya only in the northern parts, have never been found in Borneo (except *W. periplocifolia* once at Bandjermasin, Motley) or New Guinea; in West Java they occur also in the wetter parts, but far less common than the species of the former class. They occur also in the drier parts of Malesia and

<sup>1)</sup> STEENIS, C. G. G. J. VAN. 1961. Preliminary revision of some genera of Malaysian Papilionaceae I. Introduction. *Reinwardtia* 5: 420—429.

See also Van Steenis in BACKER, C. A. & R. C. BAKHUIZEN VAN DEN BRINK f. 1965. *Flora of Java* 2: (62) seq.

outside Malesia in India and the Indo-Chinese Peninsula; *Wissadula periplocifolia* is of American origin, but occurs in Asia of old; the Linnean type is from Ceylon.

Also *Malvastrum coromandelianum* belongs in my opinion to this class. It does not occur in the wettest parts of Malesia (Sumatra mainland, Malaya, Borneo and New Guinea); in West Java it is found, but, though usually occurring in the same habitats, not as common as *Sida rhombifolia*, *S. acuta*, or *Urena lobata*. The species is of American origin, but now of pantropical occurrence.

A similar case seems *Abutilon indicum* ssp. *albescens*, which occurs in Sumatra only in the East Coast region, not in Malaya or in Borneo. It occupies a restricted distributional area; outside Malesia it occurs solely in North Australia and some Pacific islands; it may be dispersed wider in the future by human agency.

c) *Species requiring a pronounced dry season.* Drought class 3. These species do not occur on the Sunda shelf (Sumatra, Malaya, Borneo), and in Papua only in strictly seasonal spots. I got the impression that they also lack in the wettest parts of Java, viz. West Java except the northern coastal regions.

A good example of this class is presented by *Hibiscus vitifolius*. Outside Malesia it is widely distributed in the Old World, but in America only incidentally.

*Abelmoschus manihot* ssp. *tetraphyllus* var. *tetraphyllus* has about the same distributional pattern within Malesia, but it has been found in Java only once, viz. in Madiun Residency (East Java), which may be correlated with a different land-use in Java. Outside Malesia it is found in the Indo-Chinese Peninsula and North Australia. It occurs in the lowlands up to 400 m. Var. *pungens* has been collected in North Sumatra, but not in New Guinea. The variety is found above 400 m, a fact which may offer an explanation for the differences in distribution. Outside Malesia it occurs in India, the Indo-Chinese Peninsula, but not in North Australia.

*Sida javensis* ssp. *expilosa* also belongs to the present class; its distribution matches that of *Hibiscus vitifolius*, but it has not (yet) been encountered in New Guinea. Ssp. *javensis* has also been found in North Malaya (Perlis). *Sida javensis* has a very wide distribution outside Malesia.

Also *Abelmoschus crinitus* (fig. 3) seems to belong here, though inside Malesia it has been only collected in Java (West Java included), and the Philippines (Mindoro); in the Indo-Chinese Peninsula it is a common species. From the actual distributional area I venture to conclude that its dispersal through Malesia can be expected to proceed. Like *A. moschatus* ssp. *tuberosus* it often occurs in vegetations periodically set on fire; its taproot becomes tuber-like.

d) *Species requiring a rather strong dry period.* Drought class 4. In this class the areas of distribution in Malesia begin to break up into two parts, viz. a northwestern part in the Asian mainland and a southeastern one consisting of the drier parts of Java, the Lesser Sunda Is., the SE. Moluccas, sometimes the drier spots in East New Guinea and also often in North Australia but still with occasional localities in the Philippines and/or S. Celebes which present feeble links between the two parts.

Good examples seem to me *Hibiscus panduriformis* and *H. lunariifolius*. The former species occurs in tropical Africa, India, Birma, Java (the drier parts), the Lesser Sunda Is., SW. Celebes, and North Australia. From the Philippines there is one old record (Manila, Perrottet). The latter is restricted within Malesia to East Java (with Madura and the Kangean Arch.), the Lesser Sunda Is., and SW. Celebes; outside Malesia it is widely distributed in the semi-arid regions of the Old World, North Australia excepted.

e) *Species requiring a strong dry season.* Drought class 5. Species belonging to this class show wide disjunction between their distributional area in SW. Asia and that in Malesia. Intermediary localities are not anymore present.

*Abutilon crispum*, in origin American, but now a pantropical weed, shows such a pattern. It occurs in the drier parts of Java, Christmas I. (Indian Ocean), the Lesser Sunda Is., Kisar, and the Kalaotoa Is.; there is also an old record from Makassar (*Zipelius*). Outside Malesia it occurs among others in India, Ceylon, Hainan, and North Australia. *A. auritum* can also be classified here; it is found in E. Java, Madura, Christmas I. (Indian Ocean), the Lesser Sunda Is., E. Papua, North Australia, and New Caledonia, but not in India or the Indo-Chinese Peninsula. There are two old specimens said to come from Celebes (fig. 1).

In addition the two species of the American genus *Malachra* can be mentioned, which as far as known follow this pattern.

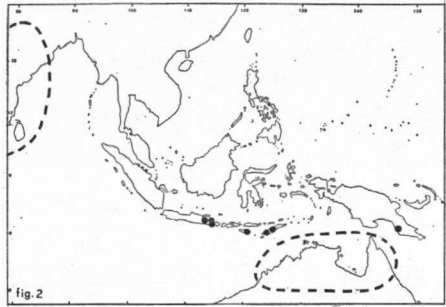
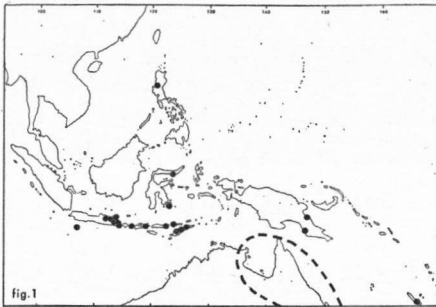


Fig. 1. *Abutilon auritum* (Wall. ex Link) Sweet, a lowland species bound to areas subject to a strong dry season.

Fig. 2. Area of *Abelmoschus ficulneus* (L.) W. & A. ex Wight, a tropical lowland species extending from Madagascar and E. Africa, bound to areas subject to a severe dry season.

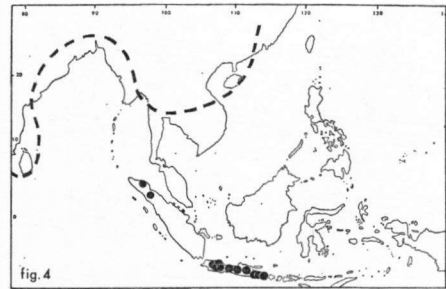
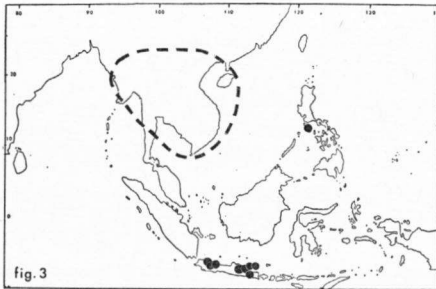


Fig. 3. Distribution of *Abelmoschus crinitus* Wall., a lowland species restricted to areas subject to a pronounced dry season.

Fig. 4. Distribution of the montane species *Abelmoschus angulosus* W. & A. sens. lat., the broken line representing the approximate southern border in continental SE Asia; dots are localized, identified specimens.

f) *Species bound to a severe dry season.* Drought class 6. These species are restricted to the driest parts of Malesia, viz. in NE. Java (Madura and Kangean Arch. included) and the Lesser Sunda Is. The *Malvaceae* belonging to this class also occur in very dry regions outside Malesia (except for *Sida elongata*), often in marginal parts of deserts or in oases.

Good examples are evidently *Hibiscus lobatus* (Java only), *H. hirtus* (Java, Lesser Sunda Is., Kalaotoa Is., Leti, Tanimbar: old record), *Abelmoschus ficulneus* (Java, Lesser Sunda Is.; fig. 2), *Abutilon persicum* (Java, Timor), *Malvastrum americanum* (easterly Lesser Sunda Is.), *Pavonia procumbens* (easterly Lesser Sunda Is.), and *Sida elongata* (Java, Lesser Sunda Is.). Most species are native in the Old World; *Malvastrum americanum* is of American origin.

*Hibiscus meraukensis*, an Australian species of semi-arid regions, has been found near Merauke in New Guinea, and in Trangan I., the southernmost driest island of the Aru Is. (fig. 8).

I believe that *Sida spinosa*, of circumtropical distribution in semi-arid regions, also belongs here. It is a common species in North Australia and the Torres Strait Is. The few localities in Malesia are possibly at least partly temporary, adventive settlements. *Sida parvifolia* may be a similar case.

(v) **Rare species, obviously or possibly of foreign origin.** To this category I bring rare species only known in the wild (a), and cultivated species occasionally running wild (b).

a. *Obviously adventive species* are *Pavonia rigida* (from the Indo-Chinese Peninsula), *Malva parviflora* (from the northern temperate regions), *Abutilon theophrasti* (from the subtropical regions in the northern hemisphere), *A. hirtum* (semi-arid tropical regions of the Old World), *Sida acuta* (to wit ssp. *carpinifolia*, tropical America and Africa), *S. glutinosa* (tropical America), and *S. ciliaris* (tropical and subtropical America). In addition *Hibiscus cochleariferus*, a new species found in North Sumatra, may have been introduced, because its closest relative, *H. sororius*, is a South American species. *Abutilon listeri*, only known from Christmas I. (South of Java), and hitherto not identified with any well-known species elsewhere, may have been introduced there. The same may hold good for *Hibiscus bicalyculatus*, an aberrant woody vine in the Philippines (Luzon). *Hibiscus diversifolius* of wide distribution in the Old World has been encountered in Malesia only in few localities (Philippines, New Guinea); it is one of the few *Malvaceae* preferring very moist grounds (river banks etc.).

I believe moreover, that the Malesian species of *Kosteletzkya* (*K. batacensis* from the Philippines, *K. wetarensis* from Wetar) are of foreign origin, because the genus as a whole mainly occurs in America and also in Africa. Compare also p. 11.

b. *Species occasionally running wild* are *Hibiscus acetosella*, *H. radiatus*, *Abelmoschus esculentus*, *Gossypium hirsutum* (var. *taitense*), *G. barbadense* (var. *acuminatum*), *Modiola carolineana*, *Anoda cristata*, *Wissadula contracta*, *Abutilon striatum*, and possibly *A. arboreum*.

(vi) **Cultivated species.**

a. *Ornamentals.* Frequently used ornamentals are *Hibiscus mutabilis*, *H. indicus*, *H. rosa-sinensis*, *H. schizopetalus* (and hybrids of the last-named two species), *Malvaviscus arboreus*, and *Abutilon striatum*; occasionally encountered as ornamentals are *Hibiscus syriacus*, *H. hirtus*, *H. pedunculatus*, *Thespesia populnea*, *Pavonia spinifex*, *Modiola carolineana*, *Anoda cristata*, *Malva sylvestris*, and *Althaea rosea*.

b. *Vegetables.* Locally used as vegetables are *Hibiscus acetosella*, *H. radiatus*, *H. sabdariffa*, *Abelmoschus manihot* (glabrous forms), and *A. esculentus*.

c. *Technical plants* (wood, fibres, textile). As such are planted or cultivated *Hibiscus tiliaceus*, *H. macrophyllus*, *H. cannabinus*, *H. sabdariffa*, *Gossypium* sp. div., *Wissadula contracta*, and *Abutilon grandifolium*.

Many other species have been reported to be cultivated in Malesia; most of them are never in regular cultivation, however, but occur only in botanical and experiment gardens.

#### TYPIFICATION OF NAMES OF SPECIES AND INFRASPECIFIC TAXA

With regard to names published by authors of the last hundred years of which no holotypes were designated, it must be stated that I have abandoned in most cases to select lectotypes out of series of isotypes. One can accept the necessity that ultimately every validly published name without a holotype should be supported by either a lectotype, or if necessary, by a neotype. But in that case one should also accept the obligation to select these in the most accurate, fair way, and in agreement with the 'Guide for the determination of types' in the Code. For a lectotype among a collection of isotypes one has to look for the specimen which is the most complete, in the best condition, and matches at best the protologue, the description included. One can then, therefore, only come to a definite choice, when comparing all isotypes at the same time. This situation is difficult to attain, because the isotypes are mostly distributed among several herbaria. I am of the opinion that in most cases a selection of a lectotype, assuming that the name was based on one collection, makes little sense in ligneous plants and large herbs. Good collectors gather a collection of one number by preference only from one living specimen, so that the whole collection is very homogeneous and can be considered equivalent to the type.

For validly published names of some authors, e.g. Jacquin, J. A. Murray, Moçinho & Sessé, Ker, and W. Watson, no specimens have been seen; the plates (with descriptions) have been used here as types instead.

Notice should be taken of the fact that the qualifications holotype, lectotype, etc., as inserted below the synonymy, are not always in accordance with the preliminary annotations made by me on sheets in several herbaria in the earlier phases of the work.

Some explanation has to be given with respect to the policy followed here in the typification and/or regarding the location of types for the following authors.

**F. M. Blanco.** Except for a small collection supposed to be gathered by Blanco & A. Llanos (at MA), there are no authentic specimens of this author. For the *Malvaceae* I have designated specimens of Merrill's 'Species Blancoanae' as neotypes, as far as these specimens match Blanco's descriptions.

**C. L. Blume.** It is difficult to state which specimens Blume has used for his 'Bijdragen'. Of the numerous specimens at Leyden bearing names of *Malvaceae* in the handwriting of Blume, there are two kinds, viz. those very neatly labelled and usually provided with the annotation 'Bl. Bijdr.', and several other ones labelled in a more hurried handwriting. I believe that the first kind belonged to the collection which Blume considered to be illustrative for his species, and I have qualified these, therefore, as holotypes (if unica) or lectotypes. The other kind probably consists of duplicates or specimens which he received and identified afterwards. I have named these isotypes, although this is presumably not true for some of them. Of *Hibiscus similis* Bl. I have not found authentic specimens at Leyden, but there is one at Paris with the same neat handwriting as mentioned above. There are also isotypes of some other Blumean names at Paris.

**A. J. Cavanilles.** Most types of specific names of this author, especially holotypes, can be found at Paris (Herb. de Jussieu, Herb. Lamarck); some holotypes are apparently in the Herbarium Thouin (preserved at Montpellier), which I have not seen, but duplicates are usually present in the herbaria mentioned above. Isotypes and some holotypes are preserved at Madrid (mainly Herb. Cavanilles). Cavanilles used to indicate fairly exactly where his specimens were preserved. Sometimes he referred to a living specimen in a French garden ('v.v. '), but usually also dry specimens can be traced in these cases. Most type specimens bear separately labels with the locality and collector and labels with the name in Cavanilles's handwriting. In addition there are usually the corresponding clippings (descriptions and figures) cut out from the printed publications.

**J. K. Hasskarl** based several new species on living plants cultivated in the botanic garden at Bogor. His extensive descriptions are not always sufficiently clear to recognize the species. When at Bogor he did not collect many plants in the garden, but afterwards he received a collection gathered by Teijsmann, which he named. Some of these specimens (at L) can be used as types.

**C. Linnaeus.** I have followed the method of typification which Dr. W. T. Stearn has explained and promoted in his introduction to the third facsimile print (1957) of the first edition of 'Species Plantarum'. Stearn has pointed to Linnaeus' obviously consistent ways of redacting the protologues of his species, thus discriminating between species never dealt with before (e.g. *Hibiscus surattensis*, *H. hirtus*) and species treated by himself and/or other authors in previous publications, be it under pre-Linnean phrase-names. In part of the last-named group of species he just cited the phrase-name as used in the first publication referred to, followed in the same line by that reference. This means, according to Stearn, that Linnaeus based these species directly on that publication (e.g. *Malva americana*, *Hibiscus tiliaceus*). In part, however, he published a new phrase-name, and had the first reference printed in a new paragraph, which means, in Stearn's opinion, that Linnaeus based these species primarily on his own material (e.g. *Sida cordifolia*).

The opinion of Stearn is more or less confirmed by my experience with the *Malvaceae* in the Linnean herbarium. In cases when Linnaeus apparently based a species on previous items, there is often no corresponding material in that herbarium, or only material evidently added by his son, or J. E. Smith, and, if added by himself, the specimen often does not fit the protologue. When Linnaeus introduced a completely new species or used a new phrase-name, there is usually a corresponding specimen in the herbarium, marked with the species number in 'Species Plantarum'.

It follows that for purposes of typification an examination of the Linnean herbarium is certainly not sufficient. In many cases also the collections of Clifford, Hermann, Sloane, Plukenet (all in BM), Van Royen (at L), Osbeck (Stockholm), etc. should be consulted.

**F. A. W. Miquel** based most of his new species on specimens collected by Junghuhn and Zollinger. The specimens of Junghuhn are at Leyden, but duplicates are often found at Utrecht or even in other herbaria. Of the Zollinger herbarium Miquel had a set on loan from Paris, of which he retained fragments which are preserved at Utrecht. Most of these fragments are incompletely labelled, and usually lack numbers. In my opinion these should not be considered holotypes or chosen as lectotypes. The original set is still at Paris, and bears names in Miquel's handwriting.

**W. Roxburgh.** Many names of *Malvaceae* with this author's name exist in literature, partly *nomina nuda* validated by other authors who used Roxburgh specimens in their herbaria (e.g. Hornemann). For the names validated by Roxburgh himself (post-

humously in the Carey edition of the Flora Indica), I have chosen, if possible, corresponding specimens as lectotypes in the Roxburgh collection in the Herbarium Martius at Brussels, or Roxburgh specimens in the Wallich herbarium (K-W).

N. Wallich had in his 'Numerical List' many nomina nuda in *Malvaceae*, which were partly validated by subsequent authors. I have selected lectotypes in the Wallich herbarium at Kew. In case a number was represented there by one specimen (or locality) I have considered that to be the holotype.

#### PRESENTATION OF DATA

##### Morphological terminology

The ontogenetic morphology of the *Malvaceae*, in particular that of the flower, but also that of the fruit, is rather complicated, requires a special study, and actually falls beyond the scope of the present revision. With respect to the morphology of the androecium (staminal column) is referred to the recent study of Van Heel (1966, *Blumea* 13: 177—394).

The morphological terminology used here in keys and descriptions is purely descriptive and the terms applied are in accordance with those which are more or less in general use among specialists on *Malvaceae*. In some cases, when two or more equivalents exist, one has been chosen at random, when I started the work. Because all terms are well-known I omit a glossary, but it is useful to comment on some of them.

*Indumentum*. The family shows a rich assortment of hairs: simple hairs, gland-hairs, and in particular stellate hairs, which in some taxa of the tribe *Hibisceae* have developed into scales, which may be fimbriate (transition between stellate hairs and scales) or entire. The number of arms of the stellate hairs may vary from 2 to  $\infty$ ; the length of the arms from 1/8 mm to 10 mm. Every species can be characterized by its indumentum; it can also be used in keys as is done here to a certain extent. A key exclusively based on the indumentum is presumably possible, and could be of use for the identification of sterile specimens.

In many *Malvaceae*, e.g. *Hibiscus tiliaceus*, *Sida rhombifolia*, the indumentum consists of a dense, soft cloth of extremely small stellate hairs, which gives the plants a more or less ashen-grey appearance, especially in the herbarium. I have described this type of indumentum as 'stellate-cinereous', or 'cinereous by minute stellate hairs'.

*Leaves*. As a measure for the deepness of the incisions I have used the terminations '-lobed', '-fid', and '-parted'. A palmilobed leaf has incisions less deep than half the radius, a palmifid one incisions as deep as half the radius, and a palmiparted one incisions that go farther than half the radius. With the length of a cordate leaf is meant its greatest longitudinal dimension, i.e. from the apex to the bottom of the basal lobes.

*Pedicel*. I have used this term in a purely descriptive sense, and applied it to the whole stalk of a single flower. Such a stalk has in some genera (e.g. *Hibiscus*, *Abutilon*, *Sida*) often an articulation, mostly at or above the middle. Such a flower stalk is of course a peduncle or scape of a reduced inflorescence with on top the pedicel of the one remaining flower.

*Epicalyx*. I have used this term for the accessory whorl of segments below the calyx as occurring in many genera of *Malvaceae*. In many publications the term 'involucrum' is used, but this is less appropriate, since it is also in use for the whorl of bracts in the capitulum of the *Compositae* and in the umbel of *Umbelliferae*; it is also a term in hepaticology and in mycology. It would seem that 'hypocalyx' would be a better term than

epicalyx from a philological point of view, but the latter is already in common use for a long time.

*Calyx.* The height of the calyx (and sometimes also the epicalyx) is measured from its base to the plane formed by the tips of the segments, hence not along the outer surface to the tips.

*Corolla.* The corolla of *Malvaceae* has a contorted aestivation, which means that, seen from outside, each petal has one side covering an adjacent petal, and the other side covered by the other adjacent petal. The margin of one petal may differ considerably on both sides with respect to the indumentum, especially in the *Hibisceae*. In the descriptions I have often distinguished between a 'covering margin' and a 'covered margin'.

*Style.* I have applied this in a wide sense, although the style of e.g. *Hibiscus* must be considered a symphysis of five styles.

*Stigma.* This is a difficult term to use in herbarium-taxonomy. In the strictest sense it is only a surface on the apex of the style, fit to receive and hold the pollen for the fertilization. In practice it is also used for the thickened or broadened apex of a style or its branches, of which the stigma proper occupies only part of its surface. In the present revision its meaning follows in each case from the context.

*Schizocarp, mericarps.* According to Jackson's glossary a schizocarp is a fruit which splits into one-seeded portions named mericarps. Here a mericarp can also be two- or more-seeded as in *Abutilon*. A difficulty arises when trying to name the fruit of some species of *Abutilon*, e.g. *A. persicum* and *A. auritum*. In these the schizocarp, as I call it, splits tardily into mericarps, so that one gets sometimes the picture of a loculicidally dehiscent capsule. In the field the splitting into mericarps usually goes ahead of the dehiscent of the mericarps. In a herbarium young fruits give sometimes a delusive 'capsular' picture by the pressing during the drying process.

## Descriptions

In general each taxon is provided with a description, but tribes, sections, and varieties are only contrasted in the keys unless one of them is proposed as new.

Furthermore, no descriptions have been made of species which occur solely in cultivated state in Malesia and have not even been encountered as occasional escapes.

In this respect it must be remarked that Backer in his works on the flora of Java recorded many species as probably cultivated or possibly occasionally escaped or introduced. Backer's criterion for such cases were the dispatch lists of the Botanic Garden at Bogor; all species from such lists Backer took up as potential future additions for the Flora of Java regardless whether they would succeed as cultivated plants or become naturalized. In many cases this forestalling of treating species for the Flora of Java has appeared to be superfluous.

## Synonymy

All synonyms and interpretations of names are given as far as the Malesian flora is concerned; for the adjacent areas of continental Asia, Australia, and the Pacific only the important synonyms are given including those of which type material was examined during the course of the work; from other areas only occasionally synonyms are added.

In the synonymy names are primarily arranged chronologically to their basionyms; under each basionym the names belonging to the nomenclatural type are in their turn enumerated chronologically.

Pre-Linnean names are added at the end of the synonymy.



**Types** (see also the preceding chapter)

I have examined type material of nearly all validly published names and have recorded this in a paragraph following the synonymy. When types were not seen by me I have mostly indicated this by the abbreviation 'n.v.', or an explanation is given in the notes. Under less important species in which typification appeared to be very complicated (e.g. *Malva sylvestris* L.), or of which I had insufficient evidence, types are not accounted for. Denotation of the herbaria is according to Index Herbariorum (Regn. Veget. 31, 5th ed. 1964). In species which are subdivided into infraspecific taxa both synonyms and their types have been mentioned under the latter.

**Specimens examined**

Because of the size of this revision I have omitted long lists of specimens with localities and other data; occasionally collections showing particular characters or interesting or exceptional data are mentioned. The summarized definition of distributional areas and variety of habitats is given in sufficient detail under the respective paragraphs 'Distribution' and 'Ecology' under each taxon. An 'identification List' containing an evaluation of all numbered specimens examined will be published separately. If institutes or individual botanists will show sufficient interest in geographically arranged lists of specimens of each taxon, I am prepared to have these mimeographed.

## ACKNOWLEDGMENTS

I started this revision after October 1950, when I was appointed as a botanist to the Herbarium Bogoriense at Bogor, Indonesia. With a diminishing scientific staff and consequently an increasing amount of routine-work, progress was delayed, and towards my departure in June 1957 the work was completely stopped. From 1958—1960, when I was a guest at the Rijksherbarium at Leyden, I could continue the work and since 1961, when I was attached as a scientific officer to the Botanic Gardens of Groningen University, it was gradually completed largely in my spare time. Warm thanks are due to Prof. Dr M. H. van Raalte and Prof. Dr D. Bakker (Groningen) who granted me in the preceding years some official time to complete the manuscript.

In 1954, when on leave in Europe, I visited the herbaria of the Royal Botanic Gardens at Kew, the British Museum (Nat. Hist.) in London, and the Conservatoire Botanique at Geneva, at the expense of the Flora Malesiana Foundation. In 1959, a grant from the Netherlands Organization for the Advancement of Pure Research (Z.W.O.) enabled research work in the herbaria of Madrid, Paris, the Linnean Society of London, and further visits to the herbaria of Kew and the British Museum. In 1962 I could study in the herbarium of the Rijksplantentuin at Brussels.

From the following herbaria material was received on loan: Bandung, Berkeley, Cal., Berlin-Dahlem, Bogor (Herbarium Bogoriense; Forestry Research Institute), Brisbane, Calcutta, Cambridge, Mass. (Arnold Arboretum; Gray Herbarium), Copenhagen, Florence, Groningen, Honolulu, Kepong, Kuching, Lae, Lyon, Manila, Melbourne, New York, Singapore, Stockholm, Utrecht, Vienna, Wageningen, and Washington, D.C.

To all directors and curators of these herbaria I wish to express my gratitude for their hospitality and liberal support. Valuable advice with respect to the typification of Linnean names was given by Dr. W. T. Stearn. Mr. A. W. Exell and Mr. L. L. Forman kindly assisted during my sojourns in the herbaria of the British Museum and Kew respectively. Miss Dr. E. Paunero was so kind as to guide me in the herbarium at Madrid.

I feel indebted to Prof. Dr. H. J. Lam, former Director of the Rijksherbarium, for

his useful suggestions and for reading part of the manuscript, and to Prof. Dr. C. G. G. J. van Steenis, present Director of the Rijksherbarium, for a critical reading and polishing of the manuscript, for suggestions to some valuable additions, and for providing administrative facilities.

Furthermore I wish to tender warm thanks to Dr. R. C. Bakhuizen van den Brink Jr. for scanning the nomenclature and publication dates and for correcting some Latin diagnoses, to Miss E. van Nieuwkoop for her devoted, accurate typing of the MS, to Mr. Soekirno c.s. (Bogor) and Messrs H. J. T. Tammel and E. Vijsma (Leyden), who drew and composed the plates, and to Miss Dr. Ch. H. Andreas (Groningen) and Mr. D. N. F. Kiehl (Leyden) who assisted in proofreading.

## MALVACEAE

Annual or perennial herbs, rarely prickly (*Hibiscus* § *Furcaria*), shrubs or trees; stems and/or bark usually very fibrous and with slime canals; bark with dilated rays. Indumentum almost always stellate-hairy or lepidote, mostly simple hairs also present, sometimes also with simple or stalked gland-hairs. *Leaves* spirally arranged, stipulate, simple, entire to deeply parted, mostly palmately nerved or at least plinerved at the base, not unfrequently provided with extra-floral nectaries on the nerves beneath. *Flowers* (in Mal.) actinomorphic, bisexual, 5-merous, solitary and axillary, or in terminal or/and axillary racemes or panicles often condensed to clusters or even reduced to a single flower. *Calyx* connate, valvate, lobed or occasionally entire, sometimes with nectaries on the costae, occasionally with a hypanthium, persistent or during the setting of the fruit spathaceously splitting and caducous, often subtended by a usually persistent epicalyx with 3—∞ free or connate, subulate to leafy segments. *Disk* none, but nectariferous tissue at the base of the calyx or exceptionally (in *Hibiscus pulvinulifer*) between the adnation of corolla and staminal column. *Corolla* contorted, at base adnate to the staminal column and falling off with it, limb of the petals usually asymmetric, ephemeral, not seldom marcescent. *Stamens* ∞, monadelphous; staminal column ending into 5 minute teeth (trib. *Hibisceae* & *Ureneae*) or dissolved into ∞ filaments; anthers dorsifixed, monotheal; pollen echinate. *Ovary* (in Mal.) (3—)5—∞-celled; ovules 1—∞ per cell, axile; styles as many as carpels or twice as many, often united to various degree; stigmas as many as styles, on distinct style-arms or almost united. *Fruit* a schizocarp or a capsule, sometimes not dehiscent (*Thespesia*); mericarps 1—∞ seeded; capsule 3—∞-seeded. *Seeds* albuminous, often with oil; testa often provided with hairs; embryo mostly curved; cotyledons often plicate.

*Distribution*: About 50 genera with possibly 1000 species, throughout the world, but mainly developed in the tropics and subtropics.

*Ecology*: Generally heliophilous plants with a preference for dry climatic conditions, in the tropics not ascending higher than to montane altitude.

KEY TO THE TRIBES <sup>1)</sup>

1. Staminal column at apex 5-toothed; filaments projecting from the whole surface of the column or from a great part of it. Epicalyx mostly present, rarely absent (*Hibiscus lobatus*, *Malachra*).
  2. Style 1, at apex branched or with a lobed or ribbed stigma; branches, lobes or ribs as many as carpels, usually 5. Fruit a capsule . . . . . I. tribe **Hibisceae**
  2. Styles twice as many as carpels or mericarps, always 10. Fruit a schizocarp, at maturity breaking up into mericarps . . . . . II. tribe **Ureneae**
1. Staminal column without teeth, at apex split up into numerous filaments. Epicalyx present or lacking. Styles or style-branches as many as carpels, 5—∞. Fruit a schizocarp, at maturity breaking up into mericarps . . . . . III. tribe **Malveae**

## KEY TO THE GENERA OF I. TRIBE HIBISCEAE

1. Style distally divided into 5, ultimately spreading branches.
  2. Ovary with more than 1 ovule per cell; capsule usually with more than 1 seed per cell.
    3. Calyx not (or rarely) splitting on one side during anthesis, 5-lobed to 5-parted, not adnate to the corolla, persistent after flowering . . . . . I. **Hibiscus**

<sup>1)</sup> Of the tribe *Malopeae*, *Malope trifida* Cav. is recorded by Backer & Bakh. f. as cultivated in Java. I have not seen any specimen.

- 3. Calyx splitting on one side during anthesis, at apex minutely 5-toothed, adnate to the corolla and falling with the latter after flowering . . . . . 3. *Abelmoschus*
- 2. Ovary with 1 ovule per cell; capsule with 1 seed per cell. Calyx 5-lobed to 5-parted . . . . . 2. *Kosteletzkya*
- 1. Style undivided, at apex with a ribbed or lobed stigma. Calyx entire or minutely 5-toothed.
- 4. Epicalyx segments 3—8, small and narrow, mostly caducous. Seeds glabrous or short-hairy, rarely lanate. Ovary and fruit 5-merous. Not black punctate. . . . . 4. *Thespesia*
- 4. Epicalyx segments 3, large, leaf-like, cordate, persistent. Seeds densely and long lanate. Ovary and capsule 3—5-merous. Nearly all parts punctate by black oil-glands . . . . . 5. *Gossypium*

KEY TO THE GENERA OF II. TRIBE URENEAE

- 1. Flowers usually axillary, solitary, occasionally in axillary clusters. Epicalyx present.
- 2. Mericarps mucronate, prominently reticulately veined, with 3 retrorsely hairy awns or with many hooked spines, rarely smooth, never fleshy. Corolla rotate; petals never auriculate. Herbs or undershrubs.
  - 3. Mericarps with hooked spines (glochidiate). Leaves always with a nectary on the midrib beneath . . . . . 8. *Urena*
  - 3. Mericarps mucronate, prominently reticulately veined, or with 3 retrorsely hairy awns, never with hooked spines. Leaves rarely with a nectary . . . . . 7. *Pavonia*
- 2. Schizocarp smooth and fleshy like a berry. Corolla long campanulate or fusiform; petals auricled at base. Shrubs, often with scrambling branches . . . . . 6. *Malvaviscus*
- 1. Flowers in heads with involucre. Epicalyx absent . . . . . 9. *Malachra*

KEY TO THE GENERA OF III. TRIBE MALVEAE

- 1. Flowers (and fruits) with an epicalyx.
  - 2. Ovules 1 per cell; seeds 1 per mericarp. Mericarps without a transversal, false dissepiment. Flowers yellow, pink, purple or white.
    - 3. Style-branches with capitate stigmas. Leaves (in Malesia) mostly penninerved (with foot-nerve). Epicalyx segments 3 . . . . . 14. *Malvastrum*
    - 3. Style-branches at apex acute. Leaves palminerved.
      - 4. Epicalyx segments 6—9, at base connate. Stout, erect herbs . . . . . 13. *Althaea*
      - 4. Epicalyx segments 3, free, sometimes adnate to the calyx. Low, ascendent or prostrate herbs. . . . . 12. *Malva*
  - 2. Ovules 3 per cell; seeds 2—3 per mericarp. Mericarps semibilocular by a transversal, false dissepiment being an accrescent funicle of the lower seed. Flowers very small, vermilion. Stigmas capitate. . . . . 10. *Modiola*
- 1. Flowers (and fruits) without epicalyx.
  - 5. Ovules 2 or more per cell; seeds 2 or more per mericarp, rarely 1 by abortion. Mericarps follicular, usually dehiscent and dropping the seeds at maturity.
    - 6. Ovules 2 or more per cell; seeds 2 or more per mericarp, in a longitudinal series. Mericarps without constriction. Flowers mostly medium-sized and solitary in the leaf-axils, rarely in panicles. . . . . 16. *Abutilon*
    - 6. Ovules 3 per cell; seeds usually 3 per mericarp, occasionally less by abortion; the two upper seeds in a collateral position, separated from the lower seed by a more or less distinct constriction of the mericarp. Flowers small, in lax panicles . . . . . 15. *Wissadula*
  - 5. Ovules 1 per cell; seeds 1 per mericarp. Mericarps closely enveloping the seed, at maturity releasing the seed by withering of the wall or by dehiscence at the apex.
    - 7. Lateral walls of the mericarps persistent or decaying after maturity. Flowers small, yellow. Leaves orbicular to lanceolate or linear, never hastate . . . . . 17. *Sida*
    - 7. Lateral walls of the mericarps obliterated before maturity. Flowers medium-sized, purple. Leaves hastate . . . . . 11. *Anoda*

I. Tribe HIBISCEAE

Endl., Gen. Pl. (1840) 982; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 47; Gürke, in Fl. Bras. 12, 3 (1892) 539.  
 Holotype: *Hibiscus* L.

## I. HIBISCUS

Linné, Gen. Pl. ed. 5 (1754) 310; *nom. cons. prop.* Taxon 15 (1966) 43; cf. p. 249 Sp. Pl. (1753) 693; B. & H., Gen. Pl. 1 (1862) 207, *excl.* sect. *Abelmoschus*; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 49; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 56, *excl.* sect. *Abelmoschus*; Kearney, Am. Midl. Nat. 46 (1951) 109. — *Pariti* Adans., Fam. Pl. 2 (1763) 401; St. Hil., Fl. Bras. Merid. 1 (1828) 255 ('*Paritium*'). — *Triguera* Cav., Diss. 1 (1785) 41. — *Solandra* J. A. Murray, Comm. Soc. Reg. Sc. Goetting. 6 (1785) 20, non L. 1759. — *Laguna* Cav., Diss. 3 (1787) 175; Schreb., Gen. 2 (1791) 463 ('*Lagunaea*'); Pers., Syn. 2 (1807) 259 ('*Lagunea*'); DC., Prod. 1 (1824) 474 — *Furcaria* Kosteletzky, All. Med.-Pharm. Fl. 5 (1836) 1856. — *Sabdariffa* Kostel. l.c. — *Bombycidendron* Zoll., Nat. & Geneesk. Arch. 2 (1845) 14. — *Triplochiton* Alefeld, Oest. Bot. Z. 13 (1863) 13. — *Fioria* Mattei, Bol. Ort. Bot. Palermo n.s. 2 (1917) 71. — *Wilhelminia* Hochr., Nova Guinea 14 (1924) 160.

Lectotype: *H. syriacus* L. (cf. Hitchcock & Green, Int. Rules Bot. Nomencl. ed. 3, 1935, 141).

Herbs, undershrubs, shrubs or trees, with stellate hairs and (or) scales. *Leaves* not incised or palmatilobed to -parted, rarely pennilobed, often with extrafloral nectaries. *Flowers* axillary, solitary, often in racemes or panicles by reduction or abortion of the upper leaves. Pedicel mostly articulate, at apex rarely thickened into an obconical or discoid hypanthium. *Epicalyx segments* 3—∞, rarely lacking, usually free or shortly connate, mostly persistent. *Calyx* usually campanulate, 5-lobed to 5-parted, rarely splitting one-side, mostly with a distinct nervation, sometimes with nectaries, persistent. *Corolla* mostly large and showy, also medium-sized or small, of various colour, often yellow with a dark purple centre. *Staminal column* mostly as long as or shorter than the petals, rarely longer, antheriferous throughout or only in the upper half. *Ovary* mostly 5- or as a result of 5 false dissepiments 10-celled; ovules 3—∞ per cell; style 1, distally 5-branched; stigmas usually discoid, sometimes capitate or indistinct. *Capsule* loculicidally dehiscent, 5- or by false dissepiments 10-celled. *Seeds* 3—∞ per cell, globose or reniform, glabrous or hairy.

*Distribution*: At least 250 *spp.* in the tropics and subtropics of the Old and New World, only 2 or 3 *spp.* in the temperate zone. *H. tiliaceus* L. is a pantropical coastal species. Some species, for example *H. surattensis* L., *H. panduriformis* Burm. f., and *H. vitifolius* L., have been widely dispersed in the Old World, no doubt mainly by human agency. Many, mainly woody species, are restricted to one island or area, such as the woody species (sect. *Azanza*) of New Guinea.

*Ecology*: Most species are heliophilous and prefer lower altitudes; herbaceous species and undershrubs occur in particular in waste places, along roadsides, in lang fields, etc.; the arboreous species occur especially in secondary forest.

*Notes*: As has been explained more in detail on p. 132 the generic name *Hibiscus* must be conserved if we want to maintain it; I have published an official proposal to that effect.

*Paritium* St. Hil. is only an etymological variant of *Pariti* Adans. and is not a separate taxonomic concept. Consequently it is not a taxonomic or other kind of synonym; combinations are hence to be treated as belonging to one concept, regardless whether *Pariti* or *Paritium* was used.

## KEY TO THE SECTIONS

1. Trees, usually with large, ovate to orbicular, often broadly attached stipules. Ovary often 10-celled by 5 true and 5 false dissepiments.

2. Stipules broadly attached, initially pairwise enveloping young sprouts, ultimately leaving annular scars. Leaves usually palminerved. Pedicel at apex without discoid hypanthium. *Spp.* 1—16.
  1. sect. **Azanza**
2. Stipules otherwise. Leaves penninerved. Pedicel at apex thickened into a more or less discoid hypanthium (thus an adnation of the epicalyx and calyx is simulated). *Spp.* 17—18.
  2. sect. **Bombycidendron**
1. Herbs, undershrubs or shrubs. Stipules small, filiform, linear to lanceolate, occasionally spatulate or cochleariform, rarely about orbicular (viz. in *H. surattensis* L., a prickly herb, and *H. bicalyculatus* Merr., a rare shrub or woody climber). Ovary and capsule always 5-celled.
3. Herbs or undershrubs, often prickly and mostly with an extrafloral nectary on the midrib of the leaves. Calyx, particularly after flowering, pergamentaceous, rarely fleshy, after flowering much enlarged, somewhat inflated, with 10 strongly prominent nerves; 5 of these (the costae) running to the apices of the segments, and 5 to the sinuses; the latter 5 forking into 10 strongly prominent intramarginal nerves in the segments<sup>1</sup>). Calyx mostly with a nectary on the costae. Epicalyx often with leaf-like appendages, sometimes adnate to the calyx at the very base. *Spp.* 19—27.
  3. sect. **Furcaria**
3. No such combination of characters.
4. Shrubs, usually with ovate penninerved leaves. Corolla large; staminal column longer than the petals, antheriferous in the upper half. *Spp.* 32—35. . . . . 5. sect. **Lilibiscus**
4. Staminal column shorter than the petals, antheriferous throughout.
  5. Epicalyx segments extremely small and caducous or lacking. Flowers small. Herbs or undershrubs. *Sp.* 40. . . . . 7. sect. **Solandra**
  5. Epicalyx segments well developed, persistent.
  6. Mature seeds in the median plane with an auricle of long, silky, ferruginous hairs. Usually herbs or undershrubs with small flowers, rarely shrubs with medium-sized flowers. *Spp.* 36—39. . . . . 6. sect. **Hibiscus**
  6. No such seeds.
    7. Capsule 5-winged or with prominent angles. *Sp.* 43. . . . . 9. sect. **Pterocarpus**
    7. Capsule not so.
      8. Calyx more or less inflated, particularly in fruit. Mostly shrubs with palmilobed or angular leaves and large flowers. *Spp.* 28—31. . . . . 4. sect. **Trionum**
      8. Calyx not inflated. Herbs or undershrubs with medium-sized flowers. Indumentum with many stiff, shiny, often 2—3-branched hairs. *Spp.* 41—42. . . . . 8. sect. **Ketmia**

## KEY TO THE SPECIES OF I. SECT. AZANZA

1. Ovary and capsule 10-celled by 5 true and 5 false dissepiments.
2. Staminal column much shorter than the petals, antheriferous throughout. Epicalyx segments 8—11, connate, usually much shorter than the calyx, forming a whorl of short appressed to erecto-patent teeth. Stigmas capitate. . . . . 1. **H. tiliaceus**
2. Staminal column antheriferous in the apical half, mostly about as long as the petals or longer.
3. Corolla large, inside at the base without a hair-cushion; petals 5—11 cm long. Stigmas discoid.
  4. Epicalyx cupular to campanulate, 3—5-lobed, up to half as long as the calyx. Petals inside near base with an obovate nectary. Indumentum consisting of scales. 2. **H. sciadirolepidus**<sup>2</sup>)
  4. Epicalyx segments 4—9, usually free, occasionally very shortly connate at base, half as long or as long as the calyx. Petals without a nectary.
  5. Indumentum consisting mainly of stellate hairs. Capsule fusiform, hirsute by stiff simple hairs, also with stellate hairs.
  6. Epicalyx segments ovate to orbicular, at base usually cordate. Calyx without nectaries.
    7. Leaves ovate, acute to acuminate, with an indumentum consisting mainly of minute stellate hairs (on the lower surface  $\frac{1}{2}$ — $\frac{1}{3}$  mm  $\varnothing$ ), usually without a nectary on the midrib beneath. Epicalyx segments 5—6. . . . . 3. **H. d'albertisii**
    7. Leaves orbicular, with an indumentum consisting of fairly coarse stellate hairs (on the lower surface  $\frac{1}{2}$ — $1\frac{1}{2}$  mm  $\varnothing$ ), with a linear nectary on the midrib beneath. Epicalyx segments 4. . . . . 4. **H. leeuwenii**

<sup>1</sup>) This type of nervation actually occurs in most *Hibiscus* species and in many other *Malvaceae*, though it is often hardly visible. In this section, however, it is very striking as a result of the size of the calyx and the strong prominence of the nerves.

<sup>2</sup>) 2a. *H. carrii* Borss., of which flowers are still unknown, probably belongs here (cf. p. 39).

6. Epicalyx segments lanceolate, narrowed towards the base, not cordate.
8. Leaves ovate, with an indumentum consisting of minute stellate hairs (on the lower surface  $\frac{1}{4}$ — $\frac{1}{2}$  mm  $\varnothing$ ), with a linear nectary on the midrib beneath. Epicalyx segments 9, appressed against the calyx or nearly so. Calyx without nectaries, stellate-velutinous.
5. *H. aruensis*
8. Leaves ovate to elliptical, with an indumentum of fairly coarse stellate hairs (on the lower surface  $\frac{1}{4}$ — $1\frac{1}{2}$  mm  $\varnothing$ ), with a linear nectary on the midrib beneath. Epicalyx segments 6, spreading to reflexed. Calyx with a nectary on each costa, scaly, scabrid.
6. *H. ellipticifolius*
5. Indumentum consisting mainly of scales (fimbriate or not). Capsule ovoid to globular, obtuse to acute, densely scaly, not hirsute . . . . . 7. *H. archboldianus*<sup>1)</sup>
3. Corolla medium-sized or small, inside at base with a cushion of long woolly hairs; petals  $1\frac{1}{2}$ —3 cm long. Stigmas capitate.
9. Epicalyx segments 5—6, free, occasionally very shortly connate, about half as long as the calyx, 8—12 cm long. Petals  $2\frac{1}{2}$ —3 cm long . . . . . 8. *H. pleijtei*
9. Epicalyx stellate to widely campanulate, 5-fid to 5-parted.
10. Epicalyx half as high as the calyx or more, 5—7 mm. Petals c. 3 cm long 9. *H. sepikensis*
10. Epicalyx less than half as long as the calyx,  $2\frac{1}{2}$ — $3\frac{1}{2}$  mm. Petals  $1\frac{1}{2}$ —2 cm long.
10. *H. pulvinulifer*
11. Ovary and capsule 5-celled, without false dissepiments. Stigmas capitate.
11. Calyx without scales, stellate-hairy.
12. Epicalyx segments 10—14, linear, shortly connate. Indumentum with very coarse, shiny, ferruginous, stellate hairs (arms up to 8 mm). Stipules very large, ovate, up to 15 cm long.
11. *H. macrophyllus*
12. Epicalyx segments 7—9. Indumentum with much smaller stellate hairs (arms up to c. 1 mm).
13. Stipules more or less reniform. Epicalyx segments free or very shortly connate, spreading, shorter than the calyx . . . . . 12. *H. borneensis*
13. Stipules ovate. Epicalyx widely campanulate, 7-fid, about as long as the calyx, appressed.
13. *H. pseudotiliaceus*
11. Calyx densely covered with scales.
14. Epicalyx segments free or shortly connate, linear, lanceolate or ovate, almost as long as the calyx. Seeds 2 per cell . . . . . 14. *H. decaspermus*
14. Epicalyx widely campanulate, 7—8-lobed with triangular segments, shorter than the calyx.
15. Leaves orbicular, angular to shallowly lobed. Seeds 6—7 per cell . . . 15. *H. floccosus*
15. Leaves broadly ovate, not angular or lobed. Seeds 2 per cell . . . . 16. *H. teijsmannii*

## KEY TO THE SPECIES OF 2. SECT. BOMBYCIDENDRON

1. Epicalyx segments 6—10, linear to lanceolate, much shorter than the calyx. Staminal column much shorter than the petals, antheriferous throughout . . . . . 17. *H. grewiifolius*
1. Epicalyx segments 5—7, ovate, somewhat shorter than or about as long as the calyx. Staminal column about as long as the petals, antheriferous in the upper half . . . . . 18. *H. campylosiphon*

## KEY TO THE SPECIES OF 3. SECT. FURCARIA

1. Epicalyx segments close to the apex on the inner surface with an appendage.
2. Epicalyx segments long spatulate or cochleariform, obtuse.
3. Stems, petioles and pedicels prickly. Most leaves 3—5-palmatipartite, green, as the calyx without nectaries. Stipules ovate, leaf-like, at base usually auriculate. Pedicel 5—8 cm.
19. *H. surattensis*
3. Stems, petioles and pedicels without prickles. Most leaves 3—5-lobed or not incised, usually tinged red, at base of midrib beneath with a distinct nectary. Stipules linear to lanceolate. Calyx on the costae with a nectary. Pedicel up to 5 mm . . . . . 20. *H. acetosella*
2. Epicalyx segments linear, acute. Pedicel c. 5 mm. Leaves and calyx without nectaries.
21. *H. radiatus*
1. Epicalyx segments without such an appendage.
4. Stems more or less densely covered with patent, thick, conical prickles with sharp, mostly reflexed points.

<sup>1)</sup> 7a. *H. schlechteri* Laut. possibly belongs here (cf. p. 44).

5. Calyx outside with a scabrous, coarse tomentum. Epicalyx segments  $\pm$  as long as the calyx. Corolla white with a red centre or wholly red . . . . . 27. *H. heterophyllus*
5. Calyx hirsute or ciliate. Corolla yellow with a dark purple centre.
6. Pedicel 2—7 mm. Epicalyx segments 7—10, shortly linear to lanceolate, not overtopping the calyx, rather flexible. Calyx hirsute. Petals 4—5 cm long . . . . . 25. *H. diversifolius*
6. Pedicel 8—16 mm. Epicalyx segments 10—12, long linear to filiform, usually overtopping the calyx, rigid. Calyx ciliate. Petals 5—6½ cm long . . . . . 26. *H. divaricatus*
4. Stems not prickly or slightly prickly by stiff, sharp hairs.
7. Epicalyx segments 10—12, free or nearly so, after anthesis spreading, 1½—2½ cm long. Leaves with or without nectary. Calyx without nectary.
8. Leaves on one plant not much differing in size and shape, without nectaries, herbaceous. 21. *H. radiatus*
8. Leaves on one plant much differing in size and shape, with a distinct nectary on the base of the costa beneath, more or less coriaceous or fleshy . . . . . 22. *H. meraukensis*
7. Epicalyx segments 7—10, adnate to the calyx for  $\pm$  one third, ¾—1½ cm long. Leaves beneath on the midrib and calyx outside on the costae with a nectary.
9. Leaves palmatilobed to -parted, rarely not incised; lateral segments patent to retrorse. Epicalyx segments spreading to reflexed. Calyx with a white arachnoid tomentum, never becoming fleshy after flowering . . . . . 23. *H. cannabinus*
9. Leaves palmatifid to -partite, rarely not incised; lateral segments erecto-patent. Epicalyx segments usually finally appressed. Calyx without white arachnoid tomentum, after flowering mostly becoming fleshy . . . . . 24. *H. sabdariffa*

## KEY TO THE SPECIES OF 4. SECT. TRIONUM

1. Epicalyx cupular to campanulate, 5-lobed, inflated, finally splitting one side. 30. *H. bicalyculatus*
1. Epicalyx segments free.
2. Epicalyx segments 11—12, cochleariform, consisting of a lower stalk-like and an upper leaf-like part. 31. *H. cochleariferus*
2. Epicalyx segments 5—10, linear to ovate.
3. Epicalyx segments 7—10, linear to lanceolate. Capsule slightly hispid, inside on the costae woolly with long hairs. Seeds dorsally woolly with 2—4 mm long erecto-patent to patent hairs. Green parts with multibrachiate stellate hairs, thus floccose (*in sicco* white-punctate). 28. *H. mutabilis*
3. Epicalyx segments 4—7, lanceolate to ovate. Capsule densely hispid, inside glabrous. Seeds covered with c. 1 mm long, appressed hairs. Green parts with paucibrachiate stellate hairs. 29. *H. indicus*

## KEY TO THE SPECIES OF 5. SECT. LILIBISCUS

1. Petals entire. Staminal column slightly longer than the petals.
2. Leaves entire. Pedicel 5—7½ cm. Epicalyx segments 6—9, 5—18 mm long 32. *H. rosa-sinensis*
2. Leaves 3—5-lobed. Pedicel 3½—5½ cm. Epicalyx segments 4—5, 16—25 mm long. 35. *H. × telfairiae*
1. Petals more or less deeply incised. Staminal column much longer than the petals, up to  $\pm$  twice as long.
3. Petals doubly pennilobed to -parted, with narrow segments. Pedicel 8—16 cm. Epicalyx segments 5—8, 1—2 mm long. Staminal column  $\pm$  twice as long as the petals, very thin. 33. *H. schizopetalus*
3. Petals at apex lobed with wide lobes and shallow incisions. Pedicel 6—9 cm long. Epicalyx segments 6—9, 8—15 mm long. Staminal column usually less than twice as long as the petals. 34. *H. × archeri*

## KEY TO THE SPECIES OF 6. SECT. HIBISCUS

1. Large shrubs with large flowers. Pedicel shorter than the appertaining petiole. Leaves without nectary. 36. *H. syriacus*
1. Herbs or undershrubs, mostly with small flowers. Pedicel much longer than the appertaining petiole. Leaves beneath on midrib with a linear nectary.
2. Epicalyx segments obovate to spatulate. Leaves not incised or 3-lobed, with acute tips. Staminal column 27—30 mm. Capsule pubescent, glabrescent . . . . . 37. *H. lavateroides*
2. Epicalyx segments linear to lanceolate, occasionally ovate.
3. Leaves not incised or 3-lobed, with acute to acuminate tips. Staminal column 8—10 mm. Capsule pubescent, glabrescent . . . . . 38. *H. hirtus*
3. Leaves trilobed to -parted, with rounded tips. Staminal column 20—30 mm. Capsule hispid. 39. *H. pedunculatus*



KEY TO THE SPECIES OF 8. SECT. KETMIA

- 1. Epicalyx 7—12, segments spatulate. Green parts more or less densely tomentose or velutinous by minute soft white stellate hairs, especially on the stems, petioles and pedicels also with yellow shiny, stiff, often prickly, 1—8-brachiately stellate hairs. Seeds usually stellate-tomentose 41. *H. panduriformis*
- 1. Epicalyx 5—6, linear to lanceolate. Green parts whether or not tomentose by minute rather soft white stellate hairs, always with yellow shiny, stiff but brittle, tribrachiately stellate hairs. Seeds glabrous or sparsely stellate hairy . . . . . 42. *H. lunariifolius*

I. Section *Azanza*

DC., Prod. 1 (1824) 453; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 58, *ampl.* — *Pariti* Adans., Fam. Pl. 2 (1763) 401.

Lectotype: *H. tiliaceus* L.

*Notes:* *Azanza* appears for the first time as a generic name with one species, *Azanza insignis*, in an unpublished work of Moçiño & Sessé, viz. Flora Mexicana, illustrated by a plate. This plate, t. 75, shows a plant which, in my opinion, doubtless represents a form of *H. tiliaceus* L. From a historical point of view, *H. azanzae* DC. (l.c. 454) based on the plate, would be the best name for a lectotype, but from a practical standpoint it is better to designate as such *H. tiliaceus* L., which was also mentioned by De Candolle under his section.

Hochreutiner (op. cit. 20, 1917, 153) classified *H. cardiostegius* Hochr. (a synonym of *H. d'albertisii* F. v. M.) under sect. *Columnaris* Hochr. on account of its resemblance with *H. campylosiphon* Turcz., which is classified here under a new section *Bombycidendron* (Zoll.) Borss. The large, broadly attached stipules, however, point to the sect. *Azanza*. Moreover, a hypanthium, which is characteristic for sect. *Bombycidendron*, does not occur in *H. d'albertisii* F. v. M. and related species from New Guinea. On the strength of these arguments I include these species in sect. *Azanza*.

The shape of the stigmas, capitate or discoid, is apparently a good taxonomical character, but it is difficult to discern this in herbarium material. As it can well be observed in the living plant, I have mentioned it in the key.

1. *Hibiscus tiliaceus* Linné, Sp. Pl. (1753) 694; *ampl.* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 62; Bull. Inst. Bot. Btzig 19 (1904) 8—10, 13; Ann. Cons. Jard. Bot. Genève 15—16 (1912) 244; Nova Guinea 14 (1924) 163.

See for the *synonyms under the subspecies*.

Small tree, up to 15(—30) m. Trunk fairly smooth, without buttresses, with a tough, fibrous bark. Twigs stellate-hairy, glabrescent, finally lenticellate and with annular stipular scars. *Leaves* chartaceous to coriaceous, usually orbicular (rarely otherwise; cf. key) or the upper leaves ovate, at base mostly deeply cordate, at apex cuspidate, rarely rounded or obtuse, rarely tricuspidate with entire or crenate to undulate margin, at base 5—9-nerved, beneath 1—5 central nerves with a nectary, on the upper surface sparsely stellate-hairy or glabrous, beneath mostly densely stellate-hairy; petiole stout, ± as long as the blade or shorter, stellate-hairy. Uppermost leaves often represented only by their stipules. *Stipules* large, ultimately spreading, ovate to oblong, obtuse to acute, parallel-nerved, outside stellate-hairy, inside usually simply sericeous. *Flowers* solitary, axillary, by abortion or reduction of the upper leaves in pauciflorous racemes. Pedicel short, stout, club-shaped, sulcate, after flowering thickened and lengthened, inarticulate, stellate-hairy. *Epicalyx* cupular, after flowering slightly accrescent, usually shorter than the calyx, spreading and often splitting, 8—11-lobed or-parted, with deltoid

to triangular, acute segments, outside stellate-hairy, inside simply sericeous. *Calyx* campanulate, 5-fid or 5-parted, after flowering widened and often splitting, outside with nectaries on the nerves and stellate-hairy, inside stellate-velutinous along the margin and for the rest simply sericeous. *Corolla* large and showy, yellow with a dark purple centre, turning orange-red, outside stellate-hairy, inside with scattered gland-hairs; petals at base fleshy, obovate, at apex rounded. *Staminal column* shorter than the petals, glabrous, yellow, antheriferous throughout; pollen yellow. *Ovary* globose to ovoid, acuminate, 5-angular, densely sericeous, 10-celled; style with 5 gland-hairy arms; purple; stigmas capitate, dark purple. *Capsule* globose to obovoid, acuminate with a short beak, sericeous or tomentose with stellate and simple hairs; 10-celled; pericarp thin, crustaceous; mesocarp fibrous; endocarp pergamentaceous, inside glabrous and somewhat shining. *Seeds* 5—7 per cell (of 10), reniform, punctate by minute warts and glabrous or more or less densely stellate-hairy, black-brown.

*Note:* I have accepted the wide conception of *H. tiliaceus* L. as proposed by Hochreutiner (l.c.). His varieties, however, have been raised to the rank of subspecies, as the differences in the characters are fairly great and are correlated with differences in distribution or ecology.

*Sp. elatus* (Hochr.) Borss., *comb. nov.* — *H. tiliaceus* var. *elatus* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 63, non *H. elatus* Swartz; Bates, Bailey 13 (1965) 74, fig. 21d. This taxon, differing by much stouter habit and much larger flowers, and occurring on the E. American and W. African coasts, is only cultivated in the Botanic Garden at Singapore.

#### KEY TO THE SUBSPECIES

1. Epicalyx c.  $\frac{1}{2}$  as long as the calyx; segments deltoid, 2—2½ mm long. Indumentum of leaves usually consisting of minute stellate hairs (on upper surface mostly c.  $\frac{1}{2}$  mm across, beneath mostly  $\frac{1}{4}$ — $\frac{1}{2}$  mm across). A nectary on 1—5 nerves at the base beneath. Seeds minutely stellate-hairy.
  2. Leaves mostly orbicular, at base deeply cordate, not incised, rarely inconspicuously 3-lobed.
    - A. ssp. *tiliaceus*
    2. Leaves in outline ovate to elliptic, at base mostly acute to rounded, deeply 3-lobed to 3-parted.
      - D. ssp. *hastatus*
  1. Epicalyx  $\frac{1}{2}$ — $\frac{2}{3}$  as long as the calyx; segments long triangular, 5—14 mm long. Leaves with an indumentum mostly consisting of larger stellate hairs (on the upper surface  $\frac{1}{4}$ — $\frac{1}{2}$  mm across, beneath  $\frac{1}{2}$ —1 mm across).
    3. Leaves beneath on one or more basal nerves with a nectary far above the base. Seeds clothed with  $\frac{1}{4}$ — $\frac{1}{2}$  mm long hairs . . . . . B. ssp. *similis*
    3. Leaves beneath on one or more basal nerves with a nectary at the base.
      4. Leaves usually orbicular, at base deeply cordate. Seeds densely clothed with long, ferruginous woolly hairs . . . . . C. ssp. *celebicus*
      4. Leaves ovate to elliptic or somewhat obovate, at base rounded or shallowly cordate. Seeds unknown . . . . . E. ssp. *crestaensis*

**A. ssp. *tiliaceus*.** — *H. tiliaceus* Linné, Sp. Pl. (1753) 694; in Stickman, Herb. Amb. (1754) 10; Linné, Amoen. Acad. 4 (1759) 121; Forster f., Prod. (1786) 48; Cav., Diss. 3 (1787) 151, t. 55 f. 1; DC., Prod. 1 (1824) 454, p.p.; Blume, Bijdr. 2 (1825) 73; Roxb., Fl. Ind. ed. Carey 3 (1832) 192; Rich., Sert. Astrolab. (1834) 17; Blanco, Fl. Filip. (1837) 541; ed. 2 (1845) 379; Mor., Syst. Verz. (1846) 29; Miq., Pl. Jungh. (1854) 280; Fl. Ind. Bat. 1, 2 (1858) 153; Suppl. (1860) 163; Benth., Fl. Austr. 1 (1863) 218; F. v. M., Descr. Not. Pap. Pl. 4 (1876) 56; Mast., in Fl. Br. Ind. 1 (1875) 343; Blanco, Fl. Filip. ed. 3, 2 (1879) 332, t. 274; Fern.-Vill., Novis. App. (1880) 24; Vidal, Simops. Pl. Filip., Atlas (1883) 16, t. 16 f. B; Hemsl., Rep. Voy. Chall. (Bot.) 1, 3 (1885) 125; Britten,

in Forbes, Natur. Wand., App. 6 (1885) 500; Vidal, Phan. Cuming. Philip. (1885) 97; Rev. Pl. Vasc. Filip. (1886) 63; K. Sch., Bot. Jahrb. 9 (1887) 209; K. Sch. & Hollr., Fl. Kaiser Wilhelmsl. (1889) 55; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 49, f. 20H; King, J. As. Soc. Beng. n.s. 60, ii (1891) 46; O.K., Rev. Gen. Pl. 1 (1891) 69; Gürke, in Fl. Bras. 12, 3 (1892) 567; Trimen, Handb. Fl. Ceyl. 1 (1893) 157; Ridley, Trans. Linn. Soc. Bot. II, 3 (1893) 279; Koord. & Val., Bijdr. Booms. Java 2 (1895) 106; Koord., Med. Lands Plantent. 19 (1898) 359; K. Sch., Notizbl. Berl.-Dahl. 2 (1898) 133; Bailey, Queensl. Fl. 1 (1899) 130; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 13, var. *geminus* Hochr., et var. *hirsutus* Hochr., *quoad specim. p.p.*; Baker f., in Andrews, Mon. Christmas I. (1900) 173; K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 438; Perk., Fragm. Fl. Philip. (1904) 110; Merr., Philip. J. Sc. 1 (1906) Suppl. 92; Ridley, J. Str. Br. R. As. Soc. 45 (1906) 177; Backer, Fl. Bat. 1 (1907) 117; Val., Bull. D'Ép. Agr. Ind. Néerl. 10 (1907) 32; Merr., Philip. J. Sc. 3 (1908) Bot. 419; Rech., Denkschr. K. Ak. Wiss., M.-N. Kl. Wien 85 (1910) 309, f. 15, 16; Gagn., in Fl. Gén. I.-C. 1 (1910) 431; Koord.-Schum., Syst. Verz. 2 (1910) 6, 35; op. cit. 1, fam. 175 (1911) 7; Backer, Schoolfl. Java (1911) 121; Ridley, J. Str. Br. R. As. Soc. 57 (1911) 24; Whitf., For. Fl. Philip. 2 (1911) 55; Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 244, var. *geminus* Hochr.; Merr., Fl. Manila (1912) 323; Koord., Exk. Fl. Java 2 (1912) 584; Koord.-Schum., Syst. Verz. 3 (1914) 82; Koord., Atlas 3 (1914) t. 437; Ridley, J. Fed. Mal. St. Mus. 8, 4 (1917) 22; Merr., Int. Rumph. Herb. Amb. (1917) 358; Ewart & Davies, Fl. North. Terr. (1917) 187; Merr., Sp. Blanc. (1918) 254; Merr., En. Born. Pl. (1921) 375; Doct. van Leeuwen, Ann. Jard. Bot. Btzg 32 (1922) 173; C. T. White, Proc. R. Soc. Queensl. 34 (1922) 43; Ridley, Fl. Mal. Pen. 1 (1922) 259, p.p.; Merr., En. Philip. Fl. Pl. 3 (1923) 39; Lane-Poole, For. Res. Papua (1925) 112; Craib, Fl. Siam. En. 1 (1925) 161; Doct. van Leeuwen, Trop. Nat. 15 (1926) 179; Guillaumin, Bull. Soc. Bot. Fr. 73 (1926) 440; Merr., Philip. J. Sc. 29 (1926) 393; Heyne, Nutt. Pl. (1927) 1035; C. T. White, J. Arn. Arb. 10 (1929) 238, 239; Guillaumin, J. Arn. Arb. 12 (1931) 228; Steen., Arch. Hydrobiol., Suppl. 11 (1932) 308, f. 43; C. T. White, Contr. Arn. Arb. 4 (1933) 70; Merr., Contr. Arn. Arb. 8 (1934) 102; Burk., Dict. Ec. Prod. Mal. Pen. 1 (1935) 1172; Kirtikar, Basu & Ann, Ind. Med. Pl. ed. 2, 1 (1935) 333, t. 133; Doct. van Leeuwen, Ann. Jard. Bot. Btzg 46—47 (1936) 394; Blumea 2 (1937) 260, 271, 273; Bloembergen, Tectona 33 (1940) 152, 156, 160, 191; Corner, Wayside Trees Mal. (1940) 442, f. 144, atlas, t. 133; Kaneh. & Hatus., Bot. Mag. Tokyo 55 (1941) 390; Holth. & H. J. Lam, Blumea 5 (1942) 212; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 19; Steen., Fl. Schol. Indon. (1949) 267; W. H. Brown, Usef. Pl. Philip. 2 (1950) 418; Meijer Drees, Comm. For. Res. Inst. 33 (1951) 75; Hochr., in Fl. Madag. fam. 129 (1955) 16, t. 4 f. 3—5; Hu, Fl. China, fam. 153 (1955) 44, 45, t. 19 f. 6; Van Royen, Nova Guinea, Bot., n.s. 5 (1960) 59; Borss., Ann. Bog. 4 (1960) 30; Exell, Fl. Zamb. 1 (1961) 435, t. 89 f. 8; Backer & Bakh. f., Fl. Java 1 (1963) 429; Bates, Baileya 13 (1965) 71, f. 21A. — *Pariti tiliaceum* (L.) St. Hil., Fl. Bras. Merid. 1 (1828) 256 (*'Paritium'*); W. & A., Prod. (1834) 52; Decne, Herb. Timor. (1835) 105; Wight, Ic. 1 (1840) t. 7; Span., Linnæa 15 (1841) 171; Hassk., Pl. Jav. Rar. (1848) 305; Thw., En. Pl. Zeyl. (1858) 26; Merr., Philip. J. Sc. 3 (1908) Bot. 78; Britten, Fl. Bermuda (1918) 239 (*'Pariti tiliaceum'*); Degener, Fl. Haw. fam. 221 (1956) *descr. cum tab.* (*'Pariti tiliaceum'*). — *H. abutiloides* Willd., En. Hort. Berol. (1809) 736, *ex descr.*; DC., Prod. 1 (1824) 454. — *H. tiliaceus* var. *abutiloides* (Willd.) Hochr., Nova Guinea 14 (1924) 163. — *Pariti* Rheede, Hort. Malab. 2, 53, t. 30. — *Novella* Rumph., Herb. Amb. 2, p. 218, t. 73.

Types: *H. tiliaceus* L.: Herb. Hermann, Vol. III, fol. 51, *Linn. n.* 258 (holotype: BM); *H. abutiloides* Willd.: Bot. Gard. Berlin, from America (holotype: B †).

Twigs usually glabrous, rarely stellate-cinereous or stellate-tomentose and glabrescent. *Leaves* orbicular to ovate, at base cordate, at apex mostly cuspidate, sometimes rounded or obtuse, 3—22 by 1½—22 cm, usually entire, sometimes crenate to undulate, beneath at base on the 1—5 central nerves with a 5—20 mm long, linear nectary, beneath mostly stellate-cinereous, sometimes glabrous or stellate-tomentose; petiole ½—20 cm, mostly stellate-cinereous, sometimes stellate-tomentose, glabrescent. *Stipules* 1—3½ by ½—1 cm. *Pedicele* 1—1½ cm, after flowering up to 2½ cm, stellate-cinereous, sometimes tomentose. *Epicalyx* c. 1/3 as long as the calyx, 6—9 mm high and 14—16 mm  $\varnothing$ , 9—11-dentate; segments deltoid, 2—2½ by 2—3 mm; sinuses rounded. *Calyx* 18—22 mm high, 20—25 mm  $\varnothing$ . *Corolla* up to c. 9 cm  $\varnothing$ ; petals 5—7 by 4—5½ cm. *Staminal column* 2½—3 cm; filaments c. 1 mm; anthers 1—1½ mm. *Ovary* 6—8 mm high; style arms 5—6 mm. *Capsule* 1½—2 cm  $\varnothing$ , stellate-tomentose. *Seeds* 4—5 mm  $\varnothing$ , punctate by minute warts, sometimes with minute stellate hairs.

*Distribution*: Widespread in the tropics and subtropics of the world, in particular along the coasts, throughout Malesia. The seeds are capable to float in seawater for several months (Guppy, *Observ. Natur. Pacif.* 2, 1906, 529; Muir, *Dep. Agr. For., Bot. Surv. Mem.* 16, 1937, 43), and thus contribute to the dispersal. Also man plays a role in the dispersal by planting the subspecies in suitable places, as both wood and fibrous bark are valuable from a technical point of view. Most botanists accept the opinion of Merrill (*Chron. Bot.* 14, 1954, 222, 248) that human activity has not been the main cause of its wide distribution. However, some amateur botanists, such as O. F. and R. C. Cook (*J. Wash. Ac. Sc.* 8, 1918, 153—170) and Hillebrand (*Fl. Haw. Is.* 1888, p. XVI) believe that it was introduced in pre-historic time in some remote Pacific islands.

*Ecology*: In Malesia very common along sandy sea-shores and tidal creeks, a normal constituent of the *Barringtonia*-formation, rarely in higher places (usually former beach-ridges) in the mangrove, also spreading inland on riverbanks, often along lake-shores and marshes; frequently planted in and around villages and sometimes running wild. In the *Barringtonia*-formation it usually forms a narrow seaside fringe.

The often abundant occurrence of the subspecies on riverbanks, and along lakes and marshes in thinly habited or inhabited regions (e.g. in New Guinea: cf. H. J. Lam, *Sargentia* 5, 1945, 30, 51, 54; Brass, *J. Arn. Arb.* 22, 1941, 287; in Borneo: cf. Endert, *Midd. Oost-Borneo Exp.* 1925, 1927, 204), demonstrates that it is not dependent on salt or brackish water. Presumably much light and possibly also moisture are the main conditions for the subspecies. In many Pacific islands *H. tiliaceus* L. ssp. *tiliaceus* has been found, like some other coastal species, frequently inland far from rivers or lakes in secondary vegetation (cf. Guppy, *Observ. Natur. Pacif.* 2, 1906, 42, 52, 547, 557).

The subspecies is mentioned in an enormous number of publications dealing with the vegetation of tropical coasts. It goes beyond the scope of this monograph to give a complete survey of these references.

Guppy (l.c. 105), Schimper (*Indo-Mal. Strandfl.* 1891, 163) and others found that the buoyancy of the seeds is due to the presence of an aeriferous cavity between the seed-coat and the embryo. Schimper (l.c. 159) made a small experiment with the seeds at Bogor; he kept 6 seeds during 40 days in seawater or a salt-solution. In contrast to experiments with seeds of other coastal species none of them germinated after that period.

The seeds are a common constituent of the seed drift along the coasts in Malesia, and germinate there in abundance, as I have observed personally.

*Notes*: According to the protologue of *H. tiliaceus* L. in *Species Plantarum*, Linnaeus based the species obviously primarily on an entry in his *Flora Zeylanica*. Thus the corresponding plant in Hermann's herbarium should be considered the type. It consists of

a twig with some leaves, a flower and a loose corolla with staminal column, together suitable for the purpose. In the Linnean herbarium there is a good sheet (*n.* 875. 10) bearing a branch with leaves and a fruit. The sheet is marked with the epitheton 'tiliaceus' in the handwriting of Linnaeus and with '4' referring to the species number in *Species Plantarum*. That specimen should be accepted as a paratype.

According to a letter from the Berlin Herbarium there is no type specimen of *H. abutiloides* Willd. at Berlin. Possibly it was in the general herbarium and destroyed there during the war. According to the description of Willdenow it differs from the Linnean material by glabrous leaves.

*H. tiliaceus* L. ssp. *tiliaceus* varies considerably in its vegetative characters, but this variability is, no doubt, largely phenotypical. I studied it in many localities in Indonesia and made the following observations: In sunny places the leaves are usually relatively small and have mostly an entire margin; in addition the indumentum is rather dense, sometimes even tomentose. In places exposed to regular inundation by seawater the leaves are often somewhat fleshy. In shady places the leaves become larger, thinner and usually glabrous or nearly so; they then often develop a crenate margin and sometimes red petioles and nerves (cf. *Novella rubra* of Rumphius). Leaves of watersprouts are usually very large. Frequently leaves of different character can be found on the same tree, especially when it occurs in a narrow fringe along the beach. Here the seaside is very light, whereas the landside, covered by forest, is usually more or less shady.

It should be borne in mind that along coasts light does not come solely from the sky, but also from the sea, and even from the beach if this consists of white coral sand. The one-sided light causes one-sided growth resulting in sloping trunks and long horizontal branches. Sometimes, however, the last mentioned phenomenon is caused by a soft, swampy ground, bringing along a seaward leaning of the whole tree (cf. *Novella repens* of Rumphius).

Many varieties were described from herbarium specimens from outside Malesia; in my opinion they were mostly based on phenotypical differences mentioned above. Watersprouts or sucker shoots show often, and normal twigs and seedlings rarely, 3-apiculate leaves. Specimens with such leaves from SE. Polynesia were described as var. *henryanus* F. Brown and var. *sterilis* F. Brown (Bern. P. Bish. Mus. Bull. 130, 1935, 175). Already Masters (in Oliver, Fl. Trop. Afr. 1, 1868, 208) wrote: 'A variety with lobed leaves looks distinct, but as leaves of this form occur on the same trees with those of the ordinary form, there are no grounds for making a distinct variety even.' The varieties of F. Brown, which also differ in habit, are of doubtful taxonomical value. The same holds good for *Pariti tiliaceum* var. *potteri* Degener (Fl. Haw. fam. 221, 1957, *s.p.*). Degener described in the same work the forms *albiflorum* and *immaculatum* Degener differing by white flowers with a maroon centre and entirely yellow flowers respectively. He also reported on double flowers. Specimens with such flowers have not been reported from Malesia.

**B. ssp. similis** (Bl.) Borss., *stat. nov.* — *H. similis* Blume, Bijdr. 2 (1825) 73, 105; Hassk., Pl. Jav. Rar. (1848) 305; Koord. & Val., Bijdr. Booms. Java 2 (1895) 110; Backer, Fl. Bat. 1 (1907) 119; Koord., in Jungh. Gedenkb. (1910) 179; Backer, Schoolfl. Java (1911) 121; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 6; Koord., Exk. Fl. Java 2 (1912) 584; Heyne, Nutt. Pl. (1927) 1034; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 19; Backer & Bakh. f., Fl. Java 1 (1963) 430. — *Pariti simile* (Bl.) G. Don, Gen. Syst. 1 (1831) 485 ('*Paritium*'). — *H. tiliaceus* var. *similis* (Bl.) Hochr., Ann. Cons. Jard. Bot. Genève 15–16 (1912) 244. — *H. tiliaceus* var. *hirsutus* Hochr., *op. cit.* 4 (1900) 64, *quoad specim. cit. p.p.*; Bull. Inst. Bot. Btzig 19 (1904) 10, *p.p.* — *H. tiliaceus sensu* DC.,

Prod. 1 (1824) 454, *quoad specim. p.p.*; Ridley, J. Fed. Mal. St. Mus. 8, 4 (1917) 22; Fl. Mal. Pen. 1 (1922) 259, *quoad specim. cit. p.p.*; Baker f., J. Bot. 62, Suppl. (1924) 11. — *H. tortuosus* (non Roxb.) Wall., Cat. (1829) n. 1913, p.p. — *H. elatus* (non Sw.) Miq., Pl. Jungh. (1854) 280; Fl. Ind. Bat. 1, 2 (1858) 154; Suppl. (1860) 163.

Types: *H. similis* Bl.: Java, Blume s.n. (lectotype: P); *H. tiliaceus* var. *hirsutus* Hochr.: Java, Tjikoja, Zollinger 132 (lectotype: G; isotypes: BM, FI, L, P).

Twigs usually glabrous, rarely stellate-tomentose, glabrescent. Leaves orbicular to ovate, at base cordate, at apex cuspidate,  $4\frac{1}{2}$ —31 by  $3\frac{1}{2}$ — $27\frac{1}{2}$  cm, crenate, on the central basal nerves beneath far above the base, sometimes even above the middle, with a 5—31 mm long, linear nectary, beneath stellate-tomentose; petiole  $1\frac{1}{2}$ —22 cm, at apex stellate-tomentose, for the rest with scattered stellate hairs, glabrescent. Stipules 3—5 by  $1\frac{1}{4}$ — $2\frac{1}{2}$  cm. Pedicel 3—7 mm, after flowering up to 11 mm, stellate-tomentose, glabrescent. Epicalyx  $1/2$ — $2/3$  as long as the calyx, 14—16 mm high, c. 20 mm  $\varnothing$ , 8—11-fid; segments long triangular, 13—14 by 3—4 mm. Calyx 24—26 mm high, c. 30 mm  $\varnothing$ . Corolla up to c. 12 cm  $\varnothing$ ; petals  $6\frac{1}{2}$ — $7\frac{1}{2}$  by 5— $6\frac{1}{2}$  cm. Staminal column  $3\frac{1}{2}$ —4 cm; filaments and anthers c.  $1\frac{1}{2}$  mm. Ovary 7—9 mm high; style arms 6—9 mm. Capsule 2— $2\frac{1}{2}$  cm  $\varnothing$ , hirsute. Seeds rarely developed, 4— $5\frac{1}{2}$  mm  $\varnothing$ , warty, every wart with a bunch of  $\frac{1}{4}$ — $\frac{1}{2}$  mm long hairs.

*Distribution*: Sumatra, Malay Peninsula, Java, Kangean Arch.; collected once (by Korthals) in Borneo; found by Wallich in Bengal, Hooghly R. (Wallich n. 1913-1). Presumably the subspecies does not occur really wild. It is often planted as a shade-tree within the area. Fig. 5.

*Ecology*: Lowlands and mountains up to c. 1400 m, mostly in or near inhabited places, occasionally in secondary vegetation, possibly as a relict of cultivation; never along or near the coast. Koernicke (Flora 169, 1918, 528) has described and pictured the nectaries on the leaves (under the name of *H. tiliaceus*), which can be recognized in the field as black stripes, since they are always overgrown by a fungus.

*Notes*: I did not succeed in locating an authentic specimen of *H. similis* Bl. in the Rijksherbarium at Leyden. In Paris there is, however, a good specimen with the name in Blume's handwriting; this has accordingly been chosen as the lectotype.

The original description of *H. tiliaceus* var. *hirsutus* Hochr. runs: 'Stipulis bracteis et calyce hirsutis; involucri lobis basi fisis non sinuatis. Ceterum ut in *a*'. Hochreutiner mentioned three specimens, viz. China, Haunton, Lambert s.n. (G-DC), Java Zollinger 132 (G), and Martinique, Bélanger (G). The first and third specimens hardly show the second character mentioned and should be considered densely hairy specimens of ssp. *tiliaceus*. The Zollinger number, however, fits the description perfectly and is, hence, designated as the lectotype. The position of the nectaries on the leaves of the Zollinger number is just as in the present subspecies, and consequently the variety is nomenclaturely synonymous. It is clear that the variety in the sense of Hochreutiner is an artificial assemblage. Splitting of the epicalyx, though more frequent in ssp. *similis*, may occur in all forms.

There is some remarkable evidence with respect to the genetics of *H. tiliaceus* ssp. *similis*, because ripe capsules are rarely developed. In herbarium specimens they are seldom present (cf. Backer, 1907, 120) and I have never observed them on living trees in West Java. According to Koorders & Valetton (1895, 10) it is propagated by cuttings. There is no doubt that most herbarium specimens were collected from planted trees and I have never found trees which were indubitably wild; they always occurred near houses, in villages or along roads or trails. Furthermore, it is striking that the characters point to an intermediate position between *H. tiliaceus* L. s.s. and *H. macrophyllus* Hornem.

The usually larger dimensions of the leaves and the floral parts, the coarser indumentum of the green parts, the position of the nectaries on the leaves, the relatively longer epicalyx segments, and the indumentum of the seeds show a close relationship with the last-named species. All things considered I deem it possible that *H. tiliaceus* ssp. *similis* (Bl.) Borss. originated as a hybrid between *H. tiliaceus* s.s. and *H. macrophyllus*. It is interesting that ssp. *similis* has in Malesia about the same area of distribution as *H. macrophyllus* (fig. 5).

The subspecies has occasionally double flowers (Bogor, *Beumée s.n.*; Pasuruan, cf. Backer & Bakhuizen f., 1963, 430).

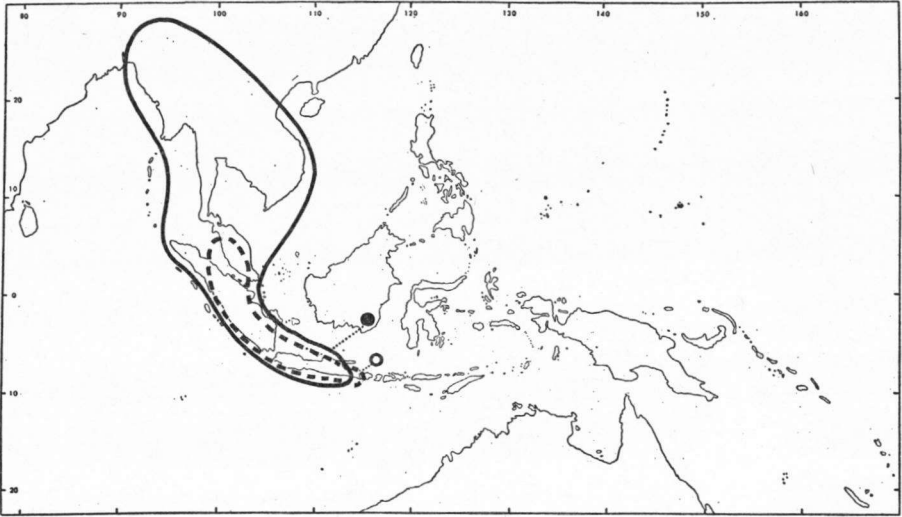


Fig. 5. Distribution of *Hibiscus macrophyllus* Roxb. ex Hornem. (continuous line) and the area of *H. tiliaceus* L. ssp. *similis* (Bl.) Borss. (cultivated or run wild). The latter is suspected to be a hybrid of the former and *H. tiliaceus* L. ssp. *tiliaceus*.

**C. ssp. celebicus** (Koord.) Borss., *stat. nov.* — *H. celebicus* Koord., *Med. Lands Plantent.* 19 (1898) 359, 632; Koord.-Schum., *Syst. Verz.* 3 (1914) 81; *Suppl. Fl. N.O. Celebes* 2 (1922) t. 65; Heyne, *Nutt. Pl.* (1927) 1030. — *H. tiliaceus* var. *hirsutus* Hochr., *Bull. Inst. Bot. Btzg* 19 (1904) 13, p.p. 'forma subeglandulosa'.

Type: Celebes, Kajuwatu, *Koorders 17820* (lectotype: BO 57167; isotypes: BO, L).

Tree, 20–30 m. Twigs stellate-tomentose. *Leaves* orbicular to ovate, at base cordate, at apex cuspidate,  $6\frac{1}{2}$ –30 by  $4\frac{1}{2}$ –30 cm, entire to crenate, beneath at the base on the 1–5 central nerves with a 2–3 mm long, linear to oblong nectary, stellate-tomentose beneath; petiole  $1\frac{1}{2}$ –22 cm, stellate-tomentose. *Stipules* 2– $2\frac{1}{2}$  by 1– $1\frac{1}{2}$  cm, on both surfaces stellate-tomentose. *Pedicle*  $\frac{1}{2}$ – $1\frac{1}{2}$  cm, after flowering up to 2 cm, stellate-tomentose. *Epicalyx*  $\frac{1}{2}$  as long as the calyx, c. 1 cm high,  $1\frac{1}{2}$ –2 cm  $\varnothing$ , 8-fid to -parted; segments triangular, 5–8 by c. 4 mm. *Calyx* 10–12 mm high, c. 8 mm  $\varnothing$ . *Corolla* c.  $5\frac{1}{2}$  cm  $\varnothing$ ; petals 3–4 by  $2\frac{1}{2}$ – $3\frac{1}{2}$  cm. *Staminal column* c. 2 cm; filaments and anthers c. 1 mm. *Ovary* c. 3 mm high; style arms c. 5–6 mm. *Capsule*  $1\frac{1}{2}$ –2 cm  $\varnothing$ , stellate-tomentose. *Seeds*  $3\frac{1}{2}$ –4 mm  $\varnothing$ , densely covered by long, ferruginous, woolly hairs.

*Distribution*: Northeast Celebes (Minahasa).

*Note*: Living trees of this subspecies no doubt grown from seeds or young plants

collected and presented by Koorders, once belonged to the collections of the Botanic Gardens of Bogor. Herbarium specimens, which are in much better condition than the lectotype, and which should be considered paratypes, were collected at different times from these trees and distributed. Hochreutiner, who distributed them under the name *H. tiliaceus* var. *hirsutus* Hochr., and other collectors were not aware of the true identity.

**D. ssp. hastatus** (L. f.) Borss., *stat. nov.* — *H. hastatus* L. f., Suppl. (1781) 310, non Cav., 1787; Forster f., Fl. Ins. Austr. (1786) 49; Kurz, For. Fl. Burma 1 (1877) 126; Bates, *Baileya* 13 (1965) 73, f. 21B. — *H. tiliaceus* var. *hastatus* (L. f.) Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 63; Merr., Chron. Bot. 14 (1954) 353—354. — *Pariti hastatum* (L. f.) Degener & Greenwell, Fl. Haw. fam. 221 (1957) s.p. — *H. tricuspis* [Sol. ex Park., Journ. (1773) 42, *nom. nud.*] Banks ex Cav., Diss. 3 (1787) 152, t. 55 f. 2; DC., Prod. 1 (1824) 453; W. & A., Prod. (1834) 52; Mast., in Fl. Br. Ind. 1 (1875) 344. — *H. cuspidatus* Sol. ex Park., Journ. (1773) 42, *nom. nud.* — **Fig. 6a.**

Types: *H. hastatus* L. f.: Tahiti, Forster s.n. (holotype: LINN); *H. tricuspis* Banks ex Cav.: Tahiti, Forster ?142 (holotype: P).

Twigs stellate-cinereous. Leaves ovate to elliptic or even lanceolate, at base acute, rounded, truncate, or occasionally shallowly cordate, 3-lobed to 3-parted, with ovate to lanceolate, acute to acuminate segments, entire, 5—18 by 2—11 cm, flabellinerved, at base on midrib beneath with a c. 10 mm long, linear nectary, stellate-cinereous beneath; petiole 2—8 cm, stellate-cinereous. Stipules 1½—3 by c. ¾ cm. Pedicel 1—1½ cm, after flowering up to 2½ cm, stellate-cinereous. Epicalyx c. 1/3 as long as the calyx, 6—7 mm high and wide, 9—12-dentate; segments deltoid, c. 2 by 2 mm. Calyx c. 18 mm high, 15 mm ø. Corolla up to c. 9 cm ø; petals 5—7 by 4—5½ cm. Staminal column 2½—3 cm; filaments c. 1 mm; anthers 1—1½ mm. Ovary 6—8 mm high; style arms 5—6 mm. Capsule 1¾—2 cm ø, stellate-tomentose. Seeds 4—5 mm ø, punctate by minute warts, sometimes with minute stellate hairs.

*Distribution:* Pacific islands, including the Bismarck Arch., not yet in Malesia proper. The species has also been reported to occur in India (cf. Hochreutiner, 1900, 63, and in several Floras). This was based on Wallich n. 1914, which consists of specimens from the Calcutta Botanic Gardens, and a specimen collected by Perrottet at Pondichéry possibly also derived from cultivation.

*Ecology:* Sandy sea-shores.

*Notes:* As Merrill (1954, 353, 354) has pointed out, the type of *H. hastatus* L. f. is a specimen collected by one of the Forsters in Tahiti. That specimen came into possession of Bäck, who presented it to Linnaeus and whose name is mentioned by Linnaeus f. Subsequently it came with the Linnean herbarium proper to the Linnean Society. Several other specimens collected by the Forsters (BM, K, P) are possibly isotypes.

Although Cavanilles stated with respect to *H. tricuspis* Cav.: 'Observatus a D. Banks, qui exemplar mihi communicavit', there is no specimen in the herbarium of Madrid. Possibly he was already working at Paris when he received the specimen, which is now preserved in the general herbarium there. Cavanilles attributed his species to Banks, whereas Parkinson wrote *H. tricuspis* Sol. in his Journal (of 1773). The last mentioned name as well as *H. cuspidatus* Sol. ex Park. are *nomina nuda* which have been referred correctly to *H. hastatus* L. f. by Merrill (1954).

**E. ssp. crestaensis** Borss., *ssp. nov.* — **Fig. 6b.**

Type: Luzon, Mt Cresta, Ramos B.S. 76992 (holotype: K; isotypes: NY, SING).



Lamina foliis ovata vel elliptica vel subovata, basi rotundata vel paulum cordata, pilis stellatis minutis vestita; costa in pagina inferiore paulum supra basin nectario lineari ornata. Epicalyx dimidiis parte calycis paulum longior.

Tree 6 m, trunk 20 cm  $\varnothing$ . Twigs stellate-cinereous. *Leaves* broadly ovate to elliptic or somewhat obovate, at base rounded or shallowly cordate, at apex obtusely acuminate, 7–17 by 3–9 cm, entire to slightly undulate, somewhat above the base on the midrib beneath with a linear nectary, beneath stellate-cinereous; petiole  $2\frac{1}{2}$ –7 cm, stellate-cinereous. *Stipules* 8–17 by 4–6 mm, stellate-cinereous. Pedicel short,  $\frac{1}{2}$ –1 cm, stellate-cinereous. *Epicalyx* slightly more than half the length of the calyx, *c.* 15 mm high, 20



Fig. 6. *Hibiscus tiliaceus* L. ssp. *hastatus* (L. f.) Borss. a. Habit,  $\times \frac{1}{8}$  (Peekel BO 58448). — Ssp. *crestaensis* Borss. b. Habit, in bud, showing epicalyx,  $\times \frac{1}{8}$  (Ramos BS 76992, type).

mm  $\varnothing$ , 10-parted; segments lanceolate, acute, 9—11 by  $2\frac{1}{2}$ —3 mm. *Calyx* c. 28 mm high and wide. *Corolla* yellow (possibly with a dark purple centre); petals 5— $7\frac{1}{2}$  by c. 3 cm. *Staminal column* 2—3 cm; filaments 2—3 mm; anthers 1— $1\frac{1}{2}$  mm. *Ovary* c. 4 mm high; style arms 7—10 mm.

PHILIPPINES. Luzon: Isabela Prov., Mt Cresta, low alt., *Ramos* B.S. 76992 (K, holotype; NY, SING, isotypes), April 3, 1929, tree 6 m, trunk 20 cm thick breast high, petals yellow.

*Distribution*: Philippines (Luzon).

*Ecology*: Forest, once found.

*Note*: In my opinion the material from Mt Cresta represents another local form of *H. tiliaceus* L. The shape of the epicalyx as well as the position of the extrafloral nectary point to a close relationship with ssp. *celebicus*, but the shape of the leaves and the indumentum seem different. More specimens, with mature capsules and seeds, are required for a better judgement.

2. *Hibiscus sciadiolepidus* (Hochr.) Borss., *Reinwardtia* 4 (1956) 43. — *Wilhelminia sciadiolepida* Hochr., *Nova Guinea* 14 (1924) 162, t. 18; *Boissiera* 2, 2 (1937) 3. — **Fig. 7c-d.**

Type: New Guinea, Weyland Mts, *Janowsky* 402 (holotype: L).

Small tree, c. 8 m, or tall shrub. Twigs terete, 2—3 mm  $\varnothing$ , as the petioles and pedicels densely covered by large scales, finally glabrescent. Leaves coriaceous, almost orbicular, widely ovate or elliptic, at base rounded, at apex acuminate, 2—17 by  $1\frac{1}{2}$ — $7\frac{1}{2}$  cm, entire, penninerved, at base 3—5-nerved, on midrib beneath near the base with an elliptic nectary, on both surfaces densely scaly, glabrescent above; petiole shorter than blade, stout,  $\frac{1}{2}$ —6 cm. *Stipules* spatulate to lanceolate, acute to obtuse, c. 10 by 2 mm. *Flowers* axillary, solitary, or by the decrescent leaves in 2—5-flowered racemes. Pedicel short, 1—2 cm, slightly accrescent, stout, without joint. *Epicalyx* coriaceous, cupular to campanulate,  $1\frac{1}{4}$ — $1\frac{1}{2}$  cm long and  $1\frac{1}{2}$ —2 cm  $\varnothing$ , after flowering somewhat enlarged, in bud entire or nearly so, finally splitting and then 3—5-lobed; segments triangular, acute, 4—6 by 4—8 mm; epicalyx outside densely clothed with scales, inside velutinous by minute stellate hairs. *Calyx* coriaceous, long campanulate,  $2\frac{1}{2}$ —3 cm long and  $1\frac{1}{2}$ —2 cm  $\varnothing$ , after flowering slightly enlarged; segments 5, long triangular to ovate, acute, 8—10 by 4—6 mm, outside densely scaly, inside sericeous by appressed, stellate hairs. *Petals* narrow lanceolate to spatulate, wine-red (once noted), 7—8 by 1— $1\frac{1}{2}$  cm, towards the base probably fleshy, at apex obtuse, outside, in particular upwards with fimbriate scales and stellate hairs, inside at base with an obovate, shallow, papillose excavation up to c. 5 mm long (doubtless a nectary); excavation on the apical margin with long, upwards pointing, appressed, stellate hairs. *Staminal column* c.  $5\frac{1}{2}$  cm, in the upper half antheriferous, at the very base and among the filaments stellate-hairy; filaments 2— $2\frac{1}{2}$  mm, glabrous; anthers c. 2 mm. *Ovary* ovoid, shortly acuminate, 5-angular, 6—7 by c. 5 mm, densely scaly, 10-celled; style arms 5—10 mm, clothed with fimbriate scales; stigmas discoid, c.  $1\frac{1}{2}$  mm  $\varnothing$ . Unripe *capsule* long ovoid, shortly acuminate, 5-ribbed, slightly longer than the calyx, c. 3 by 1 cm, densely scaly; pericarp thick, ligneous. Immature *seeds* covered with long, woolly hairs.

*Distribution*: West New Guinea, twice found.

*Ecology*: Forest, at 1750 m.

*Notes*: According to Hochreutiner the present species would have an intermediate position between *Malvaceae*, *Bombacaceae*, and *Tiliaceae*. The scaly indumentum and the narrow petals would point to an affinity with the *Bombacaceae*, whereas the peculiar nectaries would suggest a relationship with the genus *Grewia* in *Tiliaceae*.

Scales, though very frequent in the *Bombacaceae*, e.g. in the genus *Durio*, also occur in the tribe *Hibisceae*, e.g. in *Hibiscus archboldianus* Borss., *H. floccosus* Mast., *H. decaspermus* Koord. & Val., *H. patersonii* R. Br., and *Thespesia populnea* (L.) Correa. The scales of the *Malvales* are in fact pluribrachiate stellate hairs of which the arms are partly (fimbriate scales) or wholly connate. The narrow petals present a character which cannot be taken serious in this respect.

The nectaries remind indeed those of the petals in *Grewia*. Their structure, though as far known unique in the *Malvaceae*, seems very simple, so that there are in my opinion no taxonomic reasons to maintain a separate genus. All other characters point to *Hibiscus* sect. *Azanza* DC. (cf. also p. 7, 8).

**2a. *Hibiscus carrii* Borss., Reinwardtia 4 (1956) 57, f. 8; Kosterm., op. cit. 5 (1960) 235.**

Type: New Guinea, Boridi, Carr 13219 (holotype: L; isotypes: BM, K).

Small tree, c. 12 m. Twigs terete, 3—4 mm  $\varnothing$ , as the petioles and pedicels tomentose by minute stellate hairs, also with scattered fimbriate scales, glabrescent. Leaves coriaceous, ovate, at base rotundate, or truncate, at apex acute to acuminate, 11—19 by 9—12 cm, entire, penninerved, at base 3-nerved, on midrib beneath near base with an elliptic, c. 1 mm long nectary, above with scattered, minute, fimbriate scales, beneath stellate-tomentose, also with some minute, fimbriate scales; petiole shorter than blade, 4—8 cm. Stipules caducous, not seen. Only fruiting material known. Capsules in terminal, few-branched panicles. Bracts caducous, not seen. Pedicel stout, apically thickened, without joint, 2—2½ cm. Epicalyx widely campanulate, coriaceous, outside densely scaly, inside glabrous, 4—5 mm high, c. 8 mm  $\varnothing$ , 5-fid; segments broadly triangular, acute to obtuse, c. 2½ by 3½ mm. Calyx coriaceous, campanulate, thrice as long as epicalyx, 13—15 mm high, c. 12 mm  $\varnothing$ , closely enveloping the capsule, 5-lobed; segments revolute to reflexed, long triangular, acute, c. 7 mm by 4—5 mm; calyx indistinctly nerved, outside densely scaly, inside on the segments velutinous by minute stellate hairs. Capsule long obovoid, at apex rounded with a short mucro, c. 2½ by 1 cm, outside densely scaly, 10-celled; valves more or less ligneous, inside smooth; true dissepiments along the margin sericeous. Seeds  $\infty$ , reniform, c. 2 mm  $\varnothing$ , with a dense whorl of long ferruginous hairs.

Distribution: East New Guinea.

Ecology: Forest, at c. 1200 m.

Note: As only fruiting material is known, it could not be entered in the key. It seems closely related to *H. sciadiolepidus*, from which it differs by larger leaves and a less dense indumentum consisting partly of stellate hairs instead of exclusively scales.

**3. *Hibiscus d'albertisii* F. v. M., Descr. Not. Pap. Pl. 4 (1876) 56; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 175; Borss., Reinwardtia 4 (1956) 43. — *H. cardiostegius* Hochr., Ann. Cons. Jard. Bot. Genève 20 (1917) 153. — *H. fluminis-idenburgii* Borss., Reinwardtia 4 (1956) 53, f. 6. — ? *H. papuanus* K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 439. — ? *H. calodendron* Ulbr., Notizbl. Berl.-Dahl. 14 (1939) 367. — ? *H. fluminis-aprillii* Ulbr., l.c. 368. — Fig. 7b.**

Types: *H. d'albertisii* F. v. M.: New Guinea, Fly R., *D'Albertis s.n.* (isotypes: BM, single flower, FI ex Herb. Beccarianum n. 1594, MEL); *H. cardiostegius* Hochr.: New Guinea, Humboldt Bay, *Gjellerup 417* (isotypes: BO, K, L); *H. fluminis-idenburgii* Borss.: New Guinea, Idenburg R., *Brass 12978* (holotype: BO; isotypes: BM, GH, L); *H. papuanus* K. Sch. & Laut.: New Guinea, Nuru R., *Lauterbach 2212* (B †); *H. calodendron* Ulbr.: New Guinea, Felsspitze, *Ledermann 12467* (B †); *H. fluminis-aprillii* Ulbr.: New Guinea, April R., *Ledermann 7563* (poor isotype: SING).



Fig. 7. a. *Hibiscus floccosus* Mast.,  $\times \frac{1}{2}$  (Hamid FMS 4607). — b. *H. d'albertisii* F. v. M.,  $\times \frac{1}{2}$  (Gjellerup 417a, type of *H. cardiostegius* Hochr.). — c. *H. sciadiolopidus* (Hochr.) Borss.,  $\times \frac{1}{2}$ , d. fruit,  $\times 1$  (Eyma 4729). — e. *Urena lobata* L. ssp. *lobata*, fruit,  $\times 1\frac{1}{2}$ . — f. *U. lobata* L. ssp. *sinuata* (L.) Borss., fruit,  $\times 1\frac{1}{2}$ .

Tree, up to *c.* 20 m. Twigs terete,  $2\frac{1}{2}$ —5 mm  $\varnothing$ , as the petioles and pedicels more or less densely clothed with minute, stellate hairs and occasionally also with scattered larger stellate hairs, sometimes densely tomentose, usually glabrescent. *Leaves* coriaceous, broadly ovate, at base cordate, at apex rounded, obtuse, acute or obtusely acuminate, 6—9 by 5—17 cm, entire, at base 5—7-nerved, mostly without nectary, rarely with a linear, 1— $1\frac{1}{2}$  cm long nectary on midrib beneath near the base, above usually with scattered, minute stellate hairs, glabrescent, beneath rather densely covered, occasionally even densely tomentose, by minute, stellate hairs; petiole shorter than blade, 3—10 cm. *Stipules* ovate, acute to slightly acuminate, 1— $1\frac{3}{4}$  by  $\frac{3}{4}$ — $1\frac{1}{4}$  cm, stellate-hairy. *Flowers* axillary, solitary. Pedicel shorter than the petiole, 2—3 cm, after flowering somewhat lengthened and thickened, often with a joint above the middle. *Epicalyx segments* 5—6, appressed to and mostly as long as the calyx, but occasionally shorter, ovate, sometimes nearly orbicular, at base cordate, sometimes auricled, at apex acuminate, 2—4 by 1—2 cm, more or less densely covered, sometimes tomentose, by minute stellate hairs. *Calyx* in bud ovoid, at apex 5-winged, during anthesis campanulate, 3—4 cm high and 2—3 cm  $\varnothing$ , after flowering somewhat enlarged, 5-fid to 5-parted; segments ovate to triangular, acute to acuminate, 2— $2\frac{1}{2}$  by 1— $1\frac{1}{2}$  cm; calyx 10-nerved, outside velutinous to tomentose by minute and large stellate hairs, rarely with fimbriate scales, *in sicco* ochraceous, inside on the segments cinereous with extremely small stellate hairs, without nectaries. *Petals* long obovate to spatulate, at apex rounded, 7—9 by  $2\frac{1}{2}$ — $3\frac{1}{2}$  cm, outside clothed with stiff, stellate hairs or fimbriate scales, in particular towards the base, inside on the covering half with slender stellate hairs, deep pink to purple. *Staminal column* 5—8 cm, especially towards the base rather densely covered with large, slender stellate hairs, in the upper half antheriferous; filaments 3—4 mm; anthers *c.*  $1\frac{1}{2}$  mm. *Ovary* conical, *c.*  $2\frac{1}{2}$  mm  $\varnothing$ , hirsute, 10-celled; style arms 7—8 mm; stigmas discoid, *c.* 2 mm  $\varnothing$ , papillose. *Capsule* long ovoid, acute to shortly acuminate, 3—4 by  $1\frac{1}{2}$  cm, hirsute by shiny, erecto-patent, simple hairs, also with minute stellate hairs, 10-celled; valves inside glabrous. *Seeds*  $\infty$ , reniform,  $2\frac{1}{2}$ — $3\frac{1}{2}$  mm long, black, densely covered by long, woolly, ferruginous hairs.

*Distribution*: New Guinea: the area between Mamberamo R., Idenburg R., North coast and the frontier between West and East New Guinea, also in the area of the Digul R., Madang, Sepik, and the Fly R.

*Ecology*: Primary and secondary forests from the lowland up to 1750 m. According to Gjellerup the species is also planted by the Papuans near their villages.

*Notes*: After having seen more specimens I cannot any longer distinguish *H. fluminis-idenburgii* Borss. from *H. d'albertisii* F. v. M. sharply. The density of the indumentum probably increases with altitude; the relative length of the epicalyx and the calyx also has proved to be insufficient to maintain two separate species.

*H. papuanus* K. Sch. & Laut., *H. calodendron* Ulbr., and *H. fluminis-aprilii* Ulbr. represent presumably forms of the present species. The descriptions, though fairly extensive, lack information with respect to the occurrence of extrafloral nectaries and the presence of false dissepiments in the ovaries.

For the close affinity with *H. aruensis* Borss. see there.

#### 4. *Hibiscus leeuwenii* Borss., Reinwardtia 4 (1956) 50, f. 5.

Type: New Guinea, Mamberamo R., *Docters van Leeuwen 9113* (holotype: BO 106686; isotypes: BO, GH, K, L).

Tree, 15—20 m. Twigs terete, as the petioles and pedicels tomentose by minute stellate hairs, slightly rough, glabrescent, 3—6 mm  $\varnothing$ . *Leaves* chartaceous, orbicular, at base cordate, at apex obtuse, acute or shortly acuminate, 7—18 cm  $\varnothing$ , entire, at base 5—7-

nerved, on midrib beneath at base with a linear nectary, above slightly scabrous by stellate hairs, beneath more or less densely tomentose by fairly large stellate hairs; petiole shorter than the blade, 4—10 cm. *Stipules* ovate, shortly acuminate, *c.* 12 by 7—8 mm, above velutinous by minute stellate hairs, beneath tomentose by somewhat larger stellate hairs. *Flowers* solitary, axillary. Pedicel  $\frac{1}{2}$ — $1\frac{1}{2}$  cm, after flowering slightly lengthened and thickened, without joint. *Epicalyx segments* 4, very shortly connate, ovate, at base cordate, more or less auricled, at apex acute,  $2\frac{1}{2}$ — $3\frac{1}{2}$  by  $1\frac{1}{2}$ —2 cm, slightly rough by minute stellate hairs. *Calyx* campanulate, somewhat shorter than the epicalyx, *c.*  $2\frac{1}{2}$  cm high, 2 cm  $\varnothing$ , after flowering slightly enlarged, 5-fid; segments ovate, obtuse or acute, *c.* 13 by 8 mm; calyx 10-nerved, without nectaries, outside somewhat rough by minute stellate hairs, also with scattered, larger, slender stellate hairs, inside velutinous by minute stellate hairs. *Petals* obovate, at apex rounded, *c.* 5 by  $1\frac{1}{2}$  cm, outside covered with minute, fimbriate scales in particular toward the base, inside on the covering half with minute stellate hairs, at base ciliate by long sericeous stellate hairs, red or lilac. *Staminal column* *c.* 5 cm, at base with long, sericeous stellate hairs and fimbriate scales, in upper half antheriferous; filaments *c.* 4 mm; anthers *c.* 1 mm. *Ovary* ovoid, obsoletely 5-angular, acute, *c.* 6 by 3—4 mm, hirsute, 10-celled; style arms *c.* 3 mm; stigmas discoid, *c.*  $1\frac{1}{2}$  mm  $\varnothing$ . *Capsule* long ovoid, acuminate, *c.* 3 by 1 cm, distinctly 5-angular, outside hirsute by shiny, appressed to erecto-patent simple hairs, also with minute stellate hairs, 10-celled; valves inside pilose. *Seeds* numerous, reniform, *c.* 3 mm long, densely woolly ferruginous-stellate hairy.

*Distribution:* West New Guinea, twice collected.

*Ecology:* Primary forest, 30 m.

*Note:* Although the species is closely allied to *H. d'altbertisii* F. v. M. there are no reasons yet to unite the two species.

### 5. *Hibiscus aruensis* Borss., Reinwardtia 4 (1956) 44, f. 2.

Type: Aru Is., Pulau Wokam, *Buwalda* 5270 = *Buwalda*, *For. Inst.* 380 = *bb.* 25414 (holotype: BO 116805; isotypes: BO, BRI, BZF, GH, K, L, PNH, SING).

Tree, *c.* 20 m. Twigs terete, 2—4 mm  $\varnothing$ , as the petioles and pedicels tomentose by minute stellate hairs, also with scattered, larger stellate and patent, long, simple hairs, finally glabrescent. *Leaves* coriaceous, broadly elliptic, at base shallowly cordate, rounded or truncate, at apex acute or shortly cuspidate, 6—17 by  $4\frac{1}{2}$ — $10\frac{1}{2}$  cm, entire, at base 5—9-nerved, on midrib beneath near base with a  $1\frac{1}{2}$ —2 cm long, linear nectary, above with scattered, minute stellate hairs, glabrescent, beneath tomentose by minute stellate and scattered simple hairs; petiole shorter than the blade, 3—8 cm. *Stipules* ovate to triangular, at base cordate, at apex obtuse, acute or slightly acuminate, 10—12 by 7—10 mm, velutinous by minute stellate hairs. *Flowers* solitary, axillary. Pedicel  $1\frac{1}{2}$ — $2\frac{1}{2}$  cm, after flowering slightly lengthened and thickened, near base with a joint. *Epicalyx segments* 9, free, somewhat shorter than the calyx, lanceolate, at base slightly auriculate, at apex acuminate, *c.* 2 by  $\frac{1}{2}$  cm, *in sicco* seemingly linear as a result of the reduplicative margin, velutinous by minute stellate hairs. *Calyx* in bud 5-winged, during anthesis campanulate, *c.* 3 cm high,  $1\frac{1}{2}$ —2 cm  $\varnothing$ , after flowering slightly enlarged, 5-parted; segments lanceolate to long triangular, acute or slightly acuminate, *c.* 20 by 7—8 mm; calyx 5-nerved, without nectaries, outside velutinous by minute stellate hairs, inside so on the segments. *Petals* long obovate, at apex rounded, 7—8 by 2— $2\frac{1}{2}$  cm, outside densely covered with many-armed stellate hairs, in particular towards the base, inside on the covering half with scattered, slender stellate hairs, at base densely clothed with long-armed stellate hairs, pink or violet. *Staminal column* 6—7 cm, in lower half with

long-armed stellate hairs, in upper half antheriferous; filaments 5—7 mm; anthers *c.*  $\frac{1}{2}$  mm long. *Ovary* conical, acute, *c.* 4 by 3 mm, hirsute, 10-celled; style arms *c.* 5 mm; stigmas discoid, *c.* 1 mm  $\varnothing$ . *Capsule* long ovoid, acuminate, 3—4 by  $1\frac{1}{2}$  cm, hirsute by shiny, erecto-patent, simple hairs, also with minute stellate hairs. *Seeds*  $\infty$ , reniform, *c.*  $2\frac{1}{2}$  mm long, densely clothed with long, woolly, ferruginous, stellate hairs.

*Distribution*: Aru Is., New Guinea (Idenburg R., twice collected).

*Ecology*: Primary forest, 40—850 m.

*Note*: It is not yet clear whether in this affinity of *H. d'albertisii*, *H. leeuwenii*, etc. the number of epicalyx segments is a very constant taxonomical character. If future collections would show this not to be the case, it might become necessary to verify whether *H. aruensis* can be upheld against *H. d'albertisii*.

#### 6. *Hibiscus ellipticifolius* Borss., *Reinwardtia* 4 (1956) 55, f 7.

Type: New Guinea, Karosomeri R., *Womersley*, N. G. F. 3689 (holotype: LAE; isotypes: BM, BO, BRI, GH, K, L, SING).

Tree, up to 20 m. Twigs terete, slightly flattened, 2—3 mm  $\varnothing$ ; twigs, petioles and pedicels clothed with minute stellate hairs, glabrescent, ultimately with fine lenticels. *Leaves* chartaceous to coriaceous, elliptic to ovate, at base rounded to cordate, at apex shortly acuminate, 9—21 by 5—15 cm, entire, at base 5—9-nerved, on midrib beneath near base with a linear, 5—10 mm long nectary, above with scattered stellate hairs, glabrescent, beneath puberulous by stellate hairs; petiole  $2\frac{1}{2}$ — $10\frac{1}{2}$  cm. *Stipules* ovate, acute, *c.* 12 by 6 mm, minutely stellate-hairy. *Flowers* axillary, solitary. Pedicel 1—2 cm, without joint. *Epicalyx segments* 6, free, during anthesis spreading or reflexed, during fruiting reflexed, shorter than calyx, lanceolate, narrowed to the base, at apex acute to acuminate, 10—12 by 3—5 mm, with scattered minute stellate hairs or glabrous. *Calyx* in bud ovoid, at apex 5-winged, during anthesis campanulate, 2—3 cm long and wide, 5-fid; segments long triangular to ovate, acute, 10—15 by 6—10 mm; calyx 10-nerved, outside on the costae, at  $\frac{1}{4}$  from the base with an oblong nectary, outside scabrid by a dense covering of minute scales and scattered, stiff, stellate hairs, inside velutinous by minute stellate hairs. *Petals* long obovate, narrowed to the base, at apex rounded, 7—8 by  $2-3\frac{1}{2}$  cm, outside densely covered by minute, stiff stellate hairs, in particular to the base, inside the covering side densely covered by soft stellate hairs, bright pink or red. *Staminal column* 6—7 cm, in the lower half pubescent by soft stellate hairs, in the upper half antheriferous, pale pink; filaments 5—8 mm; anthers *c.* 1 mm, purple. *Ovary* hirsute, 10-celled; stigmas discoid, green. *Capsule* ovoid, acute to acuminate, *c.* 2 by  $1\frac{1}{2}$  cm, hirsute by erecto-patent, stiff, shiny, simple hairs, also with stellate hairs, 10-celled.

*Distribution*: East New Guinea, twice collected.

*Ecology*: Secondary forest, at *c.* 60 m.

*Note*: The spreading to reflexed epicalyx segments as well as the occurrence of a nectary on the costae of the calyx seem to be good distinguishing characters.

#### 7. *Hibiscus archboldianus* Borss., *Reinwardtia* 4 (1956) 59, f. 9. — *H. womersleyanus* Borss., op. cit. 4 (1956) 61, f. 10; Kosterm., op. cit. 5 (1960) 234—236. — *H. lepidotus* Borss., op. cit. 4 (1956) 63, f. 11. — *H. d'albertisii* (non F. v. M.) C. T. White, Proc. R. Soc. Queensl. 34 (1922) 44; Lane-Poole, For. Res. Papua (1925) 112.

Types: *H. archboldianus* Borss.: New Guinea, Palmer R., *Brass* 7092 (holotype: BO; isotypes: BM, GH, L); *H. womersleyanus* Borss.: New Guinea, Aiyura, *Womersley*, N. G. F. 3386 (holotype: LAE; isotypes: BO, BRI, K, L, SING); *H. lepidotus* Borss.: New Guinea, Mt Tafa, *Brass* 4950 (holotype: BO; isotypes: BM, BRI, GH, NY).

Tall tree, up to *c.* 40 m. Twigs terete or slightly angular, 2—5 mm  $\varnothing$ . Twigs, petioles and pedicels more or less densely covered with minute, often fimbriate scales, usually glabrescent. *Leaves* mostly orbicular, occasionally broadly ovate to even elliptic, at base rounded or shallowly cordate, rarely deeply cordate, rarely obtuse, at apex obtuse or acuminate to cuspidate, 4—16 by 4—15 cm, rarely larger, entire, at base 5—7 nerved, enectariferous, on both surfaces more or less densely covered with often fimbriate scales, above rarely with stellate hairs, glabrescent; petiole usually shorter than the blade, stout, stiff, 2—8 cm, rarely longer, up to 18 cm. *Stipules* ovate, obtuse to acute,  $1\frac{1}{2}$ —2 by  $\frac{1}{2}$ —1 cm, more or less densely scaly. *Flowers* axillary, solitary. Pedicel 1— $3\frac{1}{2}$  cm, often curved downwards, without joint or with a joint near the base, slightly accrescent. *Epicalyx segments* 4—6, coriaceous, free or at base shortly connate, erecto-patent to spreading, occasionally reflexed, shorter than or as long as the calyx, ovate to orbicular, at base narrowed, rarely somewhat cordate, at apex obtuse to acute,  $1\frac{1}{2}$ —3 by  $\frac{3}{4}$ —2 cm, more or less densely scaly. *Calyx* in bud ovoid, upwards 5-winged, during anthesis coriaceous, campanulate, 3—4 by *c.*  $2\frac{1}{2}$  cm, 5-fid to 5-parted; segments ovate, acute to acuminate,  $1\frac{1}{2}$ —2 by  $\frac{3}{4}$ —1 cm; calyx faintly 10-nerved, outside more or less densely scaly, yellowish, inside velutinous by minute stellate hairs. *Petals* obovate to spatulate, at apex rounded, 7—11 by 2—4 cm, outside rough by stiff, fimbriate scales in particular towards the base, inside on the covering half with long-armed stellate hairs, pink or orange-red. *Staminal column* 5— $8\frac{1}{2}$  cm, the lower part stellate-hairy, the upper half antheriferous; filaments 2—5 mm; anthers *c.* 1 mm. *Ovary* conical, obtuse, obsolete 5-angular, *c.*  $5\frac{1}{2}$  cm  $\varnothing$ , densely scaly; style arms 3—10 mm, minutely stellate-hairy; stigmas discoid,  $1\frac{1}{2}$ — $2\frac{1}{2}$  mm  $\varnothing$ . *Capsule* ovoid to globose, at apex acuminate or acute, 2—5 cm  $\varnothing$ , outside densely scaly, rough, 10-celled, inside glabrous. *Seeds*  $\infty$ , reniform, 3—4 mm long, densely covered by long, woolly, ferruginous stellate hairs.

*Distribution*: East New Guinea.

*Ecology*: Secondary and primary forests, 50—2400 m.

*Notes*: Since the publication of *H. archboldianus* Borss., *H. womersleyanus* Borss., and *H. lepidotus* Borss. in 1956 more material of this relationship has been collected. The new material is in many respects of an intermediate nature and has necessitated to merge the three species into one.

Kostermans (1960) has pointed to a resemblance of *H. womersleyanus* Borss. with *Papuodendron lepidotum* C. T. White and *P. hooglandianum* (Kosterm.) Borss. (cf. pp. 8, 84). This resemblance, however, concerns only the shape of the leaves, the scaly indumentum, and the habit of calyx with epicalyx. The corolla with adnate staminal column of the type of *H. womersleyanus* and the latter bearing scattered stamens as well as the five usual teeth at the tip, observed in the type material of *H. womersleyanus*, assign it undeniably to *Hibiscus*.

**7a. *Hibiscus schlechteri* Laut., Nachtr. Fl. Deutsch. Schutzgeb. Südsee (1905) 316.**

Type: New Guinea, Punam, *Schlechter 14658* (holotype: B †).

Tree. Twigs terete, *c.* 5 mm  $\varnothing$ , as the petioles densely covered by minute stellate hairs, somewhat scabrous. *Leaves* chartaceous to coriaceous, at base deeply cordate, at apex shortly cuspidate or rounded, 26—31 cm  $\varnothing$ , entire, at base 7—11-nerved; midrib beneath at  $2\frac{1}{2}$ —4 cm above base with a 2— $2\frac{1}{2}$  cm long linear nectary, with *c.* 9 side nerves on both sides; all nerves strongly prominent beneath; blade above with scattered, minute stellate hairs, somewhat scabrous, obviously glabrescent, beneath densely covered by minute stellate hairs in particular on the nerves, slightly scabrous; petiole stout, 13—18 cm. *Stipules* large, coriaceous, broad-ovate, auriculate, at apex obtuse to rounded,



25—30 by 12—25 mm  $\varnothing$ , outside and inside densely stellate-hairy, somewhat scabrous, outside also with minute, fimbriate scales. Pedicel c. 10 cm, 2—3 mm  $\varnothing$ , slightly accrescent, glabrous. *Epicalyx segments* 5, ovate, more or less acuminate, c. 20 by 8—13 mm, rough. *Calyx* widely campanulate, 3—4 cm long, with oblong, acute, unnerved segments, outside and inside scabrous, with inside prominent midribs. *Petals* large, oblique, oblong to ovate, c. 6½ cm long, outside tomentose by stellate hairs, in particular near the base, *in sicco* dark red, *in vivo* yellow. *Staminal column* somewhat shorter than the petals, c. 6 cm; filaments rather long. Overmature *capsule*  $\pm$  globular, c. 3 cm high, outside densely covered by minute scales, 10-celled, inside smooth. *Seeds*  $\infty$ , reniform, c. 3½ mm  $\varnothing$ , black, densely covered by long, ferruginous, soft hairs.

*Distribution*: East New Guinea, New Britain. Two collections.

*Notes*: The type material, which is lost, was in flower; the number of cells of the ovary was not mentioned. New material in fruit, from New Britain (N.G.F. 10011) fits the description very well, and I am perfectly confident that it is conspecific. The description given here is, therefore, based on two sources. According to native information the flowers of the New Britain material were red; this may be so of old flowers still found on the fruiting specimen.

Obviously closely related to *H. archboldianus* Borss. from which it differs mainly by the much larger, orbicular leaves and the stout, much longer pedicel. It is here only provisionally kept apart.

**8. *Hibiscus pleijtei*** Borss., *Reinwardtia* 4 (1956) 46, f. 3; van Royen, *Nova Guinea, Bot.*, n.s. 10 (1960) 42, 59.

Type: New Guinea, Kadamak near Sorong, *Pleijte 510* (holotype: BO 116999; isotypes: BO, BRI, GH, K, L, P, PNH, SING).

Tree, 13—25 m; buttresses c. 1½ m high. Twigs angular, finally terete, 2—5 mm  $\varnothing$ , as the petioles more or less densely clothed with minute stellate hairs and (or) fimbriate scales, glabrescent, developing lenticels. *Leaves* coriaceous, ovate, at base rounded or shallowly cordate, at apex obtusely cuspidate, 7—20 by 4½—14 cm, entire, penninerved, at base 5-nerved, midrib beneath near base with a 2—10 mm long, linear to oblong nectary, both surfaces with scattered, minute fimbriate scales and (or) stellate hairs, glabrescent; petiole 1—5 cm. *Stipules* large, coriaceous, ovate to orbicular, at apex obtuse or acute, 10—25 by 5—18 mm, with scattered, minute stellate hairs and (or) fimbriate scales, glabrescent. *Flowers* axillary, solitary, by decrescent leaves usually in 2—10-flowered racemes. Pedicel  $\pm$  as long as or longer than the petiole, 1½—2 cm, slightly accrescent, without joint, occasionally floccose. *Epicalyx segments* 5—6, coriaceous, shortly connate, broadly ovate to lanceolate, at base occasionally auriculate, at apex acute or slightly acuminate, 8—12 by 4—12 mm, somewhat accrescent, outside punctate by minute stellate hairs or fimbriate scales, inside densely stellate-pilose. *Calyx* in bud 5-winged, during flowering campanulate to rotate, c. 2 cm  $\varnothing$ , 12—16 mm long, slightly accrescent, 5-parted; segments ovate, acute,  $\pm$  reduplicative, 8—15 by 5—7 mm; calyx obsolete nerved, outside densely scaly, occasionally floccose, inside on the segments velutinous by minute stellate hairs, at base with a ring of short, sericeous hairs. *Petals* spatulate to oblong, at apex rounded to obtuse, 2½—3 by ½—1 cm, occasionally lanceolate and c. 5 cm long, outside densely clothed with fimbriate scales and slender stellate hairs, inside densely set with short, thick gland-hairs, on the covering side with a dense indumentum of minute, slender stellate hairs, at base with a tuft of long, woolly hairs, red to purple. *Staminal column* 1½—2 cm, rarely longer, c. 5½ cm, at base densely covered by long, woolly hairs, for the rest glabrous, red to purple, antheriferous in the upper

part; filaments *c.* 2 mm; anthers *c.* 1 mm, red to purple; pollen yellow. Woolly hairs of the petals and of the staminal column together forming a soft cushion inside the flower. *Ovary* conical, 5-angular, acute, *c.* 4 mm  $\varnothing$ , scaly, 10-celled; style arms *c.* 3 mm; stigmas capitellate. *Capsule* ovoid, slightly 5-angular, acute,  $1\frac{1}{2}$ —2 cm high, *c.*  $1$ — $1\frac{1}{2}$  cm  $\varnothing$ , densely covered by ochraceous scales, 10-celled; valves inside glabrous. *Seeds*  $\infty$ , reniform, *c.*  $2\frac{1}{2}$  mm long, black, densely covered by long, woolly, ferruginous hairs.

*Distribution*: West New Guinea (Vogelkop and adjacent islands: Waigeo, Salawati, Adi). Many collections.

*Ecology*: Primary and secondary forests, mostly at low altitude, once found at 1400 m.

*Notes*: The occurrence of a hair cushion within the flowers, as occurs in this species, is considered rare in *Hibiscus* and is shared by *H. pulvinulifer* and *H. sepikensis*.

*H. pleijtei* is apparently not very variable. The specimens from Adi I. have petals and a staminal column longer than in the other specimens.

### 9. *Hibiscus sepikensis* Borss., *sp. nov.*

Type: New Guinea, Sepik Distr., *Darbyshire & Hoogland 8234* (holotype: L).

*Arbor parva*. Ramuli teretes, squamis minutis scabriusculi, glabrescentes. *Folia* coriacea, ovata, elliptica vel subobovata, basi rotundata vel cordata, apice breviter acuminata, margine integra, basi quinquenervia, deinde pinnatinervia; costa subtus paulo supra basin nectario elliptico ornata; folia in utraque pagina squamis minutis scabriuscula. Petiolus lamina brevior, minute squamatus. *Stipulae* late annexae, coriaceae, ovatae, acutae, minute squamatae. *Flores* ad paniculas laxas terminales paucifloras et ebracteatas digesti. Pedicellus sat brevis, post anthesin accrescens, articulo nullo, apice incrassatus, in sicco sulcatus, sicut axes squamis minutis scaber. *Epicalyx* coriaceus, late campanulatus, post anthesin paulo accrescens, 5-partitus, segmentis ovalibus breviter acuminatis, extus scaber et squamis minutis punctatus, intus glaber. *Calyx* coriaceus, late campanulatus, epicalyce duplo longior, post anthesin paulo accrescens, 5-fidus, segmentis ovatis acutis, extus dense squamatus, intus stellato-velutinus. *Petala* oblonga, apice obtusa, extus squamis magnis dense vestita, intus margine ad partem obtegentem stellato-pubescentia, intus basi pulvinulo pilorum lanata, ceterum glandulosa. *Columna staminalis* petalis brevior, basi pulvinulis lanatis petalorum circumdata, parte inferiore dense stellato-pilosa, parte superiore stamina gerens. *Ovarium* conicum, squamatum, 10-loculare; stigmata capitata, papillosa. *Capsula* immatura, ovoidea, breviter acuminata, dense squamata, 10-ocularis, loculis 1—3 seminiferis. *Semina* reniformia, pilis longis lanatis dense ornata.

Tree, 15—19 m. *Leaves* 6—18 by  $4\frac{1}{2}$ — $11\frac{1}{2}$  cm; petiole  $1\frac{1}{2}$ —8 cm. *Stipules* 7—10 mm long. Pedicel  $1\frac{1}{2}$ —2 cm, finally  $2\frac{1}{2}$  cm. *Epicalyx* 5—7 mm high, 12—15 mm  $\varnothing$ ; segments 6—7 by 5—8 mm. *Calyx* *c.* 15 mm high, 20 mm  $\varnothing$ ; segments 7—10 by 5—6 mm. *Corolla* *c.* 4 cm  $\varnothing$ ; petals *c.* 3 by 1 cm. *Staminal column* *c.*  $1\frac{1}{2}$  mm. *Ovary* *c.* 5 mm high. *Capsule* (immature) *c.*  $1\frac{1}{2}$  cm long, *c.* 8 mm  $\varnothing$ . *Seeds* (immature) *c.* 3 mm  $\varnothing$ .

NEW GUINEA. East New Guinea: Sepik Distr., Aitape Subdistr., Bliiri R., Kaiye Village, *Darbyshire & Hoogland 8234* (L, holotype), along creek in garden regrowth, alt. *c.* 75 m, tree 15 m, flower pink; *ibid.*, Wantipi Village, *Darbyshire & Hoogland 8350* (L, paratype), riverbank in foothills, alt. 160 m, tree 19 m, fruits olivaceous.

*Distribution*: East New Guinea, 2 collections.

*Ecology*: Along creek in garden regrowth and riverbank, below 200 m.

*Note*: The species is closely allied to *H. pulvinulifer* Borss., from which it differs by pauciflorous panicles, and by the dimensions of all parts of the flowers and fruits which are 2—3 times larger; the pedicels and epicalyx are about thrice as long; the epicalyx is

5-parted instead of 5-fid and is about half as long as the calyx. These differences give this species a distinct habit. It is also allied to *H. pleijtei*.

**10. *Hibiscus pulvinulifer*** Borss., *Reinwardtia* 4 (1956) 48, f. 4; Kosterm., op. cit. 5 (1960) 235.

Type: New Guinea, Van Gelderen R., *Docters van Leeuwen 9280* (holotype: BO 117012; isotypes: BO, GH, K, L, PNH, SING).

Tree, up to 30 m. Twigs angular, finally terete, as the petioles, inflorescences and pedicels densely covered with scales, occasionally intermingled with minute stellate hairs, glabrescent. *Leaves* coriaceous, broadly elliptic to ovate, at base obtuse, rounded or shallowly cordate, at apex obtuse, acute or shallowly acuminate, 5—14½ by 4½—10 cm, entire, penninerved, at base 3—5-nerved, midrib beneath at base with an oblong nectary or none, on both surfaces densely scaly, in axils of basal nerves beneath with some stellate hairs; petiole 1—6 cm. *Stipules* caducous, unknown. *Flowers* in terminal, many-flowered panicles, with stiff, woody axes. Bracts caducous. Pedicel ½—1 cm, slightly accrescent. *Epicalyx* coriaceous, stellate to widely campanulate, 2½—3½ mm high, 4—5 mm ø, slightly accrescent, 5-fid; segments triangular, acute, 1½—2 by c. 1½ mm; epicalyx outside scaly, inside glabrous. *Calyx* in bud obovoid and at apex rounded, coriaceous, when open widely campanulate, c. 8 mm ø, slightly accrescent, 5-fid; segments ovate, acute, 4—5 by 3 mm; calyx outside densely scaly, inside stellate-velutinous. *Corolla* rotate, c. 2½ cm ø, pink; petals linear to lanceolate, at apex acute to obtuse, 15—20 by 3—6 mm, outside densely scaly, inside along the margin stellate-pubescent, inside at base with a cushion of long woolly hairs. *Staminal column* c. 10 mm, lower half stellate-hairy, upper half antheriferous. *Ovary* conical 2½—3 mm ø, faintly 5-angular, scaly, 10-celled; stigmas capitate. *Capsule* 8—10 mm, obovoid, acute to subacuminate, densely scaly, 10-celled. *Seeds* 1—3 per cell, reniform, 1½—2 mm ø, densely clothed with long, ferruginous, woolly hairs.

*Distribution*: New Guinea. Two collections.

*Ecology*: Primary forest, 100—500 m.

*Note*: Resembles the species of the genus *Papuodendron* very much with respect to the indumentum and the inflorescence, but the characters of the flower are those of *Hibiscus*.

**11. *Hibiscus macrophyllus*** Roxb. [Hort. Beng. (1814) 51, *nom. nud.*] ex Hornem., Hort. Hafn., Suppl. (1819) 149; DC., Prod. 1 (1824) 455; Wall., Cat. (1829) n. 1903; Pl. As. Rar. 1 (1830) 44, t. 51; Kurz, J. As. Soc. Beng. n.s. 43, ii (1874) 101; Mast., in Fl. Br. Ind. 1 (1875) 337; Kurz, For. Fl. Burma 1 (1877) 126; King, J. As. Soc. Beng. n.s. 60, ii (1891) 45; Ridley, Trans. Linn. Soc. Bot. II, 3 (1893) 279; Koord. & Val., Bijdr. Booms. Java 2 (1895) 112; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 68; Bull. Inst. Bot. Btzg 19 (1904) 8; Brandis, Ind. Trees (1906) 74, f. 34; Backer, Fl. Bat. 1 (1907) 121; Gagn., in Fl. Gén. I.-C. 2 (1910) 425; Backer, Schoolfl. Java (1911) 121; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 5; Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 243; Koord., Exk. Fl. Java 2 (1912) 584; Hall, f., Med. Rijksherb. 12 (1912) 13; Merr., Philip. J. Sc. 14 (1919) 245; Ridley, J. Fed. Mal. St. Mus. 10 (1920) 83; Fl. Mal. Pen. 1 (1922) 258; Baker, f., J. Bot. 62, Suppl. (1924) 11; Craib, Fl. Siam. En. 1 (1925) 158; Bartlett, Pap. Mich. Ac. Sc. 6 (1926) 55; Heyne, Nutt. Pl. (1927) 1031; Ulbr., Biol. Früchte Samen (1928) 180, t. 42 f. 6; Merr., Contr. Arn. Arb. 8 (1934) 102; Burk., Dict. Ec. Prod. Mal. Pen. 1 (1935) 1167; Corner, Wayside Trees Mal. (1940) 441, f. 144 right; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 20; Hu, Fl. China, fam. 153 (1955) 375; Backer & Bakh, f., Fl. Java 1 (1963)

430; Bates, *Baileya* 13 (1965) 75, f. 21E. — *Paritium macrophyllum* (Roxb. ex Hornem.) G. Don, *Gen. Syst.* 1 (1831) 485; Degener, *Fl. Haw. fam.* 221 (1934) *tab. c. descr.* ('*Pariti macrophyllum*'). — *H. spathaceus* Nees & Bl., *Syll. Ratisb.* 1 (1824) 99; Blume, *Bijdr.* 2 (1825) 72; *Mor., Syst. Verz.* (1846) 29; Beumée, *Hand. 3e Ned. Ind. Natuurwet. Congr.* (1925) 176. — *Triplochiton spathacea* (Nees & Bl.) Alefeld, *Oest. Bot. Z.* 13 (1863) 13. — *H. setosus* Roxb., [*Hort. Beng.* (1814) 97, *nom. nud.*] *Fl. Ind. ed. Carey* 3 (1832) 194. — *Triplochiton setosa* Alefeld, *Oest. Bot. Z.* 13 (1863) 13. — *H. vestitus* Griff., *Not. Pl. As.* 4 (1854) 519. — *H. vulpinus* Reinw. [*ex Bl., Cat.* (1823) 88, *nom. nud.*; De Vriese, *Tijd. Nat. Gesch. Phys.* 11 (1844) 344, *nom. nud.*] *ex Miq., Pl. Jungh.* (1854) 281, *nom. nov. superfl., illeg.*; *Fl. Ind. Bat.* 1, 2 (1859) 157.

Types: *H. macrophyllum* Roxb. ex Hornem.: Botanic Garden Calcutta, from Pakistan, Chittagong, ? *Wallich s.n.* (holotype: C); *H. spathaceus* Nees & Bl. and *H. vulpinus* Reinw. ex Miq.: Java, *Blume s.n.* (neotype: L 908. 135-482; isotype: P); *H. setosus* Roxb.: Botanic Garden Calcutta, from Pakistan, Chittagong, *Roxburgh s.n.* (lectotype: BR-Herb. Martius); *H. vestitus* Griff.: *Griffith 477* (isotypes: K, L, P).

Tree, 15–25 m. Twigs c. 6 mm  $\varnothing$ , with annular stipular scars, as the petioles and pedicels densely covered with minute stellate hairs, and in addition with numerous, longibrachiate (up to 10 mm), shining, brown stellate hairs, glabrescent. *Leaves* chartaceous, orbicular, at base deeply cordate, at apex cuspidate, on flowering twigs smaller and ovate, at base shallowly cordate or truncate, (5–)25–50 cm  $\varnothing$ , entire, sometimes crenulate, at base 7–9-nerved, on midrib and usually also on adjacent 2–6 basal nerves beneath with a 3–20 mm long, linear nectary in or above the middle, above on the nerves densely, but between the nerves not densely stellate-hairy, beneath densely stellate tomentose; petiole stout, 4–40 cm. *Stipules* large, primarily cohering along the margins and enclosing the terminal bud, finally spreading and caducous, oblong, obtuse to acute, 8–15 by 2–4 cm, parallel-nerved, outside tomentose by minute stellate hairs, in addition with numerous, large, brown stellate hairs, inside sericeous by simple hairs. *Flowers* axillary, solitary, by abortion or reduction of the upper leaves in pauciflorous racemes. Pedicel stout, short, 1–2 cm, in fruit accrescent to 3½ cm. *Epicalyx segments* 10–14, at base shortly connate, appressed to erecto-patent, linear to lanceolate, acute, 15–25 mm by 3–3½ mm, somewhat shorter than the calyx, slightly accrescent, outside densely covered with minute and large stellate hairs, inside sericeous by simple hairs. *Calyx* campanulate, 5-parted, 2½–3 cm high, slightly accrescent, c. 3 cm  $\varnothing$ ; segments triangular, acute, 15–18 by 6–7 mm; calyx 10-nerved, outside densely clothed with minute and large stellate hairs, inside on the segments sericeous, without nectaries. *Corolla* large and showy, yellow with a dark purple centre, often turning red; petals obovate, at apex rounded, 6–7 by 4–5 cm, at base stellate-ciliate, outside stellate-pubescent, inside with scattered, clavate gland-hairs. *Staminal column* c. 4 cm, glabrous, antheriferous throughout; filaments 3–8 mm; anthers c. 1½ mm; pollen yellow. *Ovary* conical, c. 7 by 5 mm, stellate-sericeous, 5-celled; style arms 5–6 mm, pilose; stigmas capitate, c. 1½ mm, pilose. *Capsule* ovoid to obovoid, acuminate, 22–35 mm high, 17–23 mm  $\varnothing$ , with a beak c. 5 mm, densely hirsute by simple and stellate hairs, 5-celled; valves woody, c. 1½ mm  $\varnothing$ , inside smooth, shining. *Seeds*  $\infty$ , reniform, c. 4 mm long, dorsally densely clothed with 3–4 mm long, ferruginous, partly spirally twisted hairs, for the rest glabrous, brown-black.

*Distribution:* Peninsular India, East Pakistan, Assam, Siam, Indo-China, Sumatra, Malay Peninsula, Java, and Southeast Borneo. Cultivated as an ornamental in Palawan and the Hawaiian Islands. Fig. 5.

*Ecology:* Secondary forests, from the lowland up to 1400 m, never along the coast.

Mrs Nieuwenhuis (Ann. Jard. Bot. Btzg 21, 1907, 242, t. 27 f. 63—64) and Koernicke (Flora 169, 1918, 527) described the extrafloral nectaries.

Notes: In 1814 Roxburgh mentioned in his Hortus Bengalensis as place and date of origin 'Chittagong, 1810', and as the collector J. Roxburgh (one of his two sons). Hornemann (1819) validated the binomium by adding a description.

Dr M. Jacobs at Leyden has kindly examined the type collection which is preserved at Copenhagen and had photographs made. There are two sheets numbered 1a and 1b, marked on the back 'Horn. Wall.' and 'Hort. bot. Ind. or.' respectively. The specimens were apparently collected in the Botanic Gardens of Calcutta by Wallich for Hornemann, and are probably duplicates of Wallich n. 1903, 3. The trees at Calcutta, no doubt, were derived from material collected at Chittagong. In 1830 Wallich published an extensive description together with a beautiful plate. In a note below the description he wrote: 'The tree was introduced into the Calcutta garden in 1810, by the late Mr. John Roxburgh, and has at present attained a height of twenty-five feet'.

Alefeld based *Triplochiton setosa* Alefeld, according to the protologue, on *Hibiscus setosa* Wall., Cat. n. 1902. The specimens under that number at Kew all belong to *H. panduriformis* Burm. f. (see there). Alefeld's description, however, applies to *H. macrophyllus* Hornem.; Wallich n. 1903 is that species. Presumably Alefeld studied a mislabelled duplicate in the Herbarium of Darmstadt, which has been destroyed during the second world war.

*H. spathaceus* Nees & Bl. is usually cited as published for the first time by Blume in his 'Bijdragen' (1825), but it was already described in 1824 in an article by Nees ab Esenbeck with an extensive description after a specimen which Nees received from Blume. Unless that specimen is discovered, a good specimen in the Rijksherbarium at Leyden, with a label on which the name is written in the handwriting of Blume, should be treated as a neotype. At Paris there is another specimen, which could be a duplicate. Alefeld (1863) mentioned *Triplochiton spathacea* (Bl.) Alefeld as a distinct species next to *T. setosa*, saying that it is only smaller in all its parts, giving only minor differences which fall within the range of variability of the present species.

## 12. *Hibiscus borneensis* Airy-Shaw, Hook. Ic. Pl. 34 (1939) t. 3377.

Type: Sarawak, Dulit Trail, *Native Collector (Oxford Univ. Exp.) 1541* (isotypes: GH, K, L, SING).

Low-branched tree, 30 m, with small buttresses; bole up to c. 80 cm  $\varnothing$ . Twigs somewhat angular, finally terete, as the petioles, peduncles, and pedicels cinereous by minute stellate hairs, glabrescent and provided with lenticels, more or less fistular, tinged red. *Leaves* subcoriaceous, broadly ovate to orbicular, at base cordate or truncate, rarely acute, at apex acute to acuminate, 10—22 by 8—16 cm (of suckers occasionally triapiculate and 25—30 by 23—26 cm), with coarsely, often doubly crenate margin, at base 5—7-nerved, with the nerves and veins in a cobweb-like pattern, without nectaries, on both surfaces with scattered, minute stellate hairs, glabrescent; petiole 5—13 cm (of suckers 16—29 cm). *Stipules* large, orbicular to reniform, auricled, 8—10 by c. 10 mm, stellate-hairy. *Flowers* in axillary, few-flowered racemes or panicles, the lower ones occasionally solitary; primary peduncle 10—28 cm; secondary peduncles 4—13 cm; bracts represented only by their stipules. Pedicel 2—5 cm, jointed above the middle. *Epicalyx segments* coriaceous, 7—9, patent or reflexed, connate at the very base, ovate to oblong or spatulate, acute, 6—15 by 3—6 mm, with minute stellate hairs, glabrescent. *Calyx* widely campanulate, somewhat inflated, 1½—2 cm high and c. 1½ cm  $\varnothing$ , coriaceous, after flowering fissured; segments usually reflexed, triangular, acute to slightly

acuminate, 6—7 mm wide and long; calyx outside 10-nerved, tomentose by stellate hairs, inside at the bottom with an annulus of fairly stiff stellate hairs. *Petals* reflexed, ultimately spreading, obovate, at apex rounded, 4—6½ by 2—2½ cm, outside somewhat rough by coarse and minute stellate hairs, also with short gland-hairs, inside downwards with minute stellate hairs, at base along the inner margin densely ciliate by large, slender stellate hairs; petals white or pinkish with pale yellow, shiny base. *Staminal column* ± as long as the petals, 3½—5½ cm, at base downy by slender stellate hairs, for the rest glabrous, antheriferous nearly throughout; filaments 1—2 mm; anthers 1—1½ mm. *Ovary* conical, acute, c. 7 mm high and 4 mm  $\varnothing$ , hirsute, 5-celled; ovules c. 7 per cell; stigmas capitate, 1½—2 mm  $\varnothing$ . *Capsule* globular to obovoid, shortly rostrate, prominently 5-costate, c. 20 mm high and 17 mm  $\varnothing$ , hirsute by fairly long, simple hairs, also with minute stellate hairs, 5-celled; valves rather thick, inside smooth, downy by long hairs. *Seeds* c. 7 per cell, reniform, 1—1½ mm  $\varnothing$ , redbrown, with long, redbrown or yellowish, woolly hairs, in particular dorsally.

*Distribution*: Borneo (Sarawak, Kutei).

*Ecology*: Primary forests, mostly on moist places, near rivers, etc., 40—300 m.

*Notes*: I agree with Airy-Shaw that this species, which is the only endemic *Hibiscus* in Borneo, is closely related to *H. decaspermus* K. & V. from S. and E. Malesia and with *H. floccosus* Mast. from Malaya. Airy-Shaw also mentioned *H. scandens* Roxb. (from Birma) and *H. macrogonus* Baill. (from Madagascar) as having the paniculate inflorescence in common. *H. scandens* Roxb. is different, however, in many other characters, and should even be placed in another section. *H. macrogonus* Baill., possessing according to Hochreutiner (Fl. Madag. fam. 129, 1955, 15) axillary flowers, was placed by that author correctly in sect. *Azanza* and doubtless belongs to the same relationship as *H. borneensis* Airy-Shaw.

### 13. *Hibiscus pseudotiliaceus* Borss., Reinwardtia 4 (1956) 65, f. 12.

Type: Morotai, *Tangkilisan* (Exp. *Kostermans*) 229 = *bb. 33899* (holotype: BO 116796; isotypes: BO, BZF, K, L, SING).

Tree, 22 m. Twigs slightly angular, finally terete, as the petioles and pedicels tomentose by larger and minute stellate hairs, glabrescent and with lenticels. *Leaves* chartaceous, orbicular, at base deeply cordate, at apex long cuspidate, 14—22 by 12—20 cm, entire or somewhat dentate, at base 5—7-nerved, without nectaries, above pubescent by minute stellate hairs, beneath tomentose by larger stellate hairs; petiole 5½—12 cm. *Stipules* ovate to lanceolate, obtuse, 2½—3 by c. 1 cm, stellate-hairy. *Flowers* in axillary, few-flowered racemes; primary and secondary peduncles short, stellate-hairy; bracts represented by their stipules. Pedicel 1—1½ cm, somewhat accrescent, without joint. *Epicalyx* large, widely campanulate, c. 2 cm high and 3 cm wide, slightly accrescent, 7-fid; segments ovate, acute to shortly acuminate, 10—15 by 6—8 mm; epicalyx outside densely covered by larger and minute stellate hairs, inside on the segments velutinous by minute stellate hairs. *Calyx* campanulate, c. 2½ cm high and 2 cm wide, 5-fid; segments long triangular, acute, c. 15 by 5—10 mm; calyx 10-nerved, outside with larger and minute stellate hairs, inside at base with a ring of appressed, simple hairs. *Petals* obovate, at apex rounded, 6—7 cm long, outside with long-armed stellate hairs, at base ciliate, yellow. *Capsule* ovoid, 5-angular, at apex shortly acuminate, c. 2 cm long and 1¾ cm  $\varnothing$ , outside hirsute by simple hairs, also with minute stellate hairs, 5-celled, dehiscent; valves thick, inside smooth, glabrous. *Seeds* ∞, reniform, angular, densely covered by short, woolly, ferruginous, stellate hairs.

*Distribution*: N. Moluccas (Morotai). One collection.

*Ecology*: Primary forest, 60 m.

*Notes*: The specimens collected are reminiscent of *H. tiliaceus* L., in particular its ssp. *celebicus* (Koord.) Borss. The capsule is, however, 5-celled, whereas the epicalyx is quite different in shape and size, and has 7 ovate segments. Besides the typical nectaries occurring on the nerves of *H. tiliaceus* L. are lacking in the present species.

*H. pseudotiliaceus* Borss. is closely related to *H. macrophyllus* Roxb. ex Hornem.

**14. *Hibiscus decaspermus*** Koord. & Val., Bijdr. Booms. Java 2 (1895) 115; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 62; Koord., Nat. Tijd. Ned. Ind. 60 (1901) 384; Koord. & Val., Ic. Bog. 2 (1904) 145, t. 131; Backer, Schoolfl. Java (1911) 121; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 5; Koord., Exk. Fl. Java 2 (1912) 587; Atlas 3 (1914) 9, t. 438; Heyne, Nutt. Pl. (1927) 1030; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 20; Backer & Bakh. f., Fl. Java 1 (1963) 430. — *H. flavotrichus* C. E. C. Fischer, Kew Bull. (1926) 464. — *H. timorensis* (non DC.) Meijer Drees, Comm. For. Res. Inst. 33 (1951) 76.

*Types*: *H. decaspermus* Koord. & Val.: Java, Tjiratjap, *Koorders 4561* (isotypes: BO, K, L); *H. flavotrichus* C. E. C. Fischer, South Tenasserim, *Parkinson 1640* (holotype: K).

Low-branched, small tree, 3–25 m, without buttresses. Twigs terete, 1½–4 mm ø, as the petioles with scattered, minute stellate hairs of fimbriate scales, glabrescent and with scattered lenticels. *Leaves* coriaceous, orbicular to ovate, at base cordate to rounded, rarely acute, at apex acute to acuminate, 3–25 by 1½–18 cm, entire or slightly crenate to undulate, at base 5–7-nerved, beneath on midrib near the base, occasionally also on the adjacent two basal nerves, with an oblong to linear nectary, when young with scattered, minute stellate hairs or fimbriate scales, beneath sometimes with longer stellate hairs, glabrescent; petiole ½–5 cm. *Stipules* linear to ovate or spatulate, acute, 5–8 by 1–2 mm, with some minute stellate hairs or fimbriate scales. *Flowers* axillary, solitary, by the decrescent leaves sometimes seemingly in racemes. Pedicel 1–5 cm, accrescent, jointed at or above the middle, above the joint thicker and sulcate, more or less densely covered with yellow scales. *Epicalyx segments* 6–7, appressed to erecto-patent, at base shortly connate, linear to lanceolate, occasionally widely ovate, acute to acuminate, 10–15 by 2–11 mm, with some minute stellate hairs or fimbriate scales, glabrescent. *Calyx* in bud ovoid, at apex 5-winged, in anthesis widely campanulate, slightly inflated, 10–15 mm high and 7–15 mm wide, later somewhat enlarged and often fissured, 5-fid to 5-parted; segments ovate to long triangular, acute to slightly acuminate, 8–12 by 4–7 mm; calyx outside with 10, somewhat prominent nerves, densely covered by yellow scales, inside at the bottom with a dense ring of long, simple hairs, inside on the segments velutinous by minute stellate hairs. *Petals* obovate, at apex rounded, 3–4 by 1½–2 cm, outside with fimbriate scales in particular downwards, at base long ciliate, white or pink. *Staminal column* 3–4 cm, at base long hairy, antheriferous throughout; filaments 3–4 mm; anthers 2–2½ mm. *Ovary* conical, somewhat 5-angular, 3–4 mm ø, hirsute, 5-celled, each cell with 2 collateral ovules; style arms 4–5 mm; stigmas capitate. *Capsule* ± globose, 1½–2 cm ø, at apex with a c. 3 mm long beak, densely covered by minute scales, also with erecto-patent, simple hairs, 5-celled; valves fairly thin, inside glabrous and smooth. *Seeds* 2 per cell, reniform, angular, 5–6 mm long, brown-black, with long, appressed stellate or simple hairs, in particular dorsally.

*Distribution*: Tenasserim, S. Siam, West Java (Djampangkulon, 2 collections), Lesser Sunda Islands (Sumbawa, Timor), Celebes, and the Philippines (Babuyan, Mindoro).

*Ecology*: Secondary vegetations at low altitudes, in particular along or near the sea-coast.

*Notes:* *H. decaspermus* K. & V. varies considerably with respect to the size and shape of the epicalyx segments. In leaf shape it is as variable as *H. tiliaceus* L. s.s., which has often leaves of a different shape on the same tree.

*H. flavotrichus* C. E. C. Fischer is conspecific with the present species. The type does not show any essential difference, though it is found very remote from the Malesian localities.

**15. *Hibiscus floccosus* Mast.,** in Fl. Br. Ind. 1 (1875) 343; King, J. As. Soc. Beng. n.s. 60, ii (1891) 46; Ridley, Trans. Linn. Soc. Bot. II, 3 (1893) 280; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 62; Ridley, J. Str. Br. R. As. Soc. 57 (1911) 24; Fl. Mal. Pen. 1 (1922) 259; Burk. & Hend., Gard. Bull. Str. Settl. 3 (1925) 350; Burk., Dict. Ec. Prod. Mal. Pen. 1 (1935) 1166; Corner, Wayside Trees Mal. (1940) 441, atlas t. 144 left. — Fig. 7a.

Type: Malacca, Mt Ophir, *Maingay 216* (isotypes: GH, K, L).

Deciduous tree, up to 30 m. Twigs terete,  $2\frac{1}{2}$ —7 cm  $\varnothing$ , as the petioles and pedicels subsabrous by ferruginous, minute stellate hairs and fimbriate scales, glabrescent. *Leaves* coriaceous, orbicular to widely ovate, angular or sometimes 3—5-lobed, at base cordate to rounded, at apex obtuse, 3—18 cm  $\varnothing$ , irregularly dentate to entire, at base 7-nerved, beneath on the 3—5 central basal nerves at  $1/4$ — $2/3$  from the base with a linear nectary, on either surface scabrous by scattered, stiff, stellate hairs and fimbriate scales; petiole 1—7 cm, upper leaves sessile. *Stipules* coriaceous, spatulate, at base acute, at apex obtuse, 6—8 by 2— $3\frac{1}{2}$  mm, minutely stellate-hairy. *Flowers* axillary, solitary, by decrescent leaves seemingly in racemes or panicles. *Pedicel* short and stout,  $\frac{1}{2}$ —1 cm, accrescent, at apex thickened, without joint. *Epicalyx* coriaceous, widely campanulate,  $1\frac{1}{4}$ — $1\frac{1}{2}$  cm high, c.  $1\frac{1}{2}$  cm  $\varnothing$ , accrescent, often fissured, 7—8-lobed; segments appressed, triangular, acute to obtuse, 4—5 by  $4\frac{1}{2}$ —6 mm; epicalyx outside scabrous by a dense covering of ferruginous fimbriate scales and stellate hairs, inside glabrous. *Calyx* coriaceous, campanulate to widely tubular, 3— $3\frac{1}{2}$  cm long,  $1\frac{1}{2}$ —2 cm  $\varnothing$ , somewhat accrescent, 5-lobed; segments ovate to triangular, acute to acuminate, 10—15 by 5—8 mm; calyx 5-nerved, outside scabrous by a dense covering of ferruginous, fimbriate scales and scattered stellate hairs, inside on the segments velutinous by very minute stellate hairs. *Petals* long spatulate, at apex rounded, 6—11 by 2—3 cm, at base fleshy, outside densely covered by ferruginous, fimbriate scales and stellate hairs particularly near the base, inside glabrous or nearly so, at base along the margin densely hirsute; petals yellow to orange with red veins and at base with a reddish brown patch. *Staminal column* 8—9 cm, at base densely stellate-hairy, antheriferous in upper half; filaments 2— $2\frac{1}{2}$  mm; anthers c. 1 mm  $\varnothing$ , red. *Ovary* conical, at apex rounded, slightly 5-angular, 4— $4\frac{1}{2}$  mm  $\varnothing$ , densely clothed with fimbriate scales; style arms 4—5 mm, pilose; stigmas capitate, short-hairy, red. *Capsule* obovoid, at apex intruded and shortly rostrate, tightly enveloped by the calyx,  $2\frac{1}{2}$ — $3\frac{1}{2}$  cm long,  $1\frac{1}{2}$ —2 cm  $\varnothing$ , densely clothed with fimbriate scales; valves thick, woody, 2—3 mm  $\varnothing$ , inside smooth, glabrous. *Seeds* 6—7 per cell, reniform, somewhat flattened, c. 7 mm long, brown-black, with appressed and fairly long stellate hairs particularly dorsally.

*Distribution:* Malay Peninsula.

*Ecology:* In open places, secondary vegetation, forest edges, often on moist places near rivers and in swamps, 15—150 m.

*Notes:* The Indochinese *H. mesnyi* Pierre (Fl. For. Coch. 3, 1888, t. 172) is closely allied to the present species, if not merely a local form of it. The single essential difference, which I could recognize in the type collection (Cochin-china, Bienhoa Prov., Donnai



R., *Pierre* 892; BM, BO, K, L, SING) is in the epicalyx segments which are in *H. floccosus* Mast. 7—9 in number, and in *H. mesnyi* Pierre 3—5.

**H. gagnepainii** Borss., *nom. nov.* (*H. squamosus* Gagn., *nom. illeg.*, Not. Syst. 9, 1944, 161; in Suppl. Fl. Gén. I.-C. 1, 1945, 382, t. 41 f. 1—4; isotype: Annam, *Poilane* 8565; BO 69686) differs from *H. floccosus* Mast. and *H. mesnyi* Pierre by the leaves, which are ovate (not lobed) and glabrous, a 5-dentate epicalyx, a hirsute capsule, and woolly seeds. Gagnepain's name is illegitimate, being a later homonym of *H. squamosus* Hochr. (Ann. Cons. Jard. Bot. Genève 4, 1900, 165), an African species.

**16. Hibiscus teijsmannii** Borss., *Reinwardtia* 4 (1956) 67, f. 13.

Type: Southwest Celebes, Schroh, *Teijsmann HB 12597* (holotype: BO 58063; isotypes: BO, L).

Ligneous plant, probably shrub or small tree. Twigs terete, 2½—5 mm  $\varnothing$ , as the petioles farinose by extremely minute fimbriate scales, glabrescent, with scattered small lenticels. *Leaves* coriaceous, ovate, at base rounded or shallowly cordate, at apex acuminate, 7½—15 by 5½—10 cm, entire, at base 5—7-nerved, beneath on the midrib near the base with a linear, *c.* 5 mm long nectary, above with scattered minute, fimbriate scales especially near the base, glabrescent, beneath in the nerve axils with little tufts of short, simple hairs; petiole farinose by fimbriate scales, 2—7½ cm. Only known in fruit. Pedicels axillary, solitary, in fruit 3—4½ cm, stout, with a joint above the middle, above the joint thicker and sulcate, densely covered by minute fimbriate scales. *Epicalyx* widely campanulate, *c.* 8 mm high and 14 mm  $\varnothing$ , 8—10-fid, with broad-triangular, acute segments, *c.* 5 by 10 mm, outside densely covered by minute, fimbriate scales. *Calyx* cupular to campanulate, *c.* 2 cm  $\varnothing$ , closely enveloping the capsule, 5-lobed, with widely triangular segments *c.* 10 mm wide, 10-nerved, densely covered by large, entire scales. *Capsule* obovoid, at apex acute to acuminate, *c.* 2 cm long, 2½ cm  $\varnothing$ , tomentose by erecto-patent, simple hairs, also with minute scales, 5-celled; valves thick, woody, inside smooth, glabrous; cells in the upper part with 2 full-grown seeds, in the lower part with 2—4 abortive ones. *Seeds* reniform, angular, *c.* 5 mm long, with long, appressed, stellate or simple hairs, particularly dorsally.

*Distribution*: Southwest Celebes.

*Note*: *H. teijsmannii* Borss. very much resembles *H. decaspermus* Koord. & Val. as far as leaves, fruits, and indumentum are concerned. It is different in having in each cell of the capsule, apart from two full-grown seeds, 2—4 abortive ones. It is, moreover, characterized by an epicalyx resembling that of *H. tiliaceus* L. s.s., consisting of 8—10 connate teeth.

## 2. Section *Bombycidendron*

(Zoll.) Borss., *sect. nov.* — *Bombycidendron* Zoll., *Nat. & Geneesk. Arch.* 2 (1845) 14, basionym. — *Hibiscus* sect. *Columnaris* Hochr., *Ann. Cons. Jard. Bot. Genève* 4 (1900) 31, *p.p.*, *excl. typ.*

Holotype: *Bombycidendron grewiaefolium* (Hassk.) Zoll.

*Notes*: Hochreutiner distinguished sect. *Columnaris* primarily on the supposed symphysis of the epicalyx and calyx, and consequently grouped together four species which differ considerably with respect to morphological characters and geographical distribution. Except for that character the affinity between *H. columnaris* Cav. (designated here as the lectotype of sect. *Columnaris*) from Réunion on the one hand, and *H. grewii-*

*folius* Hassk. and *H. campylosiphon* Turcz. on the other hand, becomes obscure. I have seen only a few poor specimens of *H. columnaris* Cav., but it certainly belongs either to the sect. *Ketmia* DC. under which De Candolle already mentioned it, or to sect. *Trionum* DC. *H. lampas* Cav., also incorporated in sect. *Columnaris* by Hochreutiner, is treated in the present revision under the genus *Thespesia* on account of its compound stigma and cupular, minutely 5-toothed calyx.

*H. grewiifolius* Hassk. and *H. campylosiphon* Turcz. do not show a real symphysis between epicalyx and calyx but a discoid hypanthium formed by the thickened apical part of the pedicel on which both epicalyx and calyx are inserted. This hypanthium is also a characteristic of the genus *Thespesia*. Sect. *Bombycidendron* can therefore be considered to represent a link between the genera *Hibiscus* and *Thespesia*.

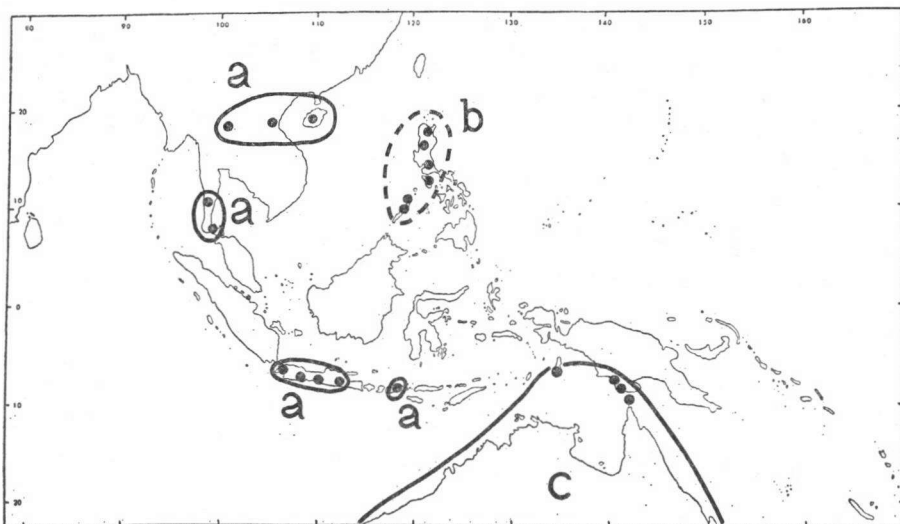


Fig. 8. Area of *Hibiscus* sect. *Bombycidendron* (Zoll.) Borss. a. *H. grewiifolius* Hassk., b. *H. campylosiphon* Turcz. — c. Area of *H. meraukensis* Hochr. (*H. radiatus* auct. austral.).

**17. *Hibiscus grewiifolius* Hassk., Cat. Hort. Bog. (1844) 197 ('*grewiaefolius*'); Tjrd. Nat. Gesch. Phys. 12 (1845) 83; Pl. Jav. Rar. (1848) 300; Miq., Fl. Ind. Bat. 1, 2 (1858) 155; Koord. & Val., Bijdr. Booms. Java 2 (1895) 114; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 57; Pl. Bog. Exsicc. (1904) 24; Koord., in Jungh. Gedenkb. (1910) 179; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 5; Backer, Schoolfl. Java (1911) 121; Koord., Exk. Fl. Java 2 (1912) 587; Atlas 3 (1914) t. 436; Heyne, Nutt. Pl. (1927) 1031; Craib, Fl. Siam. En. 1 (1931) 157; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 20; Backer & Bakh. f., Fl. Java 1 (1963) 430. — *Bombycidendron grewiaefolium* (Hassk.) Zoll., Nat. & Geneesk. Arch. 2 (1845) 14; Mor., Syst. Verz. (1846) 29. — *H. bantamensis* Miq., Pl. Jungh. (1854) 282. — *H. praeclarus* Gagn., in Fl. Gén. I.-C. 1 (1910) 427, t. 20B; Not. Syst. 1 (1910) 194; in Suppl. Fl. Gén. I.-C. 1 (1945) 375. — *H. cinnamomifolius* Chun & Tsiang, Sunyatsenia 4 (1939) 18, t. 7; Hu, Fl. China, fam. 153 (1955) 45, t. 20 f. 4.**

Types: *H. grewiifolius* Hassk.: Java, Bogor, Botanic Gardens, *Teijsmann s.n.* (lectotype: L 908.135-838); *H. bantamensis* Miq.: Java, Banten, southcoast, *Junghuhn s.n.* (isotypes:

L 908.135-779, U 039069); *H. praeclarus* Gagn.: Laos, Nape, Cam-keut, *Spire s.n.* (holotype: P). *H. cinnamomifolius* Chun & Tsiang: Hainan, Yaichow, *F. C. How 70646* (holotype: SYS, *n.v.*); S. K. Lau 28292 (paratype: K).

Small tree, 10—20 m. Twigs fairly thin, stellate-pubescent. *Leaves* ovate to oblong or nearly lanceolate, at base obtuse, rounded or shallowly cordate, often somewhat unequal, at apex gradually acuminate, 7—27 by 3—8½ cm, entire, penninerved, at base 3—5-nerved, on both surfaces minutely stellate-hairy to glabrous; petiole 1—1½ (—4) cm, stellate-pubescent. *Stipules* narrowly attached, ovate to lanceolate, 4—15 by 2—4 mm, very acute, stellate-pubescent. *Flowers* axillary, solitary, large. Pedicel short, but usually longer than the petiole, 7—15 mm, with a joint in the middle or without one, at apex thickened to a hypanthium of 7—10 mm  $\varnothing$ , finally thickened and recurved. *Epicalyx segments* 6—10, patent to reflexed, linear to lanceolate, rigid, acute, 5—15 by 1—1½ mm, stellate-pubescent, glabrescent. *Calyx* campanulate, 5-parted, 1½—3 cm high, strongly accrescent; segments long triangular, subacuminate, 10—15 by 5—6½ mm, 3-nerved; calyx outside with minute stellate hairs and (or) fimbriate scales, inside at base with an annulus of long, simple hairs and on the segments, especially along the margin stellate-velutinous. *Corolla* yellow with dark purple centre; petals obovate, 6—8½ cm long, outside with scattered stellate hairs, inside on the covering margin stellate-ciliate, also with scattered sessile gland-hairs. *Staminal column* c. 2 cm, antheriferous throughout, glabrous; filaments c. 2 mm. *Ovary* conical, c. 3½ mm high, at base with appressed, simple hairs, 10-celled by 5 false dissepiments; style c. 2 cm, at apex thickened and with c. 2 mm long, short-hairy arms; stigmas indistinct. *Capsule* globose, acuminate, 20—23 by 15—17 mm, outside densely covered with minute stellate hairs and particularly downwards also with appressed simple hairs, finally glabrous; valves woody, inside glabrous and smooth. *Seeds*  $\infty$ , reniformous, 3½—4 mm, densely set with long woolly, ferruginous hairs.

*Distribution*: Southern Birma, Peninsular Siam, Indo-China, Hainan, Java, and Lesser Sunda Islands (Sumbawa). Backer & Bakhuizen *f. l.c.* reported the species as sometimes cultivated in Java, but although it has very attractive flowers, I have never seen specimens in cultivation, those in the Bogor Botanic Gardens excepted. Fig. 8.

*Ecology*: Secondary or (rarely?) primary forest, 10—1000 m, never along the coast.

*Notes*: The species was first described by Hasskarl from cultivated material in the Bogor Botanic Gardens. A specimen in the Rijksherbarium from a collection collected for Hasskarl by Teijsmann matches the description, bears the name in Hasskarl's handwriting, and has therefore been designated as a lectotype.

Hochreutiner (1904, 24) distributed material collected from a tree in the Botanic Gardens at Bogor (XV. J. B. XXXII. 2) which he considered to be the original tree of Hasskarl. That tree was felled in recent years to make place for a nursery.

There can be no doubt that *H. praeclarus* Gagn. and *H. cinnamomifolius* Chun & Tsiang are identical with the present species.

*H. gewiifolius* Hassk. is not very variable. The material from Sumbawa differs by proportionally long petioles and broader leaves.

**18. *Hibiscus campylosiphon* Turcz., Bull. Soc. Imp. Nat. Mosc. 31, 1 (1858) 193; ampl. Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 57.**

*See for the synonyms under the varieties.*

Small tree, up to c. 20 m. Twigs terete, 2—3 mm  $\varnothing$ , as the petioles and pedicels stellate-cinereous, glabrescent or occasionally stellate-tomentose. *Leaves* chartaceous to coriaceous, ovate to oblong, at base rounded or shallowly cordate, at apex gradually

acuminate, 12—20 by  $4\frac{1}{2}$ —6 cm, entire, penninerved, at base 3-nerved, beneath on midrib at base with a linear, c. 5 mm long nectary, on both surfaces sparsely stellate-hairy, glabrescent, occasionally stellate-tomentose; petiole  $1\frac{1}{2}$ —2 cm. *Stipules* widely ovate to triangular, 3—4 by 3—4 mm, acute to acuminate, sparsely or densely stellate-hairy. *Flowers* axillary, solitary. Pedicel mostly longer than the petiole,  $1\frac{1}{2}$ — $3\frac{1}{2}$  cm, somewhat accrescent, with a joint  $\pm$  in the middle, at apex thickened to a hypanthium of 8—10 mm  $\varnothing$ . *Epicalyx segments* 5—7, free, ovate, at base narrowed, often auricled, at apex acute to acuminate, 15—30 by 5—8 mm, stellate-cinereous or occasionally stellate-tomentose. *Calyx* in bud ovoid and 5-winged, coriaceous, campanulate, c.  $3\frac{1}{2}$  cm high and wide, somewhat accrescent, 5-lobed, often splitting, becoming seemingly 5-parted; segments ovate, acute, 12—15 by 7—9 mm; calyx indistinctly nerved, outside glabrous or nearly so, inside stellate-velutinous and on the bottom with a dense ring of long, soft hairs. *Corolla* c. 10 cm  $\varnothing$ , yellow with a dark purple centre, petals narrowly obovate, at apex rounded, 6—8 by  $2\frac{1}{2}$ —3 cm, outside and inside on the covering margin stellate-hairy. *Staminal column* 6—7 cm, glabrous, antheriferous for the upper half; filaments c. 4 mm; anthers c. 3 mm. *Ovary* 10-celled; style arms only  $1\frac{1}{2}$ —2 mm, gland-hairy. *Capsule* ovoid, at apex acuminate, c. 3 by 2 cm, with a thick rostrum, c. 7 mm long, glabrous or nearly so, black, 10-celled; valves woody, inside smooth and shining. *Seeds*  $\infty$ , reniform,  $2\frac{1}{2}$ —3 mm, brown, densely set with long, ferruginous, woolly hairs.

*Distribution:* Philippines, elsewhere only in cultivation. Fig. 8.

*Ecology:* Secondary forests particularly, up to c. 1500 m.

*Note:* I have followed Hochreutiner (1900) in uniting *H. vidalianus* Naves ex Vidal with *H. campylosiphon* Turcz., as they differ only in degree of density of the indumentum.

#### KEY TO THE VARIETIES

1. Herbaceous parts stellate-tomentose . . . . . a. var. **campylosiphon**  
 1. Herbaceous parts glabrous or nearly so . . . . . b. var. **glabrescens**

**a. var. campylosiphon.** — *H. campylosiphon* Turcz., Bull. Soc. Imp. Nat. Mosc. 31, 1 (1858) 193. — *Thespesia campylosiphon* (Turcz.) Rolfe, J. Linn. Soc. 21, Bot. (1884) 308; Vidal, Phan. Cuming. Philip. (1885) 97; Rev. Pl. Vasc. Filip. (1886) 63, *quoad specim. p.p.*; Baker f., J. Bot. 35 (1897) 54, *quoad synonym. p.p.* — *Bombycidendron campylosiphon* (Turcz.) Warb. ex Perk., Fragm. Fl. Philip. (1904) 110; Merr. & Rolfe, Philip. J. Sc. 3 (1908) Bot. 112; Merr., En. Philip. Fl. Pl. 3 (1923) 42. — *Bombycidendron parvifolium* Warb. ex Perk., Fragm. Fl. Philip. (1904) 110.

Types: *H. campylosiphon* Turcz.: Luzon, Bosoboso, Cuming 1063 (holotype: CW, n.v.; isotypes: BM, FI, K, L, P); *Bombycidendron parvifolium* Warb. ex Perk.: Luzon, Prov. Cagayan, Malaueg, Warburg 11765 (holotype: B †).

*Distribution:* Philippines (Luzon: Rizal and Cagayan Prov.), only 2 collections.

*Note:* Judging from the description *Bombycidendron parvifolium* Perk. is a small-leaved form of the present variety.

**b. var. glabrescens** (Warb. ex Perk.) Borss., *stat. nov.* — *Bombycidendron glabrescens* Warb. ex Perk., Fragm. Fl. Philip. (1904) 110, basionym. — *H. vidalianus* Naves [in Blanco, Fl. Filip. ed. 3, 2 (1879) t. 333, *nom. nud.*] ex Vidal, Sinops. Pl. Filip., Atlas (1883) 16, t. 16 f. C. — *Bombycidendron vidalianum* (Naves ex Vidal) Merr. & Rolfe, Philip. J. Sc. 3 (1908) Bot. 112; Merr., Sp. Blanc. (1918) 12; En. Philip. Fl. Pl. 3 (1923) 43; W. H. Brown, Usef. Pl. Philip. 2 (1950) 401. — *H. grewifolius* (non Hassk.) Fern.-Vill.,

Novis. App. (1880) 24. — *Thespesia campylosiphon* [non (Turcz.) Rolfe] Vidal, Rev. Pl. Vasc. Filip. (1886) 63, *quoad specim. p.p.*

Types: *Bombycidendron glabrescens* Warb. ex Perk.: Warburg 2045 (holotype: B †); Botanic Gardens, Bogor, n. IX.B. 14 (neotype: BO); *H. vidalianus* Naves ex Vidal: Vidal, Atlas, t. 16 f.C (holotype).

*Distribution*: Philippines, many specimens; some specimens from Sumatra and Malaya, all cultivated.

*Notes*: The epithet *glabrescens* has been chosen for the present variety on account of its distinctive character. A specimen collected from a living tree in the Botanic Gardens at Bogor, which was grown from material collected by Warburg (*sub n. 2045*) in the Philippines, seems satisfactory as a neotype; it matches the original description perfectly. The cultivated specimen obviously died before Hochreutiner published his 'Catalogus bogoriensis novus' (1904—1908), as the corresponding garden number is not mentioned in that work.

Vidal, who provided a description to the *nomen nudum* *H. vidalianus* Naves, did not record a specimen. The plate in Vidal's Atlas thus becomes the holotype, though it may be that Vidal used a specimen of *Vidal 1174* for the description.

### 3. Section *Furcaria*

DC., Prod. 1 (1824) 449; *emend.* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 101. — *Hibiscus* sect. *Sabdariffa* DC., Prod. 1 (1824) 453. — *Furcaria* Kosteletzky, Allg. Med.-Pharm. Fl. 5 (1836) 1856. — *Sabdariffa* Kosteletzky, l.c.

Lectotype: *H. surattensis* L.

*Notes*: As far as I know the choice of a lectotype for the section is still open. *H. surattensis* L. seems fit for the purpose, as this species is widely distributed, is generally known, and possesses all essential characters of the section, included prickly hairs and forked epicalyx segments. It was one of the three species listed by Kosteletzky under his genus *Furcaria*, and the first one listed by De Candolle under the section.

The prickliness in this section is caused by stout simple hairs, usually placed on a knob; in some cases (cf. in *H. diversifolius* Jacq.) the hairs are thickened into real prickles such as in roses.

The peculiar nervation of the calyx occurs in most species of the genus, but it is usually invisible or hardly visible. In the present section it is very striking as a result of the size of the calyx and the strong prominence of the nerves.

**19. *Hibiscus surattensis*** Linné, Sp. Pl. (1753) 696; in Stickman, Herb. Amb. (1754) 15; Syst. Nat. ed. 10, 2 (1759) 1145; Amoen. Acad. 4 (1759) 126; Cav., Diss. 3 (1787) 149, t. 53 f. 1; Sims, in Curtis, Bot. Mag. 33 (1811) t. 1356; DC., Prod. 1 (1824) 449; Blume, Bijdr. 2 (1825) 68; Rchb., Ic. Bot. Exot. 1 (1827) 141; Roxb., Fl. Ind. ed. Carey 3 (1832) 206; W. & A., Prod. (1834) 48; Span., Linnaea 15 (1841) 169; Mor., Syst. Verz. (1846) 29; Miq., Pl. Jungh. (1854) 283; Fl. Ind. Bat. 1, 2 (1858) 161; Thw., En. Pl. Zeyl. (1858) 26; Mast., in Fl. Br. Ind. 1 (1875) 334; Fern.-Vill., Novis. App. (1880) 24; Hemsl., Rep. Voy. Chall. (Bot.) 1, 3 (1885) 124; Forbes, Natur. Wand. (1885) 354; Britten, in Forbes, l.c. App. 6, 500; Vidal, Phan. Cuming. Philip. (1885) 97; Rev. Pl. Vasc. Filip. (1886) 63; O. K., Rev. Gen. Pl. 1 (1891) 69; Anon., Gard. Chron. III, 9 (1891) 529, f. 105; King, J. As. Soc. Beng. n.s. 60, ii (1891) 45; Trimen, Handb. Fl. Ceyl. 1 (1893) 152; Koord., Med. Lands Plantent. 19 (1898) 359; Perk., Fragm. Fl. Philip. (1904) 110; Merr., Philip. J. Sc. 1 (1906) Suppl. 92; Gagn., in Fl. Gén. I.-C. 1 (1910) 423;

Backer, Schoolfl. Java (1911) 123; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 6; Ridley, J. Str. Br. R. As. Soc. 59 (1911) 77; Koord., Exk. Fl. Java 2 (1912) 584; Hall, f., Med. Rijksherb. 12 (1912) 13; Koord.-Schum., Syst. Verz. 3 (1914) 81; Ridley, J. Fed. Mal. St. Mus. 8, 4 (1917) 55; Merr., Int. Rumph. Herb. Amb. (1917) 359; Sp. Blanc. (1918) 254; Philip. J. Sc. 15 (1919) 246; J. Str. Br. R. As. Soc. special no. (1921) 375; Ridley, Fl. Mal. Pen. 1 (1922) 258; Merr., En. Philip. Fl. Pl. 3 (1923) 38; Baker f., J. Bot. 62, Suppl. (1924) 11; Craib, Fl. Siam. En. 1 (1925) 159; Bartlett, Pap. Mich. Ac. Sc. 6 (1926) 30; Heyne, Nutt. Pl. (1927) 1035; Backer, Onkruidfl. Jav. Suikerr. (1930) 443, atlas t. 418; Merr., Contr. Arn. Arb. 8 (1934) 102; Burk., Dict. Ec. Prod. Mal. Pen. 1 (1935) 1171; Doct. van Leeuwen, Blumea 2 (1937) 273; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 21; W. H. Brown, Usef. Pl. Philip. 2 (1950) 418, f. 200; Hochr., in Fl. Madag. fam. 129 (1955) 35, t. 10 f. 1-3; Hu, Fl. China, fam. 153 (1955) 56, t. 22 f. 2; Backer & Bakh. f., Fl. Java 1 (1963) 431. — *H. bifurcatus* Blanco, Fl. Filip. (1837) 545; ed. 2 (1845) 380; ed. 3, 2 (1879) 334, t. 347, non Cav. 1787. — *H. convolvulaceus* Hassk., Abh. Naturf. Ges. Halle 9 (1866) 74. — *H. surattensis* var. *genuinus* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 111. — *H. surattensis* var. *villosus* (non Hochr.) Backer, Fl. Bat. 1 (1907) 128. — *H. surattensis* var. *villosus* f. *bicolor* Backer, l.c. 129. — *H. surattensis* var. *villosus* f. *concolor* Backer, l.c. — *Narinam poullii* Rheede, Hort. Malab. 6, p. 75, t. 44. — *Herba crinalium domestica* Rumph., Herb. Amb. 4, p. 40, t. 16. — *Herba crinalium silvestris* Rumph., l.c. 41.

Types: *H. surattensis* L.: India, Surat, *Herb. Linn. n. 875.29* (holotype: LINN); *H. convolvulaceus* Hassk.: Rumphius, Herb. Amb. 4, t. 16 (holotype); *H. bifurcatus* Blanco: Luzon, Angat, Merrill, *Sp. Blanc. 670* (neotype: GH; isotypes: BM, BO, L, P, US); *H. surattensis* f. *concolor* Backer: Java, Tandjungpriok, Backer 32783 (isotypes: BO).

Herb or undershrub, initially erect, finally trailing on the ground or scrambling on shrubs, often rooting at the nodes,  $\frac{1}{2}$ –2 m. Stems slender, with relatively long internodes, as the petioles and pedicels densely provided with recurved prickles, whether or not clothed with soft, reflexed, simple hairs, often tinged red. *Leaves* orbicular to transversally elliptic in outline, at base shallowly cordate or truncate,  $4\frac{1}{2}$ –10 by 5–14 $\frac{1}{2}$  cm, lower ones 3–5-palmilobed, upper ones 5-palmiparted with linear to lanceolate, acute, coarsely serrate to dentate segments, at base 5–7-nerved, without nectaries, prickly on the nerves beneath, on both surfaces with thin, simple and stellate hairs or glabrous; petiole 4–11 cm. *Stipules* broad, leafy, ovate, at base auricled, at apex acute, often more or less falcate, 10–15 by 3–5 mm, serrate to dentate, pubescent or glabrous. *Flowers* axillary, solitary, often joined by an axillary shoot with leaves and occasionally with flowers. Pedicel 5–8 cm, somewhat accrescent, with a joint near the apex, there often geniculate, above the joint densely covered with stiff, retrorse, tuberculate simple hairs. *Epicalyx segments* 9–12, spreading, spatulate, 18–25 by 2 $\frac{1}{2}$ –3 mm, near apex with a filiform to linear, 5–10 mm long, erect appendage, with scattered, tuberculate, stiff, simple hairs, ciliate by thin, simple hairs. *Calyx* chartaceous, campanulate, rigid, 18–25 mm high, accrescent up to 30 mm high, 5-fid to 5-parted; segments ovate, acuminate, 10–15 by 5–8 mm; calyx outside hispid by stout, bulbous-based, simple hairs, also with some thin, simple hairs, inside glabrous or nearly so. *Corolla* yellow and mostly with a dark purple centre; petals obovate, 3–5 $\frac{1}{2}$  by 1 $\frac{1}{2}$ –5 cm, at apex rounded, outside on the covering margin stellate-pubescent. *Staminal column* much shorter than the petals, c. 1 $\frac{1}{2}$  mm, gland-hairy, antheriferous throughout; filaments 1 $\frac{1}{2}$ –2 $\frac{1}{2}$  mm; anthers c. 1 mm; pollen yellow. *Ovary* conical, 3–4 mm high, densely hairy; style arms 2–2 $\frac{1}{2}$  mm; stigmas discoid, hairy. *Capsule* ovoid to globose, acute, 12–15 by 10–12 mm, outside densely appressed-

hispid by stiff, simple hairs, inside smooth, glabrous. *Seeds* ∞, reniform, 3—3½ mm, stellate-hairy, glabrescent, black-brown.

*Distribution*: Widespread in the tropics of the Old World; common throughout Malesia except for New Guinea where the species has never been collected.

*Ecology*: Common in young secondary growths and in teak-forests, occasionally in waste places near houses and villages, from the lowland up to c. 1200 m. The flowers are only open during the morning.

*Notes*: Under the protologue of *H. surattensis* Linnaeus did not make mention of literature; he only stated India as country of origin. In the Linnean herbarium there is a sheet (n. 875.29) with the species epithet and the locality 'Surat' (after which the species was named), both in the handwriting of Linnaeus. This is obviously the holotype. The specimen consists of a twig with a flower and a young fruit. The stipules are ovate to lanceolate, resembling those of *H. furcatus* Roxb. The last mentioned species, however, differs by linear epicalyx segments instead of spatulate ones, and by less incised leaf-blades. As a rule the stipules of *H. surattensis* gradually narrow apically of the stems. Linnaeus had obviously an apical part of *H. surattensis*, the epicalyx segments proving its identity.

*H. convolvulaceus* Hassk. was based on *Herba crinalium silvestris* of Rumphius. Merrill (1917) considered this to be a form of *H. surattensis* L. with narrowly lobed leaves.

In Java *H. surattensis* L. is represented by specimens with villous stems and by forms which are glabrous or nearly so. Specimens belonging to the first form were erroneously named var. *villosus* Hochr. by Backer (1907). That variety, however, is a compact form with an extremely dense, villous indumentum, and has been found only on mountains in tropical Africa [type: Nyassaland, *Whyte s.n.* (K)].

The corolla of the species normally possesses a dark purple centre, but Backer found at Djakarta specimens with evenly yellow ones (f. *concolor* Backer).

**20. *Hibiscus acetosella*** Welwitsch ex Hiern, Cat. Afr. Pl. Welw. 1 (1896) 73; Exell, Fl. Zamb. 1 (1961) 438. — *H. eetveldianus* De Wildem. & Durand, C. R. Soc. Bot. Belg. 38, 2 (1899) 24; Hochr., Ann. Cons. Jard. Bot. Genève 6 (1902) 49; Ochse & Bakh., Ind. Groenten (1931) 472, f. 295; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 22; Backer & Bakh. f., Fl. Java 1 (1963) 431; Bates, Baileya 13 (1965) 80, f. 23B.

Types: *H. acetosella* Hiern: Angola, Cuanza Norte, *Welwitsch s.n.* (holotype: BM, n.v.); *H. eetveldianus* De Wildem. & Durand: Congo, Monbanga, *Dewèvre s.n.* (holotype: BR).

Annual or perennial herb or undershrub, ¼—2½ m, unarmed, little-branched, usually red. Stems glabrous. *Leaves* in outline orbicular to ovate, 2—8 by 2—8 cm, at base truncate or shallowly cordate; lower ones 3—5-parted to 3—5-lobed, with obtuse segments; upper ones entire; leaves coarsely crenate, slightly fleshy, at base 5—7-nerved, beneath on midrib somewhat above base with a linear nectary, glabrous; petiole ½—11 cm, glabrous or nearly so, often red. *Stipules* linear, up to 15 mm. *Flowers* axillary, solitary. Pedicel 5—7 mm, accrescent to 10 mm, articulate ± halfway, glabrous. *Epicalyx segments* 8—10, spreading, narrowly spatulate, acute, 1—2 cm, somewhat accrescent, at base of broadened part with an erect, linear, 3—4 mm long appendage, with simple stiff bulbous-based hairs in particular along margin. *Calyx* campanulate, 1½—2 cm high, after flowering closely enveloping the capsule, accrescent to 2½ cm, 5-fid; segments ovate to lanceolate, acuminate, c. 7 by 3 mm, rigid; calyx on the costae outside with an oblong nectary ± halfway, on the nerves with some bulbous-based stiff hairs, for the rest glabrous or nearly so. *Corolla* 3—7 cm ø, wine-red, rarely yellow, always with a dark purple centre; petals obliquely obovate, at apex rounded, 2—4 by 1½—3½ cm,

glabrous but inside near base with scattered glandular hairs. *Staminal column* 1—2 cm, antheriferous throughout; filaments and anthers *c.* 1 mm; style arms short, 3—5 mm; stigma discoid, dark red, long-hairy. *Capsule* ovoid, acuminate and beaked, 9—25 by 10—15 mm, thinly covered with simple, stiff hairs, verruculose. *Seeds* ∞, reniform to globose, 2½—3 mm  $\varnothing$ , verruculose, glabrous or nearly so, dark brown.

*Distribution*: Tropical Africa, in Africa and Malasia cultivated and run wild.

*Notes*: I have not seen the type of *H. acetosella*, but Mr Exell and others assured me that it is conspecific with the type of *H. eetveldianus*.

It seems doubtful whether *H. acetosella* is in origin a wild species, since the armature of prickles and bristly hairs, which is so common in sect. *Furcaria*, is completely lacking here. *H. acetosella* could well represent a cultigen originated by domestication through selection from some wild species, similarly to the cultivated forms of *Abelmoschus manihot* (L.) Medicus, *A. esculentus* (L.) Moench, and *H. sabbariffa* L.

**21. *Hibiscus radiatus* Cav.**, Diss. 3 (1787) 150, t. 54 f. 2; Jacq., Pl. Rar. Hort. Schoenbrunn. 4 (1804) 32, t. 463; Sims, in Curtis, Bot. Mag. 44 (1817) t. 1911; DC., Prod. 1 (1824) 449; Roxb., Fl. Ind. ed. Carey 3 (1832) 209; W. & A., Prod. (1834) 48; Miq., Pl. Jungh. (1854) 283; Fl. Ind. Bat. 1, 2 (1858) 160; Kurz, J. As. Soc. Beng. n.s. 43, ii (1874) 109; Mast., in Fl. Br. Ind. 1 (1875) 335; Fern.-Vill., Novis. App. (1880) 24; Gagn., in Fl. Gén. I.-C. 1 (1910) 424; Backer, Schoolfl. Java (1911) 123; Koord., Exk. Fl. Java 2 (1912) 584; Craib, Fl. Siam. En. 1 (1925) 159; Heyne, Nutt. Pl. (1927) 1032; Burk., Dict. Ec. Prod. Mal. Pen. 1 (1935) 1168; Ridley, Kew Bull. (1938) 221; Backer, Bekn. Fl. Java (em. ed.) 4c (1943) fam. 109, p. 21; Backer & Bakh. f., Fl. Java 1 (1963) 431; Bates, Bailey 13 (1965) 81, f. 19, 23C. — *H. unidens* Lindl., Bot. Reg. 9 (1823) t. 878; Hassk., Cat. Hort. Bog. (1844) 197. — *H. cannabinus* var. *unidens* (Lindl.) Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 115; Backer, Fl. Bat. 1 (1907) 129. — *H. lindleyi* Wall., Pl. As. Rar. 1 (1830) 4, t. 4; Lindl., Bot. Reg. 14 (1831) t. 1395. — *H. radiatus* var. *lindleyi* (Wall.) Kurz, J. As. Soc. Beng. n.s. 43, ii (1874) 110. — *H. furcatus* (non Roxb.) Mor., Syst. Verz. (1846) 29; Miq., Fl. Ind. Bat. 1, 2 (1858) 161, *quoad specim.* Zollinger 1248. — *H. cannabinus* (non L.) Merr., Philip. J. Sc. 3 (1908) Bot. 244; En. Philip. Fl. Pl. 3 (1923) 37.

*Types*: *H. radiatus* Cav.: Paris, cultivated from seeds collected by Banks, *Cavanilles s.n.* (holotype: P-JU 12373; isotype?: MA); *H. unidens* Lindl.: Bot. Reg. 9, t. 878 (holotype); *H. lindleyi* Wall.: Burma, Segaing on Mt Taung Dong, *Wallich n. 1895-1* (lectotype: K-W).

Erect or decumbent herb or undershrub, up to 1 m. Stems whether or not armed by bulbous-based, retrorse prickles, apically with a strip of short simple hairs below each leaf, glabrescent, tinged red. Lower leaves broadly ovate to oblong, at base cuneate, at apex acute, entire; upper leaves orbicular in outline, deeply 3—5-parted, at base cuneate, rounded or shallowly cordate, with ovate, oblong, obovate, lanceolate or linear, acute to acuminate segments; leaves 2—12 by 1½—12 cm, coarsely and sharply serrate, at base 3—5-nerved, without nectaries, glabrous or nearly so, often tinged red; petiole 2—11 cm, sparingly aculeate or unarmed, with a strip of short hairs above. *Stipules* linear to lanceolate, 5—9 mm, bristly. *Flowers* solitary, axillary. Pedicel *c.* 5 mm, articulated, pubescent below the joint, bristly above it,  $\pm$  accrescent, thickened. *Epicalyx segments* 10, free, spreading, linear, acute, 15—20 by 1½—2 mm,  $\pm$  accrescent, ciliate by bulbous-based bristles, at 1/3 from apex, on upper surface with a linear to ovate, acute, 4—8 mm long, ciliate appendage. *Calyx* stellate to campanulate, *c.* 20 mm high and 15 mm  $\varnothing$ , accrescent, up to 25 mm high, finally urceolate and becoming stiff and



hard, 5-parted; segments long triangular, long acuminate, *c.* 12 by 4–6 mm; calyx outside bristly, particularly on the prominent nerves, inside glabrous or nearly so. *Corolla* large, *c.* 8 cm across, yellow with a dark purple centre, but mostly wine-red with a darker centre; petals obovate, rounded at apex, *c.* 7 cm long, glabrous or nearly so. *Staminal column* 1–2 cm, antheriferous throughout; filaments 1–2 mm; anthers *c.* 1 mm, dark purple with ochraceous pollen. *Ovary* globose, *c.* 4 mm across, hirsute; style arms purple, stigmas capitellate, dark purple. *Capsule* globose to ovoid, with a short beak, *c.* 15 mm  $\varnothing$ , densely set by appressed, long, simple bristles. *Seeds* *c.* 4 per cell, trigonous, *c.* 4 mm  $\varnothing$ , brown, scabrous.

*Distribution:* South and Southeast Asia; in Malesia cultivated as a vegetable or drug, and running wild.

*Ecology:* On waste grounds near villages and houses.

*Notes:* Cavanilles described *H. radiatus* Cav. from a specimen which he cultivated from a seed received from Sir Joseph Banks. In the herbarium of De Jussieu at Paris there is a specimen with a label marked 'H. radiatus Cav. Issy 1786 ♀'. At Issy, a suburb of Paris, Cavanilles used to cultivate various plants in a private garden (cf. An. Jard. Bot. Madrid 6, 1945, 17). The said specimen is here accepted to be the holotype. At Madrid, in the so-called Herbarium Cavanilles, there is a similar specimen without any label; this may be an isotype. It is remarkable that the appendage usually occurring on the epicalyx segments lacks in the type material, nor does Cavanilles mention it in his description.

Unless an authentic specimen is traced the plate of Lindley in his Botanical Register is the type of *H. unidens* Lindl.

As localities of *H. lindleyi* Wall., Wallich mentioned: 'Habitat in regno Burmanico versus Segain, et in monte Avae Taong Dong dicta, florens et frugifer Novembri. Ad Tavoy orae Tenasserim legit plantarum meus collector Gerl. Gomez'. These localities are represented by *n.* 1895-1 and 2 respectively in the Wallich Herbarium preserved at Kew. The first mentioned sheet (from Segain and Mt Avae Taong) seems suitable to serve as a lectotype.

*H. radiatus* from the Australian Floras is not conspecific and is referred to *H. meraukensis* Hochr.

According to Hochreutiner (1900, 115) *H. radiatus* is a form of the polymorphous *H. cannabinus* L. He says: 'Innombrables sont les formes et plus nombreux encore les intermédiaires entre elles . . .'. I have, however, not encountered any clearly intermediate specimen.

**22. *Hibiscus meraukensis* Hochr.**, Ann. Cons. Jard. Bot. Genève 11–12 (1908) 8; Nova Guinea 14 (1924) 163. — *H. radiatus* (non Cav.) F. v. M., Fragm. Phyt. Austr. 2 (1861) 117; Benth., Fl. Austr. 1 (1863) 212; F. v. M., Fragm. Phyt. Austr. 6 (1868) 169; Descr. Not. Pap. Pl. 8 (1886) 41; Bailey, Queensl. Fl. 1 (1899) 126; Domin. Bibl. Bot. 22 (1928) 957; Specht, Rec. Am.-Austr. Sc. Exp. Arnhem Land 3 (1958) 258. — **Fig. 9.**

Type: New Guinea, Merauke, *Koch 13 = 421* (lectotype: BO; isotypes: G, L).

Herb or undershrub,  $\frac{1}{2}$ –2 m. Stems, petioles and pedicels minutely aculeate by somewhat recurved or retrorse, tuberculate prickles; stems stellate-hairy in a line decurrent from the petiolar bases. *Leaves*  $\pm$  coriaceous, inferior leaves ovate, at base cordate, at apex acute to acuminate, 2–7 by 1 $\frac{1}{2}$ –5 $\frac{1}{2}$  cm; middle leaves orbicular in outline, at base cordate, 5–12 cm, deeply 3-lobed to 3-parted, with broadly ovate, triangular, spathulate or lanceolate to linear, acute to acuminate segments, with rounded to acute sinuses; superior leaves oblong or lanceolate to linear, at base and apex acute, 4–7 $\frac{1}{2}$  by

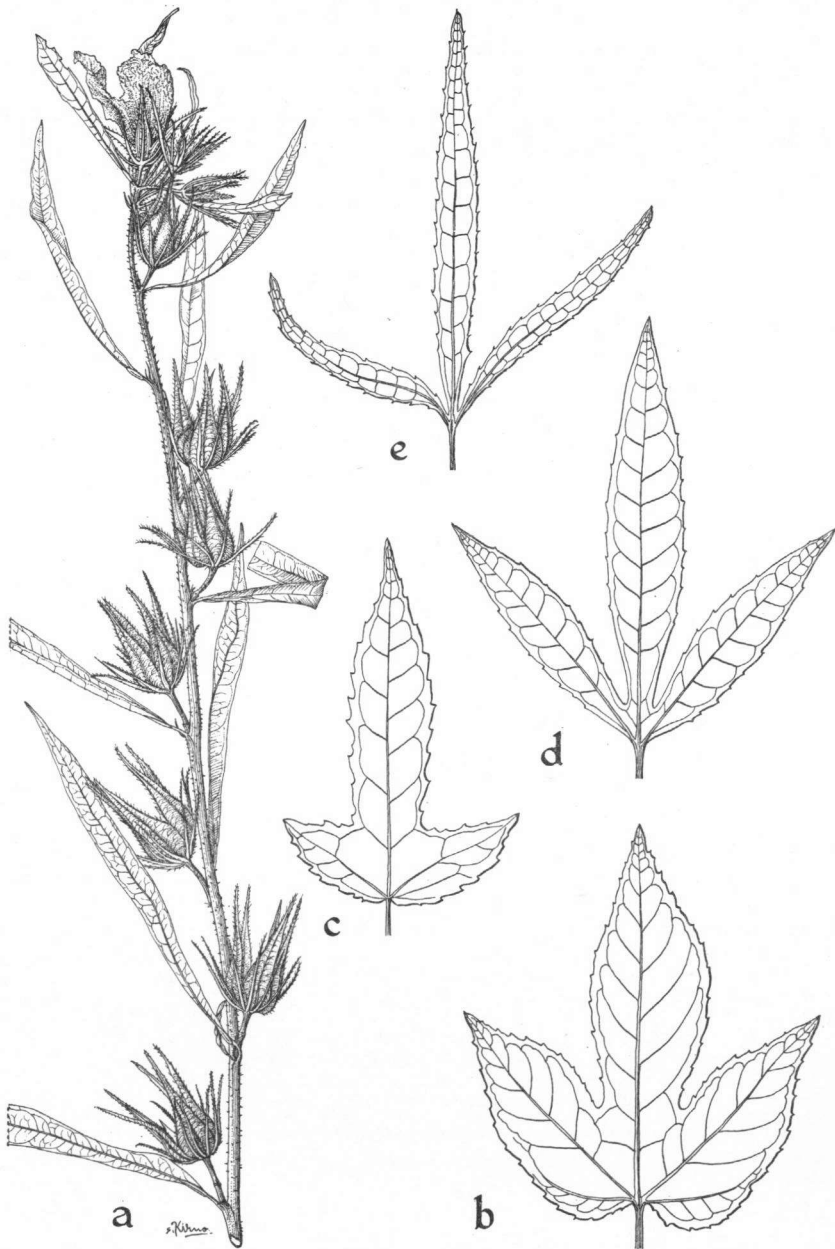


Fig. 9. *Hibiscus meraukensis* Hochr. a. Habit of fruiting twig apex with narrowest leaves,  $\times \frac{1}{2}$ . — Various leaf-shapes in the sequence in which they may occur from base to apex of shrub, b. d. e.  $\times \frac{1}{2}$ , c. nat. size (a, d. Brass 6507, b-c. Koch L 908.136-527, e. Zepelius L 908.135-543).

$\frac{1}{4}$ —2 cm; inferior and middle leaves remotely serrate to dentate, superior leaves entire; blade at base 3-nerved; midrib beneath at base usually with a nectary; both surfaces on the nerves and veins with scattered, short bristles; petiole  $\frac{1}{2}$ — $5\frac{1}{2}$  cm, stellate-hairy. *Stipules* filiform, 5—6 mm, glabrous or with some stellate or simple bristles. *Flowers* axillary, solitary. Pedicel  $\frac{1}{2}$ —1 cm, accrescent to c.  $2\frac{1}{2}$  cm, jointed in the middle, at apex stellate-hairy. *Epicalyx segments* 10, free, spreading, rigid, linear, acute, 16—19 by  $\frac{3}{4}$ —1 mm, somewhat accrescent, simply bristly to aculate. *Calyx* in anthesis shorter than the epicalyx, widely campanulate, 12—16 mm high, accrescent to c. 25 mm, 5-parted; segments long triangular, acute to acuminate, 4—6 by 3 mm; calyx outside simply and tuberculate-bristly, particularly on the nerves, inside glabrous or nearly so. *Corolla* large, white, usually with purple centre; petals obovate, at apex rounded, up to  $4\frac{1}{2}$  by 3 cm, glabrous or nearly so. *Staminal column* c. 12 mm, at apex antheriferous: styles 5-armed; stigmas capitate. *Capsule* globose, 8—12 mm  $\varnothing$ , with a 2—3 mm long beak, glabrous, inside smooth. *Seeds* 4—5 per cell, rather big,  $\pm$  trigonous, 3—4 mm  $\varnothing$ , warty, lepidote, brown-black.

*Distribution*: Northern Australia, Torres Strait Islands (Lewis and Thursday Is.), South New Guinea (Merauke; Mabaduan), and South Moluccas (Aru Is.: Trangan I.). Fig. 8.

*Ecology*: From the distribution follows that the species is adapted to savannoid lowland vegetation in areas subject to a strong dry season.

*Notes*: The Bogor specimen of *Koch 421* has been designated as the lectotype, since it fits the description best. At Leyden there are several duplicates, some of which are provided only with a fieldnumber, viz. 13.

*H. radiatus* as listed in the works on the Australian flora belongs to the present species [authentic specimen of F. von Mueller: Victoria R., *F. von Mueller s.n.* (MEL)]. The Australian specimens I saw are characterized by somewhat shorter epicalyx segments, and thicker, *in vivo* presumably fleshier leaves.

A striking character of this species is the great diversity of leaf shape on one plant.

**23. *Hibiscus cannabinus*** Linné, Syst. Nat. ed. 10, 2 (1759) 1149; Cav., Diss. 3 (1787) 148, t. 52 f. 1; Roxb., Pl. Corom. 2 (1805) 48, t. 190; DC., Prod. 1 (1824) 450; Mast., in Fl. Br. Ind. 1 (1875) 339; Dekker, in Van Gorkum, Oost-Ind. Cult. 3 (1913) 494, f. 122; Gagn., in Fl. Gén. I.-C. 1 (1910) 425; Backer, Schoolfl. Java (1911) 122; Koord., Exk. Fl. Java 2 (1912) 585; Heyne, Nutt. Pl. (1927) 1028; Backer, Bekn. Fl. Java (cm. ed.) 4C (1943) fam. 109, p. 22; Steen., Fl. Schol. Indon. (1949) 269; Hochr., in Fl. Madag. fam. 129 (1955) 36, t. 10 f. 4, 5; Hu, Fl. China, fam. 153 (1955) 58, t. 21 f. 4; Backer & Bakh. f., Fl. Java 1 (1963) 431; Bates, Bailey 13 (1965) 83, f. 23D. — *H. sabdariffa* var.  $\delta$  Linné, Sp. Pl. (1753) 695. — *H. cannabinus* var. *genuinus* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 115.

*Distribution*: According to Floras (e.g. Exell, Fl. Zamb. 1, 1961, 442) it is widely spread in tropical and subtropical regions. In Malesia, however, it has never been found in a wild state. It is said to be of African origin and is cultivated as a fibre-producer in Africa and India. In Java it has been tried as such ("*Java juté*") but not with satisfactory results (cf. Heyne, 1927, 1028 and Van Hall & Van de Koppel, Landb. Ind. Arch. 3, 1950, 181—182).

*Notes*: In Species Plantarum (first edition, p. 695) Linnaeus treated it as a variety ( $\delta$ ) of *H. sabdariffa* L., based on plates of Commelin and Ehret. In 1759 he raised this variety to specific rank, adding a detailed description. In the Linnean herbarium there is a sheet (n. 875.27) bearing the epitheton 'sabdariffa' and '11' (the species number of *H. sabdariffa* L. in Species Plantarum) in the handwriting of Linnaeus, and the inscription 'cannabina'

apparently by J. E. Smith. The specimen, according to the annotation 'HU' from the Upsala Gardens, no doubt belongs to *H. cannabinus* L., and may correspond with the protologue of that species. In view of the poor condition (the only flower has been damaged severely by insects), however, it is less suitable for typification. The plate of Commelin could be designated as the type instead.

*H. cannabinus* as listed by Merrill (En. Philip. Fl. Pl. 3, 1923, 37) has to be referred to *H. radiatus* Cav., since the specimens quoted belong to that species. Presumably Merrill followed Hochreutiner (1900), who united *H. radiatus* Cav. with *H. cannabinus* L. as *H. cannabinus* var. *unidens* (Lindl.) Hochr.

Howard & Howard (Mem. Dep. Agr. India 4, 2, 1911, 9—36) described a number of varieties (cultivars) grown in India, distinguished by the shape of the leaves and the colour-pattern of the green parts (anthocyan). Some of those cultivars have been tried in the gardens of the Agricultural Experiment Station at Bogor, Java (specimens in BO and L).

*H. cannabinus* L. can easily be distinguished from the related species *H. sabdariffa* L. and *H. radiatus* Cav. by the white, arachnoid tomentum on the calyx.

**24. *Hibiscus sabdariffa* Linné, Sp. Pl. (1753) 695; Cav., Diss. 3 (1787) 170; DC., Prod. 1 (1824) 453; Blume, Bijdr. 2 (1825) 72; Drapiez, Herb. Amat. Fl. 5 (1831) t. 373; ? Decne, Herb. Timor. (1835) 105; Mast., in Fl. Br. Ind. 1 (1875) 340; Miq., Pl. Jungh. (1854) 280; Fl. Ind. Bat. 1, 2 (1858) 158; Suppl. (1860) 163; Gürke, in Fl. Bras. 12, 3 (1891) 556; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 116; Backer, Fl. Bat. 1 (1907) 130; Schoolfl. Java (1911) 122; Koord., Exk. Fl. Java 2 (1912) 585; Merr., Fl. Manila (1912) 322; En. Philip. Fl. Pl. 2 (1923) 38; Heyne, Nutt. Pl. (1927) 1033; Ochse & Bakh., Ind. Groenten (1931) 474, f. 296; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 22; Gagn., in Suppl. Fl. Gén. I.-C. 1 (1945) 377; Steen., Fl. Schol. Indon. (1949) 269; Hochr., in Fl. Madag. fam. 129 (1955) 35, t. 11 f. 3; Hu, Fl. China, fam. 153 (1955) 58, t. 21 f. 6; Backer & Bakh. f., Fl. Java 1 (1963) 431; Bates, Baileya 13 (1965) 84, f. 23E. — *H. digitatus* Cav., Diss. 3 (1787) 151, t. 70 f. 2; ? Span., Linnaea 15 (1841) 170.**

*Distribution:* Cultivated in all tropical regions, mostly as a vegetable, but also as a fibre-producer. The original area, if any, of the species is unknown.

*Notes:* In the protologue of *H. sabdariffa* Linnaeus used a new phrase. Hence, a specimen of Linnaeus' own herbarium should be selected as the type. The only sheet (*n.* 875.27) bearing the epithet *sabdariffa* in the handwriting of Linnaeus, however, belongs to *H. cannabinus* L. As pointed out on p. 63 the last-mentioned species was initially treated by Linnaeus as a variety ( $\delta$ ) of *H. sabdariffa* L.

The next element mentioned in the protologue is an entry from the Hortus Cliffortianus. There is a specimen in the Herbarium Clifford (BM), which consists of a branch with some leaves and a separate flower. The stem is non-aculeate, which is in agreement with the corresponding entry: '*Hibiscus inermis*, . . .', but not with the heading phrase: '*. . . caule aculeato*'. The entry of the Hortus Cliffortianus is repeated in the Flora Zeylanica and in Van Royen's Florae Leydensis Prodromus. I have found no corresponding specimens. The other elements (under var.  $\alpha$ ) are entries of Rajus and Plukenet of which I have not seen the specimens. The remaining part of the protologue deals with the varieties  $\beta$ ,  $\gamma$ , and  $\delta$ . Var.  $\delta$  as stated above was subsequently raised to a species, *H. cannabinus* L. All considered, it is believed that the typification of the present species requires a special study which, however, falls beyond the scope of the present work. The concept of the species followed here is the usual one.

Spanoghe (1841) recorded *H. digitatus* Cav. with a question-mark from Timor, Kupang. I have not seen any corresponding Spanoghe specimens to check their identification. *H. digitatus* Cav. is known to be a form of *H. sabdariffa* L.

The specimens from Malesia all belong to the cultivar grown as a vegetable, which is characterized by a much-branched stem (up to 2 m), a very fleshy calyx ('jam roselle'), absence of hairs and prickles, and much anthocyan in the green parts. Another form is the 'fibre roselle' (cv. 'Altissima' Wester), which has successfully been tried in Java on a large scale as an estate crop for fibre. It differs by much higher (up to 4½ m), usually unbranched stems, mostly with little anthocyan, a less fleshy calyx, and by the frequent occurrence of hairs and prickles.

For the polymorphism of the species I refer to the papers by Howard & Howard (Mem. Dep. Agr. India 4, 2, 1911, 9—36 and 3, 1924, 47—85) and Wester (Philip. Agr. Rev. 7, 1914, 266—269).

**25. *Hibiscus diversifolius* Jacq.**, Coll. Bot. 2 (1789) 307; Ic. Pl. Rar. 3 (1792) t. 551; Edwards, Bot. Reg. 5 (1819) t. 381; Blume, Cat. (1823) 88; DC., Prod. 1 (1824) 449; Roxb., Fl. Ind. ed. Carey 3 (1832) 208; Benth., Fl. Austr. 1 (1863) 213; Mast., in Fl. Br. Ind. 1 (1875) 339; Gürke, in Fl. Bras. 12, 3 (1892) 555; Bailey, Queensl. Fl. 1 (1899) 127; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 119; Backer, Schoolfl. Java (1911) 122; Guillaumin, J. Arn. Arb. 12 (1931) 228; Hochr., in Fl. Madag. fam. 129 (1955) 38, t. 10 f. 6—10, t. 11 f. 1—2; Exell, Fl. Zamb. 1 (1961) 443; Bates, Baileya 13 (1965) 86, f. 23F. — *H. paludosus* Merr., Philip. J. Sc. 3 (1908) Bot. 151; En. Philip. Fl. Pl. 3 (1923) 38. — *H. ficulneus* (non L.) Cav., Diss. 3 (1787) 148, t. 51 f. 2; DC., Prod. 1 (1824) 448, excl. synonym. *H. sinuatus* Cav., quoad descr. et specim.

Types: *H. diversifolius* Jacq.: Jacquin, Ic. Pl. Rar. 3, t. 551 (holotype); *H. paludosus* Merr.: Mindanao, Lake Lanao, M. & S. Clemens s.n. (isotypes: BO, G, L).

Herb or undershrub, 1½—2 m. Stems more or less densely aculeate by conical prickles, velutinous to tomentose by minute stellate hairs. *Leaves* orbicular to ovate, occasionally deltoid, undivided or shallowly 3—5-lobed (in Malesia), at base cordate to rounded, at apex obtuse, acute or acuminate, 2—11 by 2—9 cm; upper leaves lanceolate to linear, at base and apex acute, 1½—3 by ¼—1 cm; margin dentate to serrate, or entire; base 3—7-nerved; midrib beneath at base usually with a nectary; both surfaces velutinous to tomentose by minute stellate hairs, glabrescent, on nerves with prickles and simple bristles; petiole 1—11 cm, stellate-tomentose or pubescent, usually prickly. *Stipules* filiform, 3—9 mm, with stellate hairs and simple bristles. *Flowers* axillary, solitary, by the smallness or abortion of the upper leaves in racemes, nearly sessile. Pedicel 2—5 mm, ± accrescent, stellate-hairy and bristly. *Epicalyx segments* 7—10, appressed to patent, linear, acute, 8—15 by ½—1 mm, ± accrescent, stellate-hairy and bristly. *Calyx* campanulate, 10—15 cm high, 10—12 cm ø, after anthesis up to 20 mm high and urceolate, 5-lobed to -fid; segments narrow triangular, 5—7 by 3—5 mm, acuminate; calyx usually with an elliptic nectary on each costa, outside stellate-hairy and with mostly bulbous-based bristles, in particular on the nerves, inside velutinous by minute stellate hairs on the segments. *Petals* obovate, rounded at apex, 4—5 by 2½—4 cm, outside stellate-hairy, purple. *Staminal column* 1½—3 cm, glabrous, antheriferous throughout; filaments c. 1½ mm; anthers c. 1 mm ø. *Capsule* ovoid, 1½—2 by c. 1½ cm, acute, densely set with appressed, yellow bristles. *Seeds* ± trigonous, 3—3½ mm ø, dark brown, glabrous.

*Distribution*: Tropics of the Old World, including the Pacific Islands and Australia, in Malesia in the Philippines (Mindanao: Lake Lanao) and West New Guinea (Sentani and Wissel Lakes area); 3 collections.

*Ecology*: Riverbanks and lake-shores at low altitude, one of the few Malvaceous plants which prefer moist environments.

*Notes*: The plate of Jacquin is treated here as the holotype of the species, since a good authentic specimen has not yet been traced.

*H. ficulneus* as pictured and described by Cavanilles, followed by De Candolle, is conspecific with *H. diversifolius* Jacq. Specimens more or less corresponding with the data given by Cavanilles are preserved at Paris (P-LA and P-JU n. 12377).

The species is highly variable with respect to the density of the indumentum and armature, and the degree of incision of the leaves. The last-mentioned character even varies in one specimen. *H. paludosus* Merr. represents a form with a densely tomentose indumentum, fairly numerous prickles and shallowly incised leaves. The Papuan specimen *Eyma* 4948 differs by a sparse indumentum, whereas that of *Brass* 8876 has a velutinous indumentum, hardly any prickles, and a calyx without bristles.

**26. *Hibiscus divaricatus*** R. Graham, Edinb. New Phil. J. (1830) 367; Benth., Fl. Austr. 1 (1863) 212; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 121; Backer, Schoolfl. Java (1911) 123. — *Abelmoschus divaricatus* (R. Graham) Walp., Rep. Bot. Syst. 1 (1842) 309.

*Distribution*: Australia.

*Note*: According to Hochreutiner (1900) the species occurs in Australia, which is correct, and also in Java, which he based on *Zollinger* 2988. That number was actually collected in the Botanic Gardens of Bogor.

**27. *Hibiscus heterophyllus*** Vent., Jard. Malm. 2 (1804) t. 103; Blume, Bijdr. 2 (1825) 69; Benth., Fl. Austr. 1 (1863) 212; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 121; Backer, Schoolfl. Java (1911) 123.

*Distribution*: Australia.

*Note*: The species, mentioned by Blume and by Backer, was formerly cultivated in the Botanic Gardens of Bogor.

#### 4. Section *Trionum*

DC., Prod. 1 (1824) 453; *emend.* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 136.

Lectotype: *H. trionum* L.

*Note*: De Candolle mentioned two species under his section, viz. *H. trionum* L. and *H. vesicarius* Cav.; the latter appears to be only a variety of the former. Therefore *H. trionum* L. is here designated as the lectotype.

**28. *Hibiscus mutabilis*** Linné, Sp. Pl. (1753) 694; in Stickman, Herb. Amb. (1754) 15; Amoen. Acad. 4 (1759) 125; Cav., Diss. 3 (1787) 165, t. 62 f. 1; DC., Prod. 1 (1824) 452; Blume, Bijdr. 2 (1825) 70; Blanco, Fl. Filip. (1837) 546; ed. 2 (1845) 381; ed. 3, 2 (1879) 336, t. 175; Miq., Pl. Jungh. (1854) 283; Fl. Ind. Bat. 1, 2 (1858) 158; Suppl. (1860) 163; op. cit. (1861) 398; Mast., in Fl. Br. Ind. 1 (1875) 344; O.K., Rev. Gen. Pl. 1 (1891) 69; Gürke, in Fl. Bras. 12, 3 (1892) 549; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 147; Koord., Nat. Tijd. Ned. Ind. 62 (1902) 243; Hochr., Bull. Inst. Bot. Btzg 19 (1904) 10; Backer, Fl. Bat. 1 (1907) 138; ? Laut., Bot. Jahrb. 45 (1911) 362; Backer, Schoolfl. Java (1911) 125; Koord., Exk. Fl. Java 2 (1912) 585; Merr., Fl. Manila (1912) 322; Int. Rumph. Herb. Amb. (1917) 359; Sp. Blanc. (1918) 254; En. Born. Pl. (1921) 374; J. J. S., Teysmannia 32 (1922) 269; Merr., En. Philip. Fl. Pl. 3

(1923) 38; Heyne, Nutt. Pl. (1927) 1031; Bruggeman, Ind. Tuinb. (1939) 241, f. 243; Corner, Wayside Trees Mal. (1940) 441, t. 132; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 24; Hochr., in Fl. Madag. fam. 129 (1955) 52, t. 15 f. 1—3; Hu, Fl. China, fam. 153 (1955) 49, t. 19 f. 1; Backer & Bakh. f., Fl. Java 1 (1963) 432; Bates, Bailey 13 (1965) 100, f. 29A. — *Abelmoschus mutabilis* (L.) Hassk., Cat. Hort. Bog. (1844) 198. — *Hina paretii* Rheede, Hort. Malab. 6, p. 69—72, t. 38—42. — *Flos horarius* Rumph., Herb. Amb. 4, p. 27, t. 9.

Type: Botanic Garden, Upsala, *Herb. Linn. n. 875.20* (lectotype: LINN).

*Distribution*: South China and Formosa (cf. Hu, 1955, 50); elsewhere cultivated for centuries or in the tropics rarely running wild; in Malesia collected (from cultivation) in Sumatra, Malaya, Banka, Borneo, the Philippines, and the Moluccas (Halmaheira).

*Note*: The first element of the protologue of the species is an entry from Linnaeus' Hortus Upsaliensis. A corresponding specimen (*n. 875.20*), which is considered the type, is preserved in the Linnean herbarium. On the sheet is written in the handwriting of Linnaeus the specific epithet 'mutabilis', the number '7' being the species number in Species Plantarum, and the abbreviation 'HU' indicating the origin of the specimen, viz. the Hortus Upsaliensis. The specimen consists of a branch with leaves and a single flower.

**29. *Hibiscus indicus*** (Burm. f.) Hochr., Mém. Soc. Hist. Nat. Afr. Nord 2 (1949) 163; Backer & Bakh. f., Fl. Java 1 (1963) 432; Bates, Bailey 13 (1965) 104, f. 29B. — *Alcaea indica* Burm. f., Fl. Ind. (1768) 149; Merr., Philip. J. Sc. 19 (1921) 365. — *Althaea indica* (Burm. f.) Steud., Nomencl. ed. 2, 1 (1840) 66. — *H. micans* Cav., Diss. 3 (1787) 167, t. 60 f. 2; DC., Prod. 1 (1824) 448; Miq., Fl. Ind. Bat. 1, 2 (1858) 160. — *H. venustus* Blume, Bijdr. 2 (1825) 71; Miq., Pl. Jungh. (1854) 281; Fl. Ind. Bat. 1, 2 (1858) 155; Suppl. (1860) 163; op. cit. (1861) 398; Hook. f., in Curtis, Bot. Mag. III, 47 (1891) t. 7183; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 93; Bull. Inst. Bot. Btzg 19 (1904) 11; Backer, Fl. Bat. 1 (1907) 136; Gagn., in Fl. Gén. I.-C. 1 (1910) 428; Backer, Schoolfl. Java (1911) 125; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 8; Koord., Exk. Fl. Java 2 (1912) 585; J. J. S., Teysmannia 32 (1922) 272; Heyne, Nutt. Pl. (1927) 1036; Bruggeman, Ind. Tuinb. (1939) 243, f. 245; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 24; Steen., Bull. Jard. Bot. Btzg III, 17 (1948) 402; Hu, Fl. China, fam. 153 (1955) 48, t. 19 f. 2. — *Abelmoschus venustus* (Bl.) Walp., Rep. Bot. Syst. 1 (1842) 309; Hassk., Cat. Hort. Bog. (1844) 199. — *H. javanicus* Weinmann, Syll. Ratisb. 2 (1828) 172, ex descr., non Mill., 1768. — *H. platystegius* Turcz., Bull. Soc. Imp. Nat. Mosc. 31, 1 (1858) 194, ex descr. — *H. mutabilis* (non L.) Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 244, quoad specim. cit.

Types: *Alcaea indica* Burm. f.: specim. in Herb. Burman f. (holotype: G, *n.v.*); *H. micans* Cav.: Java, Commerson *s.n.* (lectotype: P-JU 12367); *H. venustus* Blume: Java, Blume *s.n.* (lectotype: L 908.135-525).

*Distribution*: South China (cf. Hu, 1955, 49); cultivated in Malesia and neighbouring countries as an ornamental, in Java at least since two centuries.

*Ecology*: The flowers open early in the morning and fade towards noon. The species has been successfully grown from sea-level up to c. 2000 m.

*Notes*: Hochreutiner (1949) traced an authentic specimen of *Alcaea indica* Burm. f., a binomium which until then could not be identified because of the insufficient description.

Cavanilles wrote under the protologue of *H. micans*: 'Habitat in Insula Java. †. Observatus a Commers. V. S. apud DD. de Jussieu et Thouin, quorum quilibet possidet exemplar unicum.' Presumably the specimens of De Jussieu and of Thouin belong to-

gether, and were collected from the same living shrub. I have seen only the specimen of De Jussieu, and have accepted that as the lectotype. There is an other specimen collected by Commerson in Java in the herbarium of Lamarck, labelled *H. micans* Cav. in the handwriting of Lamarck, who, no doubt compared his specimen with the type material. There is also a specimen in the 'Herbarium Cavanilles' at Madrid, though without any label or annotation.

I have seen only one specimen with the name *H. venustus* in the minute, neat handwriting of Blume, corresponding with the 'Bijdragen'. That specimen is accepted here as the lectotype, as there are presumably comparable specimens in other herbaria.

The descriptions of *H. platystegius* Turcz. and *H. javanicus* Weinmann do not leave any doubt as to their conspecificity. Authentic specimens have not been examined.



Fig. 10. *Hibiscus bicalyculatus* Merr. Habit and large fruit (Elmer 5012), the young fruits after a drawing made at Bogor by S. Kendar from the type F.B. 2450 (BO 57109),  $\times \frac{2}{5}$ .



**30. *Hibiscus bicalyculatus* Merr.**, Publ. Bur. Sc. Manila 35 (1905) 39; En. Philip. Fl. Pl. 3 (1923) 37. — *Hibiscus* sp., Vidal, Rev. Pl. Vasc. Filip. (1886) 63. — Fig. 10.

Type: Luzon, Montalban, *Ahern's Coll. For. Bur.* 2450 (isotypes: BO, K, NY, P, SING, US).

Shrub or woody vine, trailing over bushes and trees. Twigs terete, 3–6 mm  $\varnothing$ , as the petioles and pedicels stellate-cinereous, somewhat floccose, also with scattered simple hairs. Leaves chartaceous, orbicular in outline, 5–15 cm  $\varnothing$ , at base cordate, 3-lobed with deltoid, acute to acuminate segments, entire, at base 5–7-nerved, above stellate-pubescent, glabrescent, beneath stellate-tomentose, on the nerves somewhat floccose; petiole 2–7 cm. Stipules broadly ovate, acute, c. 4 mm across, stellate-pubescent. Flowers axillary, solitary, by reduction of the upper leaves sometimes in racemes. Pedicel 5–7 cm, stout, jointed  $\pm$  in the middle, below the joint accrescent to c. 14 cm. Epicalyx large, widely campanulate, c. 2½ cm high, somewhat inflated, 5-lobed, ultimately slit down on one side, caducous; segments triangular to ovate, acute to shortly acuminate, c. 10 by 7–9 mm; epicalyx outside stellate-pubescent, inside glabrous or nearly so. Calyx large, widely tubular, somewhat inflated, 4½–5 cm high, c. 2 cm wide, accrescent to 6 cm, 5-lobed; segments triangular to ovate, acute to shortly acuminate, 1–1½ by ¾–1 cm; calyx prominently nerved, outside stellate-tomentose, also with long, stiff, shining, simple hairs, inside glabrous except for the stellate-velutinous margin. Petals obovate, at apex rounded, c. 8 by 3 cm, at base ciliate, yellow. Staminal column c. 9 cm, antheriferous for the upper 3 cm, glabrous; filaments c. 1 cm; anthers c. 2 mm. Ovary ovoid, c. 10 mm high, 5-celled. Capsule entirely enclosed by the calyx, ovoid, c. 3½ by 2 cm, 5-costate, outside densely set with stiff, shining, stellate hairs, 5-celled. Seeds  $\infty$ , reniform, c. 4½ mm, punctate by extremely minute stellate hairs, redbrown.

*Distribution*: Philippines (Luzon); c. 8 collections (cf. p. 16).

*Ecology*: Forested ravines along streams at low and medium altitude (Merrill, 1923).

*Notes*: The species occupies a somewhat isolated position. The large, 5-lobed, somewhat inflated epicalyx is an unusual character in *Hibiscus*; after flowering it splits on one side, and reminds of the calyx of *Abelmoschus*. In my opinion it should be classified with sect. *Trionum*.

On field labels the species is recorded to be a vine. Presumably it scrambles or sprawls among shrubs like *H. surattensis* L.

**31. *Hibiscus cochleariferus* Borss., sp. nov.** — Fig. 11.

Type: Sumatran East Coast, Upper Langkat, *Lörzing* 16637 (holotype: BO 116998; isotypes: BO, L).

Frutex erectus. Ramuli parum angulares, mox teretes, pilis stellatis rigidis dispersis scabri, glabrescentes. Folia coriacea, in circuitu orbicularia, basi cordata, parte superiore 3-lobata, lobis triangularibus acuminatis, lobo medio longissimo, margine remote et breviter dentata, basi 9–5-nervata; nervi 3 basales medii, recti, ad apices lorum percurrentes, utrinque 2–3 nervis lateralibus; nervi basales ceteri paulum sursum curvati, percurrentes in apices dentium marginalium vel ante marginem in venas ramosi; nervi 3 basales medii in pagina inferiore basi nectario oblongo instructi; folia imprimis subtus pilis stellatis rigidis adspersa, glabrescentia. Petiolus laminam fere aequans, praecipue apice pilis stellatis rigidis adspersus. Stipulae erecto-patentes, cochleariformes, pro parte inferiore petioiiformes, late lineares, caniculatae, pro parte superiore laminaeformes, orbiculares vel transverse ellipticae; pars laminaeformis partem petioiiformem versus ad perpendicularum directa; stipulae pilis stellatis rigidis dispersis scabrae, glabrescentes. Flores in summis axillis solitarii. Pedicellus teres, articulo nullo vel prope basin tantum obvio,



Fig. 11. *Hibiscus cochleariferus* Bors. Habit,  $\times \frac{1}{2}$  (Lörzing 16637, type).

apice paulum incrassatus, in sicco leviter sulcatus, indumento denso pilorum stellatorum rigidorum scaber, post anthesim paulum elongatus et incrassatus. *Epicalycis segmenta* 8—12, a calyce separata, libera, basi brevissime connata, patentia, elongato-cochleariformia, pro parte inferiore petioliformia, anguste linearia, pro parte superiore laminiformia, orbicularia vel ovata; segmenta pilis stellatis minutis rigidis vestita, glabrescentia, post anthesim reflexa. *Calyx* amplissime campanulatus, 5-fidus, tubo brevi inflato, segmentis patentibus ovatis vel triangularibus acutis vel breviter acuminatis, nervis 5 extus prominentibus et in apices segmentorum percurrentibus, nervis 5 alteris extus prominen-

tibus ad sinus percurrentibus et paulum ante sinum furcatis, extus indumento denso pilorum stellatorum rigidorum longi- et brevibrachiatorum, scaber, intus in segmentis pilis stellatis minutis velutinus, ultero pilis stellatis rigidis dispersis instructus, intus basi tubi annulo denso pilorum stellatorum sericeorum longiorum, post anthesim paulum amplificatus. *Petala* in specimine sicco destructa, probaliter obovata et apice rotundata, extus pilis stellatis paulum rigidis, basi principue extus ad margine fasciculis pilorum stellatorum sericeorum longiorum ornata. *Columna staminalis* petalis brevior, glabra, a basi usque ad apicem stamina gerens. *Ovarium* ovoideum vel conicum, acutum, obsolete angulare, pilis simplicibus longis erecto-patentibus vestitum, 5-loculare; stylus ad apicem stellate pilosus et in 5 brachiis stellate pilosis divisus. *Capsula* — specimen unum immaturum solum visum — globosa, pilis simplicibus rigidis longis erecto-patentibus dense vestita, 5-locularis. *Semina* matura non vidi.

Twigs 2—4 mm  $\varnothing$ . *Leaves* 5—20 cm  $\varnothing$ ; segments 1—6 by 2—8 cm; petiole 1—14 cm long,  $1\frac{1}{2}$ — $2\frac{1}{2}$  mm  $\varnothing$ . Stalk-like part of the *stipules* 2—3 by c.  $1\frac{1}{2}$  mm; leaf-like part c. 5 mm  $\varnothing$ . Pedicel 3— $3\frac{1}{2}$  cm long, c. 2 mm  $\varnothing$ . *Epicalyx segments* 1— $1\frac{1}{2}$  cm long; stalk-like part 8—10 by  $\frac{1}{2}$ —1 mm; leaf-like part 3—5 by 2—4 mm. *Calyx* c. 1 cm high,  $4\frac{1}{2}$  cm  $\varnothing$ ; tube 2— $2\frac{1}{2}$  cm wide; segments  $1\frac{1}{2}$ —2 cm by c. 1 cm. *Petals* c. 3 cm wide. *Staminal column* c.  $3\frac{1}{2}$  cm long; filaments 2—3 mm; anthers c. 2 mm. *Ovary* 4—5 mm  $\varnothing$ ; style c.  $3\frac{1}{2}$  cm; arms 2—3 mm. Immature *capsule* c. 1 cm  $\varnothing$ .

SUMATRA. East Coast: Upper Langkat, bank of Wampu R., thickets, alt. c. 100 m, *Lörzing 16637* (BO, holotype; BO, L, isotypes), almost erect shrub, loosely branched,  $2\frac{1}{2}$ —5 m, flowers whitish to incarnate, with a large wine-red centre, inferior part of the staminal column and the filaments red, superior parts whitish; Medan, cultivated, originating from the type locality, *Lörzing 16994* (BO).

*Distribution*: Sumatran East Coast Res., presumably of American origin (cf. notes).

*Ecology*: Once found in Upper Langkat, on bank of Wampu R. in thickets, at 100 m.

*Notes*: The species is characterized by its peculiar spoon-shaped stipules and epicalyx segments. It is, no doubt, closely related to the South American *H. sororius* L. f. (cf. Gürke, in Fl. Bras. 12, 3, 1892, 546, t. 107 f. 1), but differs from that species by being a stout shrub instead of a herb or undershrub, by its leaves being coriaceous, orbicular and 3-lobed instead of herbaceous and broadly ovate, finally by its pedicel and calyx having an extremely rough stellate indumentum instead of a tomentose one. There may be differences in the corolla, capsule, and seeds, but the poor condition of the material did not allow additional observations.

Possibly there is also some affinity with the insufficiently known *H. hitchcockii* Ulbr. ex Kearney (Leaf. West. Bot. 7, 1955, 271), a shrub from Ecuador and Peru; that species differs by having rounded leaf-lobes and a tomentose indumentum.

## 5. Section *Lilibiscus*

Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 130.

Lectotype: *H. rosa-sinensis* L.

*Note*: It is relevant to designate the name of the best known species, *H. rosa-sinensis* L., as the lectotype.

**32. *Hibiscus rosa-sinensis* Linné, Sp. Pl. (1753) 694; *sens. ampl.* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 134.**

*See for the synonyms under the varieties.*

*Distribution:* Cultivated throughout the world, in the tropics (Malesia included) and the subtropics in the open, often for hedges, in temperate and subarctic regions in greenhouses. The origin of the species is still uncertain, but since the related species *H. schizopetalus* (Mast.) Hook. f. was first collected as a wild plant in East Africa, it is probable that *H. rosa-sinensis* L. originates from that area.

*Note:* I have followed Hochreutiner, and most other authors, in the wide conception of the species. The enormous polymorphism tempted Hochreutiner to create several varieties. Most of these are cultivars and are neglected in the present publication, except for var. *liliiflorus* Hochr. which seems to have some botanical value, and has caused some nomenclatural confusion in literature.

#### KEY TO THE VARIETIES

1. Leaves serrate to dentate or crenate, not or slightly coriaceous . . . . . a. var. *rosa-sinensis*  
 1. Leaves entire or apically somewhat dentate, strongly coriaceous . . . . . b. var. *liliiflorus*

**a. var. *rosa-sinensis*.** — *H. rosa-sinensis* Linné, Sp. Pl. (1753) 694; Cav., Diss. 3 (1787) 158, t. 69 f. 2; Curtis, Bot. Mag. 5 (1791) t. 158; DC., Prod. 1 (1824) 448; Blume, Bijdr. 2 (1825) 68; Drapiez, Herb. Amat. Fl. 2 (1829) t. 96; Decne, Herb. Timor. (1835) 103; Blanco, Fl. Filip. (1837) 543; ed. 2 (1845) 379; ed. 3, 2 (1879) 333, t. 270; Span., Linnaea 15 (1841) 169; Miq., Pl. Jungh. (1854) 282; Fl. Ind. Bat. 1, 2 (1858) 156; Suppl. (1861) 399; Mast., in Fl. Br. Ind. 1 (1875) 344; F. v. M., Descr. Not. Pap. Pl. 4 (1876) 57; Fern.-Vill., Novis. App. (1880) 24; Forbes, Natur. Wand. (1885) 42; Hemsl., Rep. Voy. Chall. (Bot.) 1, 3 (1885) 124; K. Sch. & Hollr., Fl. Kaiser Wilhelmsl. (1889) 55; Warb., Bot. Jahr. 13 (1891) 373; O. K., Rev. Gen. Pl. 1 (1891) 69; Gürke, in Fl. Bras. 12, 3 (1892) 545; K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 437; Perk., Fragm. Fl. Philip. (1904) 109; Backer, Fl. Bat. 1 (1907) 133; Val., Bull. Dép. Agr. Ind. Néerl. 10 (1907) 32; Gagn., in Fl. Gén. I.-C. 1 (1910) 429; Backer, Schoolfl. Java (1911) 127; Koord., Exk. Fl. Java 2 (1912) 586; Merr., Fl. Manila (1912) 323; Int. Rumph. Herb. Amb. (1917) 359; Sp. Blanc. (1918) 254; En. Born. Pl. (1921) 374; En. Philip. Fl. Pl. 3 (1923) 38; J. J. S., Teysmannia 32 (1922) 270; Craib, Fl. Siam. En. 1 (1925) 159; Bartlett, Pap. Mich. Ac. Sc. 6 (1926) 30; Heyne, Nutt. Pl. (1927) 1032; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 26; Steen., Fl. Schol. Indon. (1949) 268; Hu, Fl. China, fam. 153 (1955) 46, 47, t. 20 f. 6, t. 21 f. 5; Backer & Bakh. f., Fl. Java 1 (1963) 433. — *H. javanicus* Mill., Gard. Dict. ed. 8 (1768) n. 7, *ex descr.*, *nom. illeg.* — *H. festalis* Salisb., Prod. (1796) 383, *nom. illeg.* — *H. rosa-sinensis* var. *genuinus* Hochr. *et* var. *aliores excl.* var. *liliiflorus* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 134; Bull. Inst. Bot. Btzg 19 (1904) 7, 10—13; op. cit. 22 (1905) 127; Nova Guinea 14 (1924) 163. — *H. hybridus* Hort., Bruggeman, Ind. Tuinb. (1939) f. 242. — *Scheru-Pariti* Rheede, Hort. Malab. 1, p. 25, t. 17. — *Ain-Pariti* Rheede, op. cit. 6, p. 73, t. 43. — *Flos festalis* Rumph., Herb. Amb. 4, p. 24, t. 8.

Type: Herb. Hermann, Vol. III, fol. 4, *Linn. n.* 260 (lectotype: BM).

*Notes:* The protologue of *H. rosa-sinensis* L. in Species Plantarum opens with a citation of Flora Zeylanica. In the Hermann Herbarium there is a corresponding specimen, designated here as a lectotype; it consists of a branch with leaves and one double flower. The double flower reduces the value of the specimen for the purpose of typification, but the other elements referred to by Linnaeus are plates (of Breyne and Rheede respec-

tively). There are authentic specimens in the Linnean Herbarium too; they possess also double flowers.

*H. javanicus* Mill. is a superfluous name for *H. rosa-sinensis* L.; it was based on the same protologue as Linnaeus' species.

**b. var. liliiflorus** Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 134; Bull. Inst. Bot. Btzg 19 (1904) 7, 11; op. cit. 22 (1905) 126; Backer & Bakh. f., Fl. Java 1 (1963) 433. — *H. liliiflorus* Griff. ex Mast., in Fl. Br. Ind. 1 (1875) 344, *nom. nud.*, non Cav., 1787. — *H. arnotti* Griff. ex Mast., l.c., *nom. nud.* — *H. arnottianus* (non A. Gray) Backer, Schoolfl. Java (1911) 127; Koord., Exk. Fl. Java 2 (1912) 586; J. J. S., Teysmannia 32 (1922) 267; Rant, Nat. Tijd. Ned. Ind. 99 (1939) 24; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 26.

Type: Bengal, *Griffith s.n.* (lectotype: K ex Herb. Hooker).

Notes: It is regrettable that Hochreutiner chose for his variety an epithet which was already in use as that of a species of sect. *Lilibiscus*, viz. *H. liliiflorus* Cav., an endemic of Mauritius. His choice has caused much confusion, in particular in horticultural literature and garden administrations. The epithet for the variety originates from a herbarium name: 'There is a plant in herbaria from Griffith and others, to which the manuscript names of *H. liliiflorus* (not of DC.), and of *H. Arnotti* (not of Gray), are attached. It appears identical with Wallich's 1890 D, described in Wall. Cat. l.c. as a hybrid plant introduced to the Calcutta garden from Mauritius and said to be a form of *H. rosa-sinensis*' (Masters, in Fl. Br. Ind. 1, 1875, 344).

A good, corresponding specimen in the Kew herbarium is designated here as the lectotype of the variety.

The specimens labelled *H. arnotti* do not differ essentially from those with the name *H. liliiflorus*. Evidently the first mentioned name was also used in the Botanic Garden of Calcutta, and then passed with living material to the Botanic Garden of Bogor. Some authors on the flora of Java used for it the name *H. arnottianus* A. Gray, which, however, is the name for an endemic species of the Hawaiian Islands.

*H. liliiflorus* Cav. possesses lanceolate to linear, nearly parallel-nerved leaves, and a cupular, shortly dentate calyx, resembling that of *Thespesia* spp.

**33. Hibiscus schizopetalus** (Mast.) Hook f., in Curtis, Bot. Mag. III, 36 (1880) t. 6524; Planchon, Fl. Serres II, 23 (1880) 69, t. 2397, 2398; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 131; Bull. Inst. Bot. Btzg 19 (1904) 10; Merr., Philip. J. Sc. 1 (1906) Suppl. 92; Backer, Fl. Bat. 1 (1907) 131; Gagn., in Fl. Gén. I.-C. 1 (1910) 432; Paauwe Leerb. Plantk. (1910) 20, f. 10d; Backer, Schoolfl. Java (1911) 127; Koord., Exk. Fl. Java 2 (1912) 586; Merr., Fl. Manila (1912) 323; Philip. J. Sc. 11 (1916) Bot. 290; J. J. S., Teysmannia 32 (1922) 271; Merr., En. Philip. Fl. Pl. 3 (1923) 38; Craib, Fl. Siam. En. 1 (1925) 160; Van der Pijl, Ann. Jard. Bot. Btzg 48 (1937) f. 10; Corner, Wayside Trees Mal. (1940) 442, f. 145; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 27; Steen., Fl. Schol. Indon. (1949) 268; Hu, Fl. China, fam. 153 (1955) 46, t. 20 f. 3; Exell, Fl. Zamb. 1 (1961) 470; Bates, Baileya 13 (1965) 124, f. 35. — *H. rosa-sinensis* var. *schizopetalus* Mast., Gard. Chron. n.s. 12 (1879) 272, f. 45; op. cit. 11 (1879) 538; Th. Dyer, l.c. 568. — *Hibiscus* sp., Kirk & Oliver, J. Linn. Soc. Bot. 15 (1876) 478, f. 1, 2.

Type: Gard. Chron. n.s. 12 (1879) 272, f. 45 (holotype).

Distribution: East Africa (Kenya and Tanganyika); elsewhere cultivated as an ornamental or used for living fences. According to H. Wild it is possibly a cultivar of *H. rosa-sinensis* (Ann, Mo. Bot. Gard. 52 (1965) 479).

*Ecology:* In East Africa the flowers are visited by birds, but in Malesia that phenomenon has not yet been observed, and capsules have never been collected in that area.

In Malesia it can be cultivated up to c. 2000 m. The flowers unfold early in the morning, remain open for the whole day, and fade in the evening.

*Notes:* Exell wrote (1961, 470): 'The varietal epithet was first mentioned in print by Thiselton Dyer (Gard. Chron. 1879: 568 (May, 1879)) but without sufficient description to validate it. His reference to Kirk and Oliver is also insufficient validation as he leaves the identification in doubt by saying that var. *schizopetalus* is only apparently the same as their plant. It seems best to attribute the authorship to Masters, as J. D. Hooker did, although the epithet was presumably given to the plant either by Veitch's Nursery or by Thiselton Dyer.'

As a specimen after which the original description and plate were drafted has not been traced, the plate could well be accepted as the type.

**34. *Hibiscus* × *archeri*** W. Watson, Garden and Forest (1896) 324; The Garden 15 (1899) 310, tab.; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 135; Bull. Inst. Bot. Btzg 19 (1904) 10; Backer, Fl. Bat. 1 (1907) 134; Schoolf. Java (1911) 127; Koord., Exk. Fl. Java 2 (1912) 586; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 27; Backer & Bakh. f., Fl. Java 1 (1963) 433. — *H. rosa-sinensis* (non L.) Bruggeman, Ind. Tuinb. (1939) f. 244.

Type: The Garden 15 (1899) 31, tab. (lectotype).

*Distribution:* Cultivated as an ornamental, mainly in the tropics, propagated by cuttings only; in Malesia also used as a hedge plant.

*Note:* This hybrid was raised by A. S. Archer, a clergyman and amateur-grower in Antigua (West Indies), from *H. rosa-sinensis* and *H. schizopetalus* as parents. Some of the seedlings were sent to Kew, where only one of them developed intermediary characters. That one was shortly described in a letter by W. Watson, then a curator of the Kew Gardens, to the editors of the journal Garden and Forest, in which it was printed under a section titled 'Foreign Correspondence'. The English description is sufficient to characterize the plant. A coloured plate of the specimen together with an explanation by the same writer appeared in The Garden of 1899, and can be used as a type.

**35. *Hibiscus* × *telfairiae*** G. Don, in Sweet, Hort. Brit. ed. 3 (1839) 76; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 135; Bull. Inst. Bot. Btzg. 22 (1905) 126; Backer, Fl. Bat. 1 (1907) 135; Schoolf. Java (1911) 127; Koord., Exk. Fl. Java 2 (1912) 586; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 26; Backer & Bakh. f., Fl. Java 1 (1963) 433. — *H. liliiflorus* var. *hybridus* Hook., in Curtis, Bot. Mag. 56 (1829) t. 2891; Baker, Fl. Maurit. (1877) 23.

Type: Curtis, Bot. Mag. 56, t. 2891 (holotype).

*Note:* The species is reported (Hooker, 1829) to be a hybrid between *H. liliiflorus* Cav. (an endemic species of Mauritius) and *H. rosa-sinensis* L. It is said to have been produced by fertilizing flowers of the former species with pollen of the latter one. The plate of Hooker was made after drawings of Mrs A. Telfair, wife of Ch. Telfair, a resident of Mauritius, who created the hybrid. G. Don based his species on the plate, which accordingly becomes the type. *H. × telfairiae* G. Don is also cultivated at present in colder countries in greenhouses.

6. Section *Hibiscus*

*Hibiscus* sect. *Bombycella* DC., Prod. 1 (1824) 452; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 73.

*Note:* The section hitherto named *Bombycella* DC. must be named *Hibiscus* as the type of the genus, *H. syriacus* L., belongs to it.

**36. *Hibiscus syriacus*** Linné, Sp. Pl. (1753) 695; Cav., Diss. 3 (1787) 169, t. 69 f. 1; Curtis, Bot. Mag. 3 (1789) t. 83; Miq., Fl. Ind. Bat. 1, 2 (1858) 158; Blanco, Fl. Filip. ed. 3, 2 (1879) t. 346; Fern.-Vill., Novis. App. (1880) 25; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 76; Backer, Fl. Bat. 1 (1907) 123; Merr. & Rolfe, Philip. J. Sc. 3 (1908) Bot. 111; Backer, Schoolfl. Java (1911) 124; Koord., Exk. Fl. Java 2 (1912) 585; Merr., En. Philip. Fl. Pl. 3 (1923) 39; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 25; Hu, Fl. China, fam. 153 (1955) 50, t. 10; Backer & Bakh. f., Fl. Java 1 (1963) 433; Bates, Baileya 13 (1965) 107, f. 29 E, 30.

*Distribution:* China and Formosa; elsewhere in the temperate, subtropical, and rarely also in the tropical countries of the world cultivated as an ornamental, often with double flowers.

With respect to the country of origin the following passage of Hu (1955, 52) seems important: 'This species is extensively cultivated as a hedge-plant. Spontaneous specimens have been collected from the sea-cliff in eastern Taiwan, in thickets of northeastern Kwangtung, in woods of northern Kwangsi, along streams in the mountains of Chekiang, Kiangsu, Anhwei and Kiangsi and on the open hillsides of Szechuan and Yunnan. There is no doubt that it is indigenous in China. It has been cultivated by the Chinese people since time immemorial and was introduced to Asia Minor, including Syria, and Europe by ancient travellers'.

**37. *Hibiscus lavateroides*** Moricand, Pl. Nouv. Am. (1836) 23, t. 16; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 77; Backer, Fl. Bat. 1 (1907) 124; Schoolfl. Java (1911) 126; Koord., Exk. Fl. Java 2 (1912) 586; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 25; Backer & Bakh. f., Fl. Java 1 (1963) 433.

Type: Mexico, Tampico de Tamaulipas, *Berlandier* 127 (isotypes: G. L.).

*Note:* According to Backer the species, which is indigenous in Mexico, is cultivated in Java. I have seen only specimens from the Botanic Gardens at Bogor.

**38. *Hibiscus hirtus*** Linné, Sp. Pl. (1753) 694; W. & A., Prod. (1834) 51; Wight, Ic. 1 (1840) t. 41; Hassk., Pl. Jav. Rar. (1848) 303; Miq., Fl. Ind. Bat. 1, 2 (1858) 155; Mast., in Fl. Br. Ind. 1 (1875) 335; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 86; Backer, Schoolfl. Java (1911) 124; J. J. S., Teysmannia 32 (1922) 268; Doct. van Leeuwen, Blumea 2 (1937) 267; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 25; Backer & Bakh. f., Fl. Java 1 (1963) 432. — *H. rosa-malabaricus* Koenig ex Ker, Bot. Reg. 5 (1818) 6, t. 337. — *H. virgatus* Blume, Bijdr. 2 (1825) 71; Decne, Herb. Timor. (1835) 104; Span., Linnæa 15 (1841) 169; Miq., Fl. Ind. Bat. 1, 2 (1858) 156; Hemsl., Rep. Voy. Chali. (Bot.) 1, 3 (1885) 123; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 85. — *H. sambawanus* Warb. & Uibr., Notizbl. Berl.-Dahl. 7 (1921) 365. — *H. phoeniceus* var.  $\beta$  Willd., Sp. Pl. 3 (1800) 814; DC., Prod. 1 (1824) 452. — *H. gossypinus* (non Thunb.) Mor., Syst. Verz. (1846) 29, *quoad* Zollinger 1050b. — *H. phoeniceus* (non Jacq.) Cav., Diss. 3 (1787) 157, t. 67 f. 2; Roxb., Fl. Ind. ed. Carey 3 (1832) 195. — *H. micranthus* (non L. f.) Backer, Fl. Bat. 1 (1907) 125. — *Sjasmin* Rheede, Hort. Malab. 10, p. 1, t. 1.

Types: *H. hirtus* L.: *Herb. Linn. n. 875.18* (holotype: LINN); *H. rosa-malabaricus* Ker: *Bot. Reg. 5, t. 337* (holotype); *H. virgatus* Blume: ? Timor, Zippelius s.n. (lectotype: L 908.136-40); *H. sambawanus* Warb. & Ulbr.: Sumbawa, *Warburg 17255, 17256* (syntypes: B †).

Undershrub, 1—1½ m. Stems rough by stiff, minute stellate hairs (arms 3—6, appressed against the stems, but radiating), also with a line of short, simple hairs above each leaf axil extending over the node, glabrescent. Lower leaves ovate to oblong or lanceolate, occasionally orbicular, often 3-lobed to deeply 3-parted with triangular, oblong or lanceolate segments, at base rounded or shallowly cordate, at apex acute to acuminate, 1—11 by ¼—4½ cm; coarsely serrate to dentate; upper leaves lanceolate to linear, decrescent; blade rough by minute stellate hairs, in particular beneath, occasionally tomentose, on the nerves also with appressed simple hairs, at base 3—5-nerved, on base of midrib beneath usually with an oblong nectary; petiole ½—5½ cm, with minute stellate and appressed simple hairs. *Stipules* linear to subulate, 2—7 mm, ciliate. *Flowers* solitary, axillary, small, seemingly in racemes or panicles. Pedicel much longer than the petiole, ½—2 cm, accrescent to 4½ cm, with a joint at ¼—1/10 from apex, set with minute stellate hairs and appressed simple hairs. *Epicalyx segments* 6—8, free, erecto-patent to appressed, after flowering spreading or reflexed, much shorter than to ± as long as calyx, lanceolate to linear, acute, 2½—7 by ⅓—¾ mm, outside with appressed simple hairs, inside glabrous or nearly so. *Calyx* narrowly campanulate, c. 6—7 mm high, slightly accrescent, 5-fid to -parted; segments lanceolate, acute, 3—4 by 1½ mm; calyx outside entirely and inside on the segments with appressed simple hairs. *Corolla* rotate, 2—3 cm ø, pink, rarely white; petals obovate, at apex rounded, 10—15 by 8—10 mm, on covering margin with tender, simple hairs and larger, tribrachiate stellate hairs. *Staminal column* somewhat shorter or ± as long as petals, 7—15 mm, pink, antheriferous throughout; filaments in pairs, ½—1½ mm; anthers ¼—½ mm, pink; pollen yellow. *Ovary* ovoid, c. 2½ mm ø, 5-celled; style arms c. 5 mm, pink; stigmas discoid, c. ½ mm, dark red, hairy. *Capsule* obovoid to globose, 7—10 mm ø, obtuse, outside puberulous or glabrous, inside glabrous, 5-celled. *Seeds* 2—3 per cell, reniform, c. 3½ mm long, black, densely covered by long, ferruginous, woolly hairs.

*Distribution*: India and Malesia; in Malesia in E. Java, the Lesser Sunda Islands (Bali, Lombok, Sumbawa, Sumba, Timor, Alor, Wetar), S. Celebes (Kalaotoa I.), and the SE. Moluccas (Leti, Tanimbar Is.). In Java rarely as an ornamental in gardens.

*Ecology*: Young secondary vegetation at low altitude, characteristic for periodically dry regions.

*Notes*: *H. hirtus* L. was described without mention of a previous reference. In the Linnean herbarium there is a sheet (n. 875.18) with the name and the species number in Linnaeus' handwriting. This holotype consists of two twigs with leaves, flowers and fruits.

Unless a good authentic specimen is traced, the plate of *H. rosa-malabaricus* Ker is considered as its type.

Of *H. virgatus* Blume there is at Leyden a good specimen well matching Blume's description and this is considered here the lectotype. Blume gave as habitat in his Bijdragen 'in hortis', without any geographical location. The specimen bears two labels, one with the name in the handwriting of Blume, and, in print, the word Java which is crossed out. On the other label is written 'Hibiscus Phoeniceus Timor' in the handwriting of Zippelius, and 'H. virgatus Bl.' in Blume's handwriting.

There has been much confusion with respect to the identity of *H. phoeniceus* Jacq. Hochreutiner (1900, 89) considered it conspecific with *H. brasiliensis* L. Willdenow



distinguished the present species as var.  $\beta$  of *H. phoeniceus* Jacq. Subsequently Cavanilles confounded the two species, as was already seen by Hochreutiner. His concept of *H. hirtus* is *H. brasiliensis* (cf. P-JU n. 12392), whereas his concept of *H. phoeniceus* is *H. hirtus* L. (cf. P-JU n. 12393).

The two species are closely related, and may be subspecies of one large species. *H. brasiliensis* L. differs from *H. hirtus* L. by being glabrous or nearly so, and by lanceolate epicalyx segments which are much longer than the calyx, often even longer than the petals.

The type material of *H. sumbawanus* Warb. & Ulbr. is lost; its description suggests a form of *H. hirtus* L. The authors themselves stated a close relationship with *H. virgatus* Bl.

Backer first (1907) referred his specimens from Djakarta erroneously to *H. micranthus* L. f., a species from Africa and India which differs by a more bristly habitus, on the stems a strigose indumentum of 4-armed stellate hairs of which 2 arms point upwards and 2 downwards, entire, ovate, acute to obtuse leaves, and short, ovate to oblong epicalyx segments.

In Malesia *H. hirtus* L. is represented by two forms which cannot be delimited sharply. As they are geographically not separated, these forms are not treated here as separate taxa. One form can be compared with the type of *H. hirtus* L. It is characterized by ovate, entire leaves and epicalyx segments which are about as long as the calyx. The other form, which is conformable to the type of *H. virgatus* Blume, possesses oblong, 3-lobed to 3-parted lower leaves, lanceolate to linear, entire upper leaves, and epicalyx segments which are much shorter than the calyx.

**39. *Hibiscus pedunculatus*** Linné f., Suppl. (1781) 309; Cav., Diss. 3 (1787) 163, t. 66 f. 2; Edwards, Bot. Reg. 3 (1817) t. 231; Harvey, Fl. Cap. 1 (1860) 173; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 78; Exell, Fl. Zamb. 1 (1961) 449. — *H. ficulneoides* (non Lindl.) Hassk., Tijds. Nat. Gesch. Phys. 12 (1845) 81; Pl. Jav. Rar. (1848) 300; Miq., Fl. Ind. Bat. 1, 2 (1858) 158.

*Distribution*: South Africa; elsewhere cultivated as an ornamental.

*Notes*: I have not seen specimens with the name *H. ficulneoides* in the handwriting of Hasskarl. The entry of Hasskarl presumably refers to specimens from the Botanic Gardens of Bogor. The description does not point to a species of *Abelmoschus*, but to *H. pedunculatus*. *H. ficulneoides* Lindl. belongs to *Abelmoschus manihot* (L.) Medicus ssp. *tetraphyllus* (Hornem.) Borss. var. *tetraphyllus*.

At Tjibodas *H. pedunculatus* L. f. was cultivated under the name *Abutilon bedfordianum* St. Hil. Specimens have been distributed under that erroneous name.

## 7. Section *Solandra*

(J. A. Murray, non L. 1759) Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 125. — *Solandra* J. A. Murray, Comm. Soc. Reg. Sc. Goetting. 6 (1785) 20, non L. 1759.

*Holotype*: *H. solandra* L'Herit. (*Solandra lobata* J. A. Murray).

**40. *Hibiscus lobatus*** (J. A. Murray) O.K., Rev. Gen. Pl. 3, 2 (1898) 19; Craib, Fl. Siam. En. 1 (1925) 158; Hochr., in Fl. Madag. fam. 129 (1955) 42, t. 12 f. 1—3; Exell, Fl. Zamb. 1 (1961) 445, t. 89 f. 1; Backer & Bakh. f., Fl. Java 1 (1963) 429. — *Solandra lobata* J. A. Murray, Comm. Soc. Reg. Sc. Goetting. 6 (1785) 20, t. 1; Cav., Diss. 2 (1786) 55; op. cit. 5 (1788) 279, t. 136 f. 1. — *H. solandra* L'Hérit., Stirp. Nov. 1 (1788) 103, t. 49, nom. illeg.; Mast., in Fl. Br. Ind. 1 (1875) 336; Trimen, Handb. Fl. Ceyl. 1

(1893) 155; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 128; Backer, Bull. Jard. Bot. Btzg II, 12 (1913) 18; Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 18. — *Lagunaea lobata* (J. A. Murray) Willd., Sp. Pl. 3 (1800) 733; DC., Prod. 1 (1824) 474; Thw., En. Pl. Zeyl. (1858) 27 ('*Lagunaea*'). — *H. solandra* var. *genuinus* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 128. — *Triguera acerifolia* Cav., Diss. 1 (1785) 41, t. II ult. div. — *Sida acerifolia* (Cav.) Medicus, Malv. (1787) 21. — *Lagunaea sinuata* Hornem., Hort. Hafn. 2 (1815) 645; DC., Prod. 1 (1824) 474 ('*Lagunaea*'). — *H. solandra* var. *sinuata* (Hornem.) Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 129. — *H. lobatus* var. *sinuatus* (Hornem.) Hochr., in Fl. Madag. fam. 129 (1955) 42.

Types: *Solandra lobata* J. A. Murray and *H. solandra* L'Hérit.: J. A. Murray, Comm. Soc. Reg. Sc. Goetting. 6, t. 1 (holotype); *Triguera acerifolia* Cav.: Réunion, Commerson s.n. (holotype: P-JU; isotypes: LINN, MA); *Lagunaea sinuata* Hornem.: Bot. Gard. Copenhagen (holotype: C, n.v.).

Erect herb,  $\frac{1}{2}$ — $1\frac{1}{2}$  m. Stems, petioles, and pedicels pubescent by short simple hairs, rarely with stellate hairs, also with long simple hairs, glabrescent. *Leaves* orbicular to ovate, upper ones lanceolate to linear or occasionally lyrate, at base rounded or cordate, not lobed and at apex acute to acuminate, or 3-lobed or 3—5-parted, and then with linear, lanceolate, ovate, deltoid, triangular or obovate, sometimes penniparted, obtuse, acute or acuminate segments and rounded sinuses; blade 2—10 by  $1\frac{1}{2}$ — $7\frac{1}{2}$  cm, serrate to crenate, at base 3—5-nerved, without nectary, above with appressed, short, simple hairs, beneath with appressed, short, simple hairs and tribrachiate stellate hairs, also with longer simple hairs on the nerves; petiole usually 3—12 cm. *Stipules* linear to filiform or narrowly spatulate, 3—6 mm, ciliate by simple hairs. *Flowers* axillary, solitary, by reduction or abortion (leaves then represented by their stipules only) partly in racemes. *Pedicel*  $\frac{1}{2}$ —1 cm, after flowering up to c.  $5\frac{1}{2}$  cm, with a joint at c.  $1/5$  from apex. *Epicalyx segments* according to literature only perceptible in bud, not seen. *Calyx* campanulate to rotate, 5—8 mm  $\varnothing$ , accrescent up to c. 9 mm high, 5-fid to -parted; segments triangular to lanceolate, acute, 3—5 by  $1\frac{1}{2}$ —2 mm; calyx outside with a dense indumentum as on the lower leaf surface, ciliate, inside glabrous or nearly so. *Corolla* 2— $2\frac{1}{2}$  cm  $\varnothing$ , white; petals obovate, glabrous or nearly so, c. 10—15 by 8—10 mm. *Staminal column*  $\pm$  as long as petals, practically antheriferous throughout; filaments  $\frac{1}{2}$  mm; anthers c.  $\frac{1}{4}$  mm; style arms c. 1—2 mm; stigmas discoid, hairy. *Capsule* ovoid, 12—15 mm high, rostrate (rostrum  $1\frac{1}{2}$ —2 mm), with simple and tribrachiate, stellate hairs; valves inside smooth. *Seeds*  $\infty$ , tetragonous to globose, 1— $1\frac{1}{2}$  mm  $\varnothing$ , glabrous, verruculose, black.

*Distribution*: Semi-arid parts of tropical Africa, Madagascar and adjacent islands, and SE. Asia; in Malesia restricted to Central and East Java.

*Ecology*: Secondary vegetation, waste grounds, and teak-forests, from sea-level to 800 m, characteristic of regions subject to a severe dry season.

*Notes*: The basionym for the present species is *Solandra lobata* J. A. Murray. In absence of a recognized, authentic specimen, the plate of Murray is the holotype of the species.

The holotype of *Triguera acerifolia* Cav. is preserved in the Herbarium De Jussieu at Paris. Duplicates are present in the Herbarium Cavanilles at Madrid as well as in the Herbarium of J. E. Smith (LINN). In a later part of his Dissertationes, Cavanilles admitted that his species was conspecific with *H. solandra* L'Hérit.

*Lagunaea sinuata* Hornem. was based on a specimen in the Botanic Garden of Copenhagen which originated from the Garden at Berlin. The country of origin was unknown. I have not seen a herbarium specimen, and follow Hochreutiner (1900, 1955) with respect to its identity. The original description is poor and concerns solely the shape of the leaves.

Hochreutiner distinguished two varieties, viz. var. *lobatus* of wide distribution, and var. *sinuatus* (Hornem.) Hochr. which he found restricted to Madagascar; it differs by deeper incisions and narrower segments. The specimens from Java vary considerably in this respect. As such variability can be found in one specimen in Java it is my opinion that these varieties cannot be upheld.

Epicalyx segments or their primordia have not been found in the Javanese specimens.

### 8. Section *Ketmia*

DC., Prod. 1 (1824) 448; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 195, *ampl.* — *Hibiscus* sect. *Trichospermum* Hochr., *l.c.* 92.

Lectotype: *H. pruriens* Roxb. ex Hornem. (cf. Hochr., in Fl. Madag. fam. 129, 1955, 76).

Note: Sect. *Trichospermum* Hochr., to which *H. panduriformis* Burm. f. belongs, differs from the present section only slightly in the indumentum of the seeds and has, therefore, been united with sect. *Ketmia*.

41. *Hibiscus panduriformis* Burm. f., Fl. Ind. (1768) 151, t. 47 f. 2; DC., Prod. 1 (1824) 455; W. & A., Prod. (1834) 50; Span., Linnaea 15 (1841) 169; Miq., Fl. Ind. Bat. 1, 2 (1858) 157; Thw., En. Pl. Zeyl. (1858) 26; Benth., Fl. Austr. 1 (1863) 215; Kurz, J. As. Soc. Beng. n.s. 43, ii (1874) 101; Mast., in Fl. Br. Ind. 1 (1875) 338; Trimen, Handb. Fl. Ceyl. 1 (1893) 154; Bailey, Queensl. Fl. 1 (1899) 129; Backer, Fl. Bat. 1 (1907) 126; Schoolf. Java (1911) 123; Koord., Exk. Fl. Java 2 (1912) 585; Ewart & Davies, Fl. North. Terr. (1917) 186; Merr., Philip. J. Sc. 19 (1921) 365; Domin, Bibl. Bot. 22 (1928) 959, f. 165; Backer, Onkruidfl. Jav. Suikerr. (1930) 444, atlas t. 419; Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 23; Hochr., in Fl. Madag. fam. 129 (1955) 56, t. 18 f. 1—2; Exell, Fl. Zamb. 1 (1961) 463, t. 89 f. 10; Backer & Bakh. f., Fl. Java 1 (1963) 431. — *Abelmoschuspanduriformis* (Burm. f.) Hassk., Tijd. Nat. Gesch. Phys. 10 (1843) 134; Cat. Hort. Bog. (1844) 198. — *H. tubulosus* Cav., Diss. 3 (1787) 161, t. 68 f. 2, *nom. superfl., illeg.*; DC., Prod. 1 (1824) 447; Blume, Bijdr. 2 (1825) 67; Roxb., Fl. Ind. ed. Carey 3 (1832) 196; Decne, Herb. Timor. (1835) 104; Span., Linnaea 15 (1841) 169; Miq., Fl. Ind. Bat. 1, 2 (1858) 158. — *H. panduriformis* var. *tubulosus* (Cav.) Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 96. — *H. velutinus* DC., Prod. 1 (1824) 452. — *H. setosus* (non Roxb.) Wall., Cat. (1829) n. 1902, *quoad specim.*

Types: *H. panduriformis* Burm. f. and *H. tubulosus* Cav.: Burm. f., Fl. Ind. t. 47 f. 2 (holotype); *H. velutinus* DC.: Timor, Riedlé *s.n.* (holotype: G-DC).

Herb or undershrub,  $\frac{1}{2}$ —2 $\frac{1}{2}$  m. Stems stout, stellate-velutinous to -tomentose, mostly with numerous, large, stiff, shining, prickly stellate hairs, often also with scattered, thin, simple hairs, glabrescent. Lower leaves orbicular to broadly ovate, at base deeply cordate, palmilobed with triangular, acuminate segments; higher leaves smaller, oblong, less lobed or not, at base shallowly cordate and at apex acuminate; blade 2—18 by  $\frac{1}{2}$ —14 cm, coarsely serrate to dentate or crenate, of the uppermost leaves almost entire, at base 5—9-nerved, above stellate-velutinous, glabrescent, beneath cinereously stellate-tomentose, often with scattered, large, prickly stellate hairs; petiole 1—14 cm, stellate-velutinous to tomentose, without prickly stellate hairs, but often with thin, simple hairs. *Stipules* linear, usually 2—3-parted with filiform segments, 5—10 mm, stellate-hairy. *Flowers* axillary, solitary, through decrescence of the upper leaves often in terminal racemes. Pedicel short, 4—15 mm, accrescent to 55 mm, jointed near apex, stellate-velutinous or -tomentose, moreover mostly densely clothed with prickly stellate hairs. *Epicalyx segments* 7—12, shortly connate at base, shorter than or as long as calyx, spatulate,

obtuse, 10—20 by 2—3 mm, stellate-velutinous. *Calyx* campanulate, 12—22 mm high,  $\pm$  accrescent, 5-lobed; segments ovate, obtuse, 8—10 by 4—7 mm, 3-nerved; calyx outside stellate-velutinous and with numerous large, prickly stellate hairs, inside sericeous. *Corolla* yellow with a dark purple centre; petals obovate, at apex rounded, 15—35 by 20—25 mm, outside on the covering side stellate-tomentose, inside glabrous. *Staminal column* c. 10 mm, glabrous, dark purple, antheriferous throughout; filaments  $\frac{1}{2}$ —1 mm; anthers c.  $\frac{1}{2}$  mm. *Ovary* hairy, 5-celled; style arms 3—5 mm, purple; stigmas long hairy. *Capsule* enclosed by calyx, ovoid to globose, acute to acuminate, 10—17 mm  $\varnothing$ , hirsute by simple hairs, also stellate-velutinous; valves inside smooth, shining. *Seeds*  $\infty$ , reniform, angular, c. 2 $\frac{1}{2}$  mm, concentrically ribbed, brown, shortly hairy or glabrous.

*Distribution:* Semi-arid regions of tropical Africa, Asia, and Australia. In Malasia mainly in Java (Djakarta, Central and particularly East Java; also in Madura and Kangean Is.), the Lesser Sunda Islands (Sumba, Timor), SW. Celebes, and the Philippines (once at Manila, coll. Perrottet, in L; correctly localized?).

*Ecology:* Dry regions: in teak forest, secondary vegetation, roadsides and fallow fields, at lower altitude up to c. 300 m, a characteristic species of areas subject to a rather strong dry annual period (cf. p. 14).

*Notes:* No authentic specimen of Burman *f.* has thus far been traced. Therefore the plate of Burman *f.* must serve as the type. Although the description and figure are rather poor, the identity of the species is clear.

Cavanilles mentioned Burman's name as a synonym under his *H. tubulosus* Cav., which is accordingly a superfluous name. He referred to living specimens in the botanic garden at Paris. Illustrative dried specimens collected in that garden are preserved in the Herbarium Cavanilles (M), in the Herbarium de Jussieu (P-JU n. 12359a), and in the Herbarium of Lamarck (P-LA).

De Candolle (1824) mentioned *H. panduriformis* Burm. *f.* under the heading 'Species non satis notae'; he recorded the same species as *H. tubulosus* Cav. under sect. *Cremontia*, and described it also as a new species (*H. velutinus* DC.) under sect. *Abelmoschus* (*sensu* DC.). Spanoghe (1841) listed under two subsequent numbers *H. panduriformis* Burm. *f.* with *H. tubulosus* Cav. as a synonym, and *H. tubulosus* Decne (*non* Cav.), though there is no essential difference between the specimens Spanoghe and Decaisne examined. Possibly slight differences in the density of the indumentum or differences in stage (the superior leaves are much narrower and less incised than the inferior ones), and lack of knowledge as well caused these errors.

As already pointed out (p. 49) there exists some confusion in the herbarium of Wallich, who apparently distributed specimens of the present species (*Wallich* n. 1902) under the name of *H. setosus* Roxb., which is a synonym of *H. macrophyllus* Roxb. *ex* Hornem. The confusion of Wallich has been perpetuated in some later synoptical works.

Hochreutiner (1900) listed three varieties. The Malesian specimens belong to his var. *tubulosus* (Cav.) Hochr., correctly var. *panduriformis*. Var. *senegalensis* (Guill. & Perr.) Hochr. is restricted to tropical Africa. Var. *australis* Hochr., characterized by longer pedicels, larger flowers, and densely tomentose green parts, occurs in Northern Australia, but can be expected in the Lesser Sunda Islands.

**42. *Hibiscus lunariifolius*** Willd., Sp. Pl. 3 (1800) 811; DC., Prod. 1 (1824) 451; W. & A., Prod. (1834) 49; Wight, Ic. 1 (1838) t. 6; Miq., Fl. Ind. Bat. 1, 2 (1858) 159; Mast., in Fl. Br. Ind. 1 (1875) 338; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 160; Backer, Schoolf. Java (1911) 124; Bkn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 23; Exell, Fl. Zamb. 1 (1961) 459; Backer & Bakh. *f.*, Fl. Java 1 (1963) 432. — *H. pruriens*

Roxb. [Hort. Beng. (1814) 51, *nom. nud.*] *ex* Hornem., Hort. Hafn. 1 (1815) 79; Roxb., Fl. Ind. ed. Carey 3 (1832) 196. — *H. racemosus* Lindl., Bot. Reg. 10 (1825) t. 917. — *H. lunariifolius* var. *racemosus* (Lindl.) Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 160. — *H. petiolosus* Miq., Fl. Ind. Bat. 1, 2 (1858) 159. — *H. radiatus* (*non* Cav.) Britten, in Forbes, Natur. Wand., App. 6 (1885) 500.

Types: *H. lunariifolius* Willd.: India, Tranquebar, *Klein s.n.* (holotype: B-W n. 12866); *H. pruriens* Roxb. *ex* Hornem.: India, Roxburgh *s.n.* (holotype: C); *H. racemosus* Lindl.: Lindley, Bot. Reg. 11, t. 917 (holotype); *H. petiolosus* Miq.: Java, Mt Ringgit, *Zollinger 2781* (holotype: P; isotypes: BM, BO, U).

Herb or undershrub, 1½–2½ m. Stems 1–5 mm ø, almost all parts sparsely to densely set with characteristic, stiff, shining, tribrachiate yellow stellate hairs, glabrescent; stem also with scattered, short, soft, simple hairs, occasionally stellate-tomentose. *Leaves* orbicular to ovate, rarely lanceolate, 1–9 by ½–8 cm, at base cordate or rounded, at apex acute to acuminate, lower leaves 3–5-lobed with triangular, acute to acuminate segments, often hastate, coarsely serrate to dentate, at base 5-nerved, above scattered, beneath densely stellate-hairy, occasionally stellate-tomentose; petiole 1–12 cm, sparsely stellate-hairy, also with soft simple hairs, occasionally stellate-tomentose. *Stipules* setaceous, 1–2 mm. *Flowers* axillary, solitary or by abortion of upper leaves in terminal, simple racemes. Pedicel very short, stout, c. 5 mm, accrescent to 15 mm, inarticulate, densely stellate-hairy. *Epicalyx segments* 5–6(–10), free or nearly so, linear to narrowly lanceolate, acute, c. 10–15 by 1½–2 mm, ± accrescent, short-hairy, glabrescent. *Calyx* campanulate, c. 10 mm high, ± accrescent, 5-parted, with wide rounded sinuses; segments long triangular, acuminate, c. 7 by 3 mm, prominently 3-nerved; calyx parallel-nerved, outside short-hairy on the nerves and the apices of the segments, also with some tribrachiate stellate hairs, inside short-hairy on the segments. *Corolla* medium-sized, yellow with a dark purple centre; petals obovate, at apex rounded, c. 5–6 by 4–5 cm long, outside densely stellate-pubescent, also with some tribrachiate stellate hairs. *Staminal column* 1½–2 cm, antheriferous nearly throughout; filaments and anthers c. 1 mm; style arms 2–3 mm. *Capsule* globose to obovoid, 15–18 mm ø, with a rostrum of 2½–3 mm, densely coarsely stellate-hairy; valves inside smooth and glabrous. *Seeds* ∞, reniform, 2–2½ mm, angular, punctate by minute stellate hairs, black.

*Distribution*: Tropical Africa, India; in Malesia rare: East Java (also in Madura and Kangean Is.), Lesser Sunda Islands (Lombok, Sumba, Timor, Alor), SW. Celebes, and Buton I. near SE. Celebes.

*Ecology*: Secondary vegetation and waste places in areas subject to a rather strong dry season, at low altitude up to c. 100 m (cf. p. 14).

*Notes*: *H. pruriens* Roxb. *ex* Hornem. was based on a Roxburgh specimen preserved in the herbarium at Copenhagen. Isotypes with the name of *H. pruriens* in the handwriting of Roxburgh are present at Kew (K-W n. 1892B), and Brussels (BR-Herb. Martius).

I have seen two sheets of *Zollinger 2781* with the name of *H. petiolosus* Miq. in Miquel's handwriting, the one at Utrecht obviously being a fragment retained by Miquel.

Miquel recorded *H. petiolosus* Miq. and *H. lunariifolius* Willd. on the same page of his flora. Under the last mentioned name he gave a description which he possibly took from Indian botanical works (*H. pruriens* Roxb., Hort. Beng., is cited as a synonym!); he quoted *Zollinger 2470* with a question-mark. All specimens of *Zollinger 2470* which I have examined belong, however, to *Abelmoschus crinitus* Wall. In the Herbarium of Utrecht there is a sheet (U 31063B), with a single leaf and a flower in bud both belonging to *H. lunariifolius* Willd., bearing the annotation *Zollinger* and the identification by

Miquel, *H. lunariifolius*. As a matter of fact most Zollinger specimens at Utrecht are without number; they were separated and retained from a set which Miquel borrowed from the Herbarium at Paris. Without doubt the Utrecht specimen is the one Miquel mentions under *H. lunariifolius*, and the number 2470 cited is an error for 2781. The respective descriptions of Miquel show only differences which fall within the range of variability of the species, inclusive of the numbers of epicalyx segments. Miquel stated about 10 for *H. lunariifolius* and for *H. petiolosus* 5; both, however, are the extreme numbers possible in the species.

The species is always recognizable by the indument of brittle, shiny, yellow, tri-brachiate hairs.

### 9. Section *Pterocarpus*

Garcke, Bot. Zeit. 7 (1849) 836; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 168. — Fioria Mattei, Bol. Ort. Bot. Palermo n.s. 2 (1917) 71; Kearney, Leaf. West. Bot. 7 (1955) 272.

Type: *H. vitifolius* L.

Note: Kearney (1955) shared Mattei's opinion that Garcke's section should be considered a separate genus, intermediary between *Hibiscus* and *Kosteletzkya* (cf. p. 85).

**43. *Hibiscus vitifolius* Linné, Sp. Pl. (1753) 696; Cav., Diss. 3 (1787) 145, t. 58 f. 2; DC., Prod. 1 (1824) 450; Blume, Bijdr. 2 (1825) 69; Roxb., Fl. Ind. ed. Carey 3 (1832) 200; Decne, Herb. Timor. (1835) 103; Span., Linnaea 15 (1841) 169; Miq., Pl. Jungh. (1854) 283; Fl. Ind. Bat. 1, 2 (1858) 160; Thw., En. Pl. Zeyl. (1858) 26; Benth., Fl. Austr. 1 (1863) 215; Mast., in Fl. Br. Ind. 1 (1875) 338; F. v. M., Descr. Not. Pap. Pl. 4 (1876) 56; Hemsl., Rep. Voy. Chall. (Bot.) 1, 3 (1885) 125; Trimen, Handb. Fl. Ceyl. 1 (1893) 154; Bailey, Queensl. Fl. 1 (1899) 129; Baker f., in Andrews, Mon. Christmas I. (1900) 173; Ridley, J. Str. Br. R. As. Soc. 45 (1906) 175; Gagn. in Fl. Gén. I.-C. 1 (1910) 424; Backer, Schoolfl. Java (1911) 124; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 8; Koord., Exk. Fl. Java 2 (1912) 585; Merr., Philip. J. Sc. 11 (1916) Bot. 290; op. cit. 13 (1918) 30; En. Philip. Fl. Pl. 3 (1923) 39; Craib, Fl. Siam. En. 1 (1925) 161; Backer, Onkruidfl. Jav. Suikerr. (1930) 445, atlas t. 420; Doct. van Leeuwen, Blumea 2 (1937) 269; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 23; Hochr., in Fl. Madag. fam. 129 (1955) 74, t. 20 f. 2-4; Brenan & Exell, Bol. Soc. Brot. II, 32 (1958) 72; Exell, Fl. Zamb. 1 (1961) 470; Backer & Bakh. f., Fl. Java 1 (1963) 432. — *Abelmoschus vitifolius* (L.) Hassk., Cat. Hort. Bog. (1844) 198. — *Fioria vitifolia* (L.) Mattei, Bol. Ort. Bot. Palermo n.s. 2 (1917) 71; Kearney, Leaf. West. Bot. 7 (1955) 273. — *H. obtusifolius* Willd., Sp. Pl. 3 (1801) 829; Rchb. f., Ic. Exot. (1828) t. 162. — *H. lepidospermus* Miq., Fl. Ind. Bat. 1, 2 (1858) 159; Mast., in Fl. Trop. Afr. 1 (1868) 197; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 164; op. cit. 6 (1902) 52; Backer, Schoolfl. Java (1911) 124. — *H. heterotrichus* DC., Prod. 1 (1824) 450. — *H. vitifolius* var. *heterotrichus* (DC.) Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 170; Backer, Fl. Bat. 1 (1907) 143; Hochr., in Fl. Madag. fam. 129 (1955) 74, t. 20 f. 2-4. — *Abelmoschus vitifolius* var. *mollis* Hassk., Tijd. Nat. Gesch. Phys. 12 (1845) 90. — *H. vitifolius* var. *genuinus* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 169. — *H. vitifolius* var. *genuinus* f. *indicus* Hochr., l.c. — *H. vitifolius* var. *genuinus* f. *zeylanicus* Hochr., l.c. — *H. vitifolius* ssp. *vulgaris* Brenan & Exell, Bol. Soc. Brot. II, 32 (1958) 73. — *Katu-Beloeren* Rheede, Hort. Malab. 6, p. 79, t. 46.**

Types: *H. vitifolius* L.: Herb. Hermann, Vol. IV, fol. 39, Linn. n. 265 (lectotype: BM,

cf. Brenan & Exell, 1958, 70); *H. obtusifolius* Willd.: India, Klein *s.n.* (holotype: B-W n. 12899); *H. heterotrichus* DC.: *s. loc.*, *s. coll. s.n.* (holotype: G-DC); *H. lepidospermus* Miq.: Java, Puger, Zollinger 2730 (holotype: P; isotypes: BM, P); *Abelmoschus vitifolius* var. *mollis* Hassk.: Bogor, Botanic Gardens, Teijsmann *s.n.* (lectotype: L 908.136-69); *H. vitifolius* var. *genuinus* f. *indicus* Hochr.: India, Wight n. 211 (syntype: G; duplicates: K, P); *H. vitifolius* var. *genuinus* f. *zeylanicus* Hochr.: Ceylon, Thwaites 1122 (syntype: G; duplicate: BM, *p.p.*); *H. vitifolius* ssp. *vulgaris* Brienan & Exell: Angola, Welwitsch 5236 (holotype: BM).

Herb or undershrub,  $\frac{1}{2}$ –2 $\frac{1}{2}$  m. Stems, with or without minute bulbous-based prickles, as the petioles and pedicels more or less densely pubescent by simple hairs, rarely tomentose, usually also with larger, brittle, tribrachiate stellate hairs, and gland-hairs. Lower leaves orbicular in outline, at base 3–5-lobed with deltoid to triangular and acute to acuminate segments; middle leaves ovate, at base shallowly cordate, with smaller lateral lobes; upper leaves ovate to oblong, at base truncate to rounded, at apex acute to acuminate, not lobed; blade 4–12 $\frac{1}{2}$  by 2–12 cm, coarsely dentate to serrate, at base 5–7-nerved, on both surfaces stellate-pubescent, rarely tomentose, usually with tribrachiate stellate hairs, on the nerves also with simple hairs and usually with gland-hairs; petiole 1–12 cm. *Stipules* filiform, 2–4 mm. *Flovers* axillary, solitary, by reduction of the upper leaves often seemingly in racemes. Pedicel 1 $\frac{1}{2}$ –3 cm, accrescent to 5 cm, articulated  $\pm$  above the middle. *Epicalyx segments* 8–12, free, primarily erect, ultimately spreading or reflexed, linear to filiform, acute, 8–12 by  $\frac{1}{2}$ – $\frac{3}{4}$  mm,  $\pm$  accrescent, simply pubescent, also with some gland-hairs. *Calyx* campanulate, 5-parted, 10–14 mm  $\varnothing$ ; segments ovate to triangular, acute to shortly acuminate, 6–9 by 4–6 mm; calyx outside with simple hairs, mostly also with tribrachiate stellate hairs and gland-hairs, inside pubescent by simple hairs, strongly accrescent to *c.* 3 cm  $\varnothing$ . *Corolla* yellow with a dark purple centre; petals obovate, obtuse or rounded, 2 $\frac{1}{2}$ –5 by 1 $\frac{1}{2}$ –3 cm, outside with scattered simple and stellate hairs, inside near the base with some gland-hairs. *Staminal column* 1–1 $\frac{1}{2}$  cm, glabrous, antheriferous throughout or nearly so. *Ovary* ovoid, obtuse, 5-angular, *c.* 4 mm high, sericeous, 5-celled; style arms 3–4 mm, with gland-hairs; stigmas clavate, hairy. *Capsule* globular, depressed, shorter than the calyx, 10–15 mm  $\varnothing$ , with a beak *c.* 3 mm long, with 5, during dehiscing splitting wings, simply hairy, on the keels of the wings simply bristly. *Seeds* 2–4 per cell, rarely by abortion 1, reniform, *c.* 3 mm  $\varnothing$ , verruculose, glabrous, black-brown.

*Distribution*: Tropical and subtropical regions of the Old World; rarely introduced in America. In Malasia in Christmas I. (S. of Java), Java (Djakarta, Central and East Java; also in Madura and Kangean Is.), Lesser Sunda Islands (Lombok, Sumbawa, Flores, Timor, Alor, Wetar), Celebes (also Saleyer and Buton Is.), the Philippines (Manila; Mindanao), the SE. Moluccas (Leti, Tanimbar Is.), and once in SE. New Guinea (Moresby).

*Ecology*: Bound to areas subject to an annual dry period, on waste grounds, young secondary vegetation, forest edges, teak-forest, and young forest, in the lowland below *c.* 150 m (cf. p. 14).

*Notes*: The typification of *H. vitifolius* L. has been elucidated by Brenan & Exell (1958). They choose a Hermann specimen as a lectotype, on account of the diagnosis of Linnaeus in *Species Plantarum* which was taken from Flora Zeylanica.

The type material of *H. obtusifolius* Willd. consists of two sheets bearing specimens collected by Klein in India. The specimens do not differ essentially, and together can be considered the holotype.

*H. heterotrichus* DC. was based on a specimen of unknown origin (possibly Timor), which is mainly characterized by a covering of prickles on the green parts.

The sole specimen of Zollinger 2730 with the name of *H. lepidospermus* Miq. in Miquel's handwriting is preserved at Paris. Hochreutiner (1900) mentioned Zollinger 2370 twice: first l.c. 164 as the type of *H. lepidospermus* Miq., which he believed to be a relative of *H. lunariifolius* Willd., and also l.c. 170 under *H. vitifolius* var. *heterotrichus* (DC.) Hochr. The Zollinger material consists partly of sheets, e.g. the type specimen of *H. lepidospermus* Miq., which have no fruit, a fact which may explain the confusion (see also below).

Miquel mentioned *H. lepidospermus* Miq. and *H. vitifolius* L. separately on page 159 and 160 respectively of his Flora. He distinguished the first from the second, as abstracted from the descriptions, by a dense, more or less tomentose indumentum, and by the occurrence of minute prickles; both characters fall, however, within the range of variability accepted here. Many species, not only of *Malvaceae*, show a better developed indumentum in more open, sunny habitats.

*Abelmoschus vitifolius* var. *mollis* Hassk. represents a tomentose form. It can be typified by a specimen at Leyden, which was collected in the Botanic Garden of Bogor by Teijsmann for Hasskarl, and which bears the name in the handwriting of the latter.

Hochreutiner (1900) gave several syntypes for his formae *indicus* Hochr. and *zeylanicus* Hochr. I have not seen these at Geneva, except for Wight 211, and Thwaites 1122, so that lectotypes cannot be designated. Brenan & Exell (1958), who did not designate lectotypes, have found that Thwaites 1122 (BM) can be considered in part a duplicate of Hochreutiner's syntype. The Thwaites number is apparently heterogeneous with respect to the varietal characters.

*H. vitifolius* shows a fairly large variability in the density of the indumentum, the deepness of the leaf-incisions, and the occurrence of prickles. I have not succeeded to draw a satisfactory subdivision. Field observations in the Tanimbar Islands led me to conclude that the density of the indumentum is at least partly correlated with habitat. In sunny places the indumentum is usually denser than in the shade, where completely glabrous specimens may be found. The deepness of the leaf-incisions and the number of prickles are very variable even in one plant.

Brenan & Exell (1958) have subdivided the species into two subspecies, primarily according to the density of the indumentum. They claim that ssp. *vitifolius* with leaves and stems being 'glabrous or rather sparsely hairy' occurs in 'rain-forest habitats', whereas ssp. *vulgaris* Brenan & Exell with leaves and stems being 'tomentose, tomentellous . . . to hispid' is found in 'woodland and grassland habitats'.

In Malesia it is never found in rain-forest; in Africa it may have a different ecology or the concept of rain-forest may be different.

Unarmed specimens without flowers, in particular those without fruit, can easily be confused with *H. lunariifolius* Willd., as *H. vitifolius* also possesses tribrachiate, stellate hairs, which are, however, less numerous, smaller, and less shiny. Gland-hairs, which are mostly present in *H. vitifolius*, are unknown in *H. lunariifolius* Willd.

#### EXCLUDED SPECIES

*Hibiscus calyphyllus* Cav. At Kew there is a specimen of this African species, labelled Java, Buysman 53, which, no doubt, was collected from a plant cultivated in the garden at Nongkodjadar, Mt Tengget, East Java.

*H. hooglandianus* Kosterm., Reinwardtia 5 (1960) 235, f. 1 = *Papuodendron hooglandianum* (Kosterm.) Borss., *comb. nov.* (*Bombacaceae*).

*H. papuodendron* Kosterm., Reinwardtia 5 (1960) 235 = *Papuodendron lepidotum* C. T. White, J. Arn. Arb. 27 (1946) 272, t. 1 (*Bombacaceae*).

*Hibiscus platanifolius* (Willd.) Sweet, an Indian species, *H. splendens* Graham, an Australian species, and *H. furcatus* Roxb., *non* Willd. an Indian form of *H. surattensis* L., were mentioned by Backer (Schoolfi.



Java, 1911) as having been cultivated in Java. I have seen only specimens from the Botanic Gardens at Bogor.

## REJECTED INVALIDLY PUBLISHED NAMES

*Hibiscus acetosus* Noroña, Verh. Bat. Gen. 5 (1790) 17, *nom. nud.*

*Hibiscus barbatus* Noroña, Verh. Bat. Gen. 5 (1790) 17, *nom. nud.* Probably *H. macrophyllus* Roxb. ex Hornem.; cf. Hassk., Tijds. Nat. Gesch. Phys. 11 (1844) 223.

*Hibiscus coelestis* Noroña, Verh. Bat. Gen. 5 (1790) 17, *nom. nud.*

*Hibiscus malvarosa* Noroña, Verh. Bat. Gen. 5 (1790) 17, *nom. nud.*

*Hibiscus mollis* Zipp. ex Span., Linnaea 15 (1841) 169, *nom. in synonym.* A name without standing = *H. panduriformis* Burm. f.

*Hibiscus pruriens* Noroña, Verh. Bat. Gen. 5 (1790) 17, *nom. nud.* Possibly *Abelmoschus manihot* (L.) Medicus ssp. *tetraphyllus* var. *pungens* (Roxb.) Hochr.

*Hibiscus ricinoides* Zipp. ex Span., Linnaea 15 (1841) 170, *in synonym.* = *Abelmoschus manihot* (L.) Medicus ssp. *manihot*.

*Hibiscus trinitarius* Noroña, Verh. Bat. Gen. 5 (1790) 17, *nom. nud.* Probably *H. surattensis* L. The vernacular name of Noroña applies to more than one species.

## 2. KOSTELETZKYA

Presl, Reliq. Haenk. 2 (1835) 130; B. & H., Gen. Pl. 1 (1862) 206; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 50; Kearney, Am. Midl. Nat. 46 (1951) 109; Hochr., in Fl. Madag. fam. 129 (1955) 98.

Herbs, undershrubs or shrubs with stellate hairs. *Leaves* entire or mostly palmilobed to -parted. *Flowers* mostly axillary, solitary, sometimes in axillary, reduced racemes. Pedicel usually inarticulate. *Epicalyx segments* 4—∞, free, persistent. *Calyx* campanulate, mostly with a distinct nervation, persistent. *Corolla* small or medium-sized, of various colour. *Staminal column* shorter than the petals, mostly antheriferous throughout. *Carpels* 5. *Ovary* 5-celled; ovules 1 per cell; style 1, distally 5-branched; stigmas capitate. *Capsule* 5-angular to -alate, loculicidally dehiscent, 5-celled. *Seeds* 1 per cell.

*Distribution*: About 50 spp. in tropical America (mainly Mexico) and Africa, 2 spp. in Malesia. Though there is a possibility that the Malesian spp., the only in Asia, have been introduced in post-Columbian time, neither of them has been matched with any described species.

*Note*: It is doubtful whether *Kosteletzkya* in the wider sense, for example of Hochreutiner (1955), can be considered a natural genus. In his study of the Madagascan species he gave a subdivision into two sections, viz. sect. *Azanzoides* Hochr. comprising ligneous species with many characters of *Hibiscus* sect. *Azanza* DC., and sect. *Eukosteletzkya* Hochr. including the herbaceous species, which resemble those of *Hibiscus* sect. *Pterocarpus* Hochr., in particular with respect to the alate or angular capsules (cf. Kearney, Leaflet West. Bot. 7, 1955, 272—273). As a matter of fact the sole difference between *Hibiscus* and *Kosteletzkya* lies in the number of ovules and seeds per cell, one in the latter and more than one in the former. A monographical treatment of *Kosteletzkya*, of which most species occur in tropical America, and a close comparison with *Hibiscus* as a whole, is highly desirable.

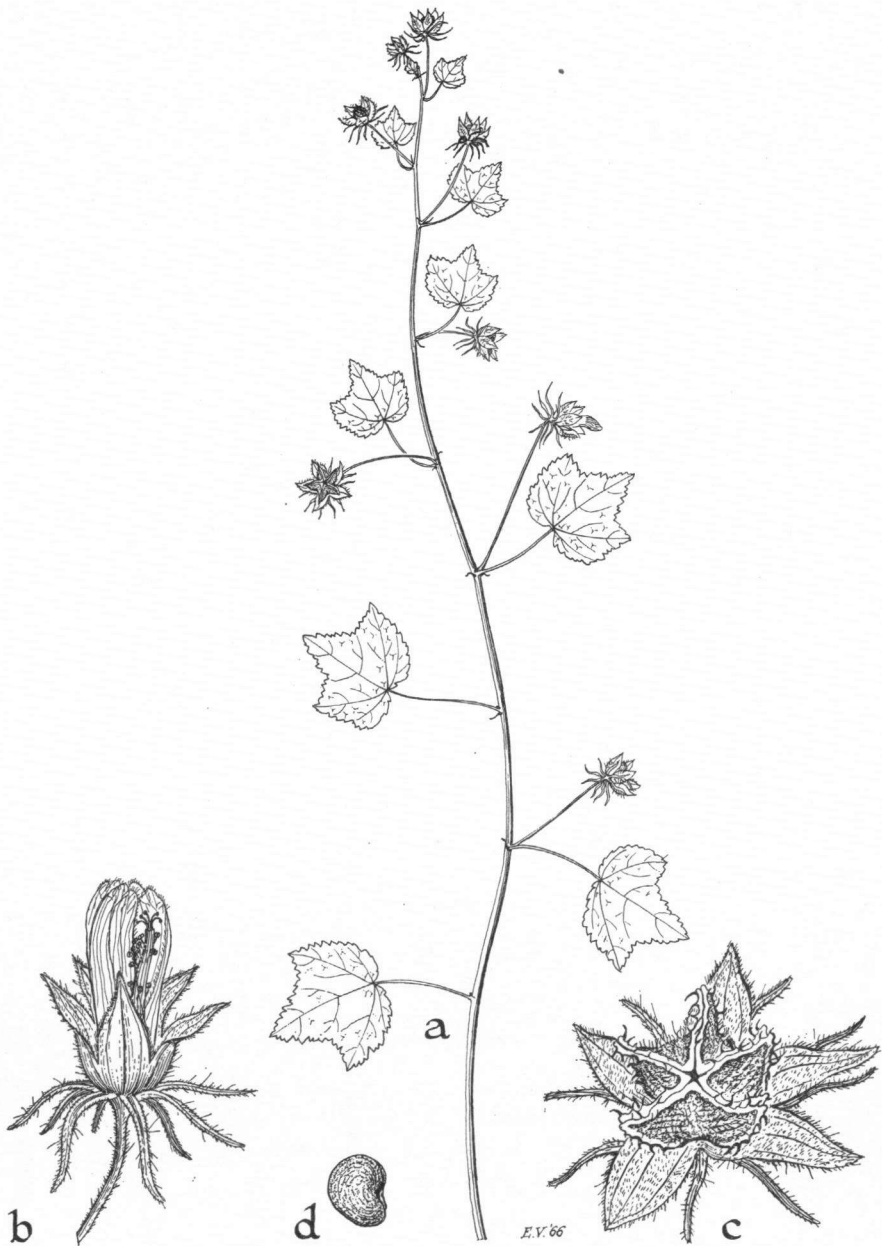


Fig. 12. *Kosteletzkyia batavensis* (Blanco) Fern.-Vill. a. Habit,  $\times \frac{1}{2}$ , b. flower,  $\times 2\frac{1}{2}$ , c. fruit,  $\times 2\frac{1}{2}$ , d. seed,  $\times 5$  (Ramos BS 41647).

## KEY TO THE SPECIES

1. Epicalyx segments *c.* 7, linear to filiform, 4—5 mm. Calyx 5 mm high, 8 mm  $\varnothing$ , segments 3 by  $2\frac{1}{2}$  mm. Petals 1 cm long. Capsule 2 cm stalked. Seeds 2 mm  $\varnothing$  . . . . . 1. *K. batacensis*  
 1. Epicalyx segments 5, lanceolate, short-connate at base, 15 by 3 mm. Calyx *c.* 11 mm  $\varnothing$ , segments 7 by  $3\frac{1}{2}$  mm. Petals  $2\frac{1}{2}$  by  $1\frac{1}{2}$  cm. Capsule *c.* 1 cm stalked. Seeds 4 mm  $\varnothing$  . . . . . 2. *K. wetarensis*

**1. *Kosteletzkya batacensis*** (Blanco) Fern.-Vill., *Novis. App.* (1880) 24; Merr., *Philip. J. Sc.* 4 (1909) Bot. 290; *Fl. Manila* (1912) 321; *Sp. Blanc.* (1918) 19, 255; *En. Philip. Fl. Pl.* 3 (1923) 41. — *Hibiscus batacensis* Blanco, *Fl. Filip.* (1837) 544; ed. 2 (1845) 380; ed. 3, 2 (1879) 334. — **Fig. 12.**

Type: Luzon, Manila, *Merrill, Sp. Blanc. 877* (neotype: GH; isotypes: BO, L, P, US).

Trailing or decumbent to ascendent herb. Stems usually rooting at the nodes, stellate-pubescent, glabrescent. *Leaves* orbicular, mostly somewhat 3-lobed, at base cordate, at apex obtuse to rounded, 1—4 cm  $\varnothing$ , coarsely crenate to serrate, at base 5—7-nerved, without nectaries, on both surfaces stellate-pubescent, glabrescent; petiole  $\frac{1}{2}$ — $9\frac{1}{2}$  cm, stellate-pubescent. *Stipules* filiform to lanceolate,  $1\frac{1}{2}$ —4 mm, ciliate. *Flowers* axillary, solitary. Pedicel short,  $\frac{1}{2}$ —1 cm, inarticulate, stellate-pubescent, accrescent to  $2\frac{1}{2}$  cm. *Epicalyx segments c.* 7, spreading, after flowering reflexed, linear to filiform, 4—5 mm, stellate-ciliate. *Calyx* widely campanulate, *c.* 5 mm high and 8 mm  $\varnothing$ , 5-fid; segments ovate, shortly acuminate *c.* 3 by  $2\frac{1}{2}$  mm, accrescent; calyx outside densely pubescent by minute stellate hairs, also with some long, simple hairs, obsoletely nerved, inside glabrous or nearly so. *Corolla* pink; petals *c.* 10 mm long, outside stellate-hairy. *Staminal column* shorter than the petals. *Capsule* flattened-globose, with 5 prominent wings, 4—5 mm high and *c.* 9—12 mm  $\varnothing$  (with the wings); wings downwards rounded, upwards flattened, carinate and with an erecto-patent beak; capsule outside pubescent by simple hairs, on the crest of the wings with stiff, somewhat reflexed hairs, dehiscing along the wings; valves inside smooth and glabrous. *Seeds* reniform, *c.* 2 mm  $\varnothing$ , dark brown, glabrous, with minute warts in concentric lines.

*Distribution:* Philippines (Luzon: Prov. Pampanga, Rizal, Ilocos Sur, Nuevo Ecija).

*Ecology:* In open waste places in the lowland, under seasonal climatic conditions, apparently of local occurrence.

*Notes:* In absence of a good plate a good specimen of Merrill, *Sp. Blanc. 877*, which matches Blanco's description very well, has been designated as the neotype.

Merrill (1909) reporting with the rediscovery of the plant by Mearns in Ilocos Sur wrote: 'A duplicate of Mearns's specimen was sent to Kew, and was reported as not matching any named species in the Kew Herbarium'. On my request Mr A. W. Exell, then at the British Museum, kindly searched for comparable material too, likewise without success. In habit it resembles the African *K. adoensis* (A. Rich.) Mast. very much, but differs at least by the indumentum, e.g. in having reflexed hairs on the capsules and a smaller, more prominently winged capsule.

**2. *Kosteletzkya wetarensis*** Borss., *sp. nov.* — **Fig. 13.**

Type: Wetar, Klitana, *Bloembergen 3806* (holotype: BO 117017; isotypes: K, L 960.38-097, SING, US).

*Suffrutex.* Caules, petioli et pedicelli pilis stellatis minutis obsiti. *Folia* herbacea, orbicularia vel late ovata vel deltoidea, basi cordata, apice acuminata, interdum 3-lobata, margine grosse crenata, palminei via, basi 5—7-nervia, utrinque pilis stellatis minutis vestita, glabrescentia; petiolus lamina brevior. *Stipulae* filiformes. *Flores* axillares, solitarii. *Pedicellus* brevis, inarticulatus, post anthesin paulo elongatus. *Epicalycis segmenta* 5, patentia



Fig. 13. *Kosteletzkya wetarensis* Borss. a. Habit, in flower,  $\times \frac{1}{8}$ , b. fruit, nat. size (Bloembergen 3806, type).

vel reflexa, basi breviter connata, lanceolata, acuta, sparse pilis stellatis minutis instincta. *Calyx* campanulatus, 5-partitus, segmentis oblongis acutis, 5-nervatus, extus stellatopilosus, intus glaber. *Corolla* media, alba, centro atroviolacea; petala obovata, subglabra. *Columna staminalis* petalis brevior, ab ima basi usque ad apicem stamina gerens, glabra, atroviolacea. Stylus breviter 5-ramosus; stigmata capitata. *Capsula* immatura, globosa, quinquecostata vel -alata, apice depressa, rostrata, 5-locularis. *Semina* 1 per loculum, immatura, reniformia, sparse pilis simplicibus induta, nigra.

Shrub, 1½ m. *Leaves* 5—15 by 3—11½ cm; *petiole* 4—9 cm. *Stipules* 3—7 mm. *Pedice*l c. 10 mm. *Epicalyx segments* c. 15 by 3 mm. *Calyx* c. 11 mm  $\varnothing$ ; segments c. 7 by 3½ mm. *Petals* c. 2½ by 1½ cm. *Staminal column* c. 15 mm. *Capsule* c. 9 mm  $\varnothing$ ; *rostrum* c. 2½ mm. *Seeds* c. 4 mm  $\varnothing$ .

LESSER SUNDA ISLANDS. Wetar: Klitana, near coast, *Pterocarpus* forest by river, alt. 2—50 m, *Bloembergen* 3806 (holotype: BO; isotypes: K, L, SING, US); shrub 1½ m, flowers white with dark violet centre, stamens dark violet, April 17/18, 1939.

*Distribution*: Lesser Sunda Islands (Wetar). The species might have been introduced long ago by the Portuguese, but it has not been possible to identify it with any species from America or Africa.

*Note*: The few immature, 5-seeded fruits point to the genus *Pavonia* as well as to *Kosteletzkya*. The five style arms mark it definitely as a *Kosteletzkya*.

### 3. ABELMOSCHUS

Medicus, *Malv.* (1787) 46; Hochr., *Candollea* 2 (1914) 81; Nova Guinea 14 (1924) 163; Kearney, *Am. Midl. Nat.* 46 (1951) 110. — *Hibiscus* sect. *Abelmoschus* (Medic.) DC., *Prod.* 1 (1824) 449; Hochr., *Ann. Cons. Jard. Bot. Genève* 4 (1900) 148.

*Lectotype*: *A. moschatus* Medicus.

Herbs or undershrubs, often prickly hairy. *Leaves* palmilobed to -parted, often hastate or sagittate, often with pennilobed to -parted segments, rarely entire, without extrafloral nectaries. *Flowers* axillary, solitary, often in racemes by reduction or abortion of the upper leaves. *Pedice*l inarticulate. *Epicalyx segments* 4—16, mostly persistent, free, occasionally shortly connate. *Calyx* spathaceous, at apex 5-toothed, splitting on one side during the expansion of the corolla, adnate to and falling with the corolla. *Corolla* large or medium-sized, mostly yellow with a dark purple centre, sometimes white or pink. *Staminal column* much shorter than the petals, antheriferous throughout. *Ovary* 5-celled; style 1, distally 5-branched; stigmas discoid. *Capsule* loculicidally dehiscent. *Seeds*  $\infty$  per cell, reniform, glabrous or hairy.

*Distribution*: Six spp. in S. and SE. Asia, and in N. Australia, introduced in the Pacific islands, tropical Africa, and tropical America as weeds or cultivated plants. All species occur in Malesia. Most forms occur in SE. Asia (Birma, Siam, Indo-China, and South China) which can be considered the centre of distribution.

*Ecology*: Waste places, road-sides, grassy vegetations, and light forests, particularly at low altitude. Some taxa are fire-resistant.

*Note*: Before 1924 in most Floras, synoptical works and monographs *Abelmoschus* was treated as a section of *Hibiscus*. In 1924 Hochreutiner re-established it as a genus on account of the fact that the calyx is adnate to the corolla and falls with the latter after flowering, and the calyx (shortly 5-toothed and spathaceous) characters occurring neither in the rest of *Hibiscus* nor in any other genus of *Malvaceae*. In most recent Floras *Abelmoschus* is now accepted as a distinct genus.

### KEY TO THE SPECIES

1. Epicalyx segments 6—16, linear to lanceolate, caducous after dehiscence of the capsule.
2. Epicalyx segments 10—16, 25—50 mm long, long linear to filiform. Capsule usually not exceeding the epicalyx, shortly ovoid to globose, terete, hispid . . . . . 5. *A. crinitus*
2. Epicalyx segments 6—10, rarely more, 5—20 mm long, mostly lanceolate. Capsule exceeding the epicalyx, terete, or faintly angular.

3. Mature capsule long fusiform, usually sulcate, 10—25 cm long. Stems glabrous or sparsely short-hairy and then rough. Pedicel  $\frac{1}{2}$ — $1\frac{1}{2}$  cm . . . . . 3. **A. esculentus**
3. Mature capsule ovoid to oblong, terete or faintly angular, up to 8 cm long, usually hispid, glabrescent; valves chartaceous, inside silvery. Stems usually hispid, rarely prickly (cf. *A. manihot*). Pedicel  $1\frac{1}{2}$ — $7\frac{1}{2}$  (—19) cm . . . . . 1. **A. moschatus**
1. Epicalyx segments 4—8, ovate, caducous after dehiscence of the capsule, rarely linear to lanceolate and then caducous before expansion of the corolla.
4. Epicalyx segments linear to lanceolate, caducous before expansion of the corolla. Calyx in bud lageniform. Capsule ovoid, terete to faintly angular, rough by short stiff hairs; costae not strongly prominent; valves chartaceous, inside silverish. Stems rough by short stiff hairs. 4. **A. ficulneus**
4. Epicalyx segments ovate, caducous after dehiscence of the capsule. Calyx in bud ovoid. Capsule ovoid-prismatical, 5-angular, hispid and usually prickly by long stiff hairs; costae strongly prominent; valves coriaceous, inside dull, brown. Stems whether or not hispid and prickly (cf. *A. moschatus*).
5. Epicalyx segments connate at base, mostly splitting by the expansion of the corolla, after flowering strongly accrescent and as long as the capsule or even longer . . . . . 6. **A. angulosus**
5. Epicalyx segments free, after flowering not strongly enlarged, much shorter than the capsule. 2. **A. manihot**

1. **Abelmoschus moschatus** Medicus, Malv. (1787) 46; *ampl.* Hochr., Candollea 2 (1924) 86; Nova Guinea 14 (1924) 164. — *Hibiscus abelmoschus* Linné, Sp. Pl. (1753) 696; *ampl.* Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 150.

See for types and synonyms under the subspecies and varieties.

Herb or undershrub,  $\frac{1}{4}$ — $1\frac{1}{2}$  m, with tap-root or root-tuber. Stems solid, rarely fistular, as the petioles and pedicels, and both surfaces of the leaves mostly hispid by simple hairs, usually also with minute stellate hairs, rarely glabrous. *Leaves* extremely variable in shape and size, in outline mostly orbicular to transversally elliptic, at base usually cordate, not incised, angular, or 3—7-palmilobed to -palmiparted, of the upper leaves usually narrower and often hastate or sagittate, with deltoid, triangular, ovate, obovate, spatulate, oblong, lanceolate or linear, sometimes pennilobed, obtuse, acute or acuminate segments, coarsely serrate to dentate, rarely entire, at base 5—9-nerved, without necraries. *Stipules* linear to filiform, simply hairy. *Flowers* axillary, solitary. Pedicel  $\pm$  accrescent. *Epicalyx segments* 7—10, rarely more, free, persistent, linear, filiform, lanceolate or oblong, usually acute, with simple hairs. *Calyx* outside stellate-tomentose, inside simply sericeous. *Petals* obovate, at apex rounded, at base fleshy and ciliate by simple hairs, for the rest scattered gland-hairs or glabrous. *Staminal column* mostly yellow, at base dark purple, glabrous. *Ovary* ovoid, hirsute; style hairy. *Capsule* ovoid or globose, occasionally fusiform, acuminate with a short rostrum, somewhat angular, usually hispid by simple, stiff hairs, often also with short simple hairs and minute stellate hairs, rarely glabrous, black or dark brown; valves chartaceous, inside smooth and shining. *Seeds* concentrically ribbed, somewhat warty, mostly glabrous, sometimes ferrugineously stellate-tomentose, black-brown.

*Note:* I have accepted the wide conception of *A. moschatus* Medicus as given by Hochreutiner (1900, l.c.). I have raised some of his varieties to the rank of subspecies, as their morphological characters of distinction are correlated with differences in their ecology; some other varieties are reduced.

#### KEY TO THE SUBSPECIES AND VARIETIES

1. Stout herbs or undershrubs up to c.  $1\frac{1}{2}$  m, with a long, slender tap-root; stems mostly retrorsely hispid, occasionally glabrous. Epicalyx segments in fruit usually appressed. Corolla yellow with dark purple centre. Capsule 5—8 cm long, mostly thinly hispid. Seeds glabrous or nearly so . . . **A. ssp. moschatus**
2. Pedicel 3—8 cm long, c. 2 mm  $\varnothing$ . Valves of the capsule chartaceous.
3. Stems always hispid, mostly evenly tinged red, rarely fistular. Epicalyx segments 7—10, linear, 8—15 by 1—2 mm . . . . . **Aa. var. moschatus**

3. Stems mostly glabrous and spotted red, usually fistular. Epicalyx segments 6—8, lanceolate, 17—25 by  $2\frac{1}{2}$ —5 mm. . . . . **Ab. var. betulifolius**
2. Pedicel very long and stout, after flowering 17—19 cm long, 3—4 mm  $\varnothing$ . Valves of the capsule coriaceous . . . . . **B. ssp. biakensis**
1. Smaller herbs up to c.  $\frac{3}{4}$  m, with a short tuber-like, turgid tap-root; stems usually patently hairy, rarely retrorsely hairy or prickly. Epicalyx segments in fruit spreading or reflexed, never appressed. Corolla mostly white or pink. Capsule 2—5 cm long, mostly densely hispid. Seeds mostly ferruginously tomentose . . . . . **C. ssp. tuberosus**

### **A. ssp. moschatus.**

Erect herb or undershrub,  $\frac{1}{2}$ — $1\frac{1}{2}$  m, with stout tap-root. Stems, petioles and pedicels usually densely retrorsely hispid by sometimes prickly simple hairs, often also with minute stellate hairs, rarely glabrous and in that case often purple-maculate. *Leaves* 6—22 by 3—24 cm; petiole 2—30 cm. *Stipules* 6—12 mm. *Pedicel* 3— $7\frac{1}{2}$  cm, slightly accrescent, up to 19 cm. *Epicalyx segments* 6—10, appressed against the calyx and ultimately against the capsule, linear to lanceolate, occasionally oblong, 8—20 by  $1$ — $2\frac{1}{2}$  mm. *Calyx* 20—35 mm long. *Corolla* yellow with a small dark purple centre; petals  $3\frac{1}{2}$ — $7\frac{1}{2}$  by  $2\frac{1}{2}$ — $5\frac{1}{2}$  cm. *Staminal column*  $1\frac{1}{2}$ —2 cm; filaments  $\frac{1}{2}$ —1 mm; anthers up to  $\frac{1}{2}$  mm. *Ovary* 6—8 mm high; style arms 2—3 mm. *Capsule* 5—8 cm long (with the rostrum), and  $2\frac{1}{2}$ — $3\frac{1}{2}$  mm  $\varnothing$  (rostrum of 4—7 mm), more or less densely hispid by simple hairs, glabrescent, valves papyraceous. *Seeds*  $3\frac{1}{2}$ —4 mm, mostly glabrous, rarely stellate-hairy, often smelling of musk.

**Aa. var. moschatus.** — *A. moschatus* Medicus, Malv. (1787) 46; Moench, Meth. Pl. (1794) 617; A. Gray, Bot. Wilkes U.S. Expl. Exp. (1854) 172; Thw., En. Pl. Zeyl. (1858) 27; Miq., Fl. Ind. Bat. 1, 2 (1858) 151; Suppl. (1860) 163; op. cit. (1861) 375; Fern.-Vill., Novis. App. (1880) 24; K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 439; Perk., Fragm. Fl. Philip. (1904) 111, p.p.?; Merr., Philip. J. Sc. 1 (1906) Suppl. 92; ? Val., Bull. Dép. Agr. Ind. Néerl. 10 (1907) 32; Merr., Philip. J. Sc. 3 (1908) Bot. 78, 419; Fl. Manila (1912) 321; Int. Rumph. Herb. Amb. (1917) 358, *excl. specim.*; Sp. Blanc. (1918) 254; En. Born. Pl. (1921) 375; Doct. van Leeuwen, Ann. Jard. Bot. Btzg 32 (1922) 173; Merr., En. Philip. Fl. Pl. 3 (1923) 40; Hochr., Candollea 2 (1924) 86, var. *genuinus* (Hochr.) Hochr.; ? Bartlett, Pap. Mich. Ac. Sc. 6 (1926) 55; Heyne, Nutt. Pl. (1927) 1037; Merr., Sarawak Mus. J. 3 (1928) 528; Backer, Onkruidfl. Jav. Suikerr. (1930) 446, atlas t. 421; Holth. & H. J. Lam, Blumea 5 (1942) 212; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 31; Hochr., in Fl. Madag. fam. 129 (1955) 7, t. 11; Hu, Fl. China, fam. 153 (1955) 38, t. 9 f. 1—4; Backer & Bakh. f., Fl. Java 1 (1963) 435. — *Hibiscus abelmoschus* Linné, Sp. Pl. (1753) 696; in Stickman, Herb. Amb. (1754) 15; Syst. Nat. ed. 10, 2 (1759) 1149; Amoen. Acad. 4 (1759) 126; Houttuyn, Nat. Hist. 2, 5 (1775) 415, t. 27 f. 2; Cav., Diss. 3 (1787) 167, t. 62 f. 2; DC., Prod. 1 (1824) 452; Roxb., Fl. Ind. ed. Carey 3 (1832) 53; Blanco, Fl. Filip. (1837) 545; ed. 2 (1845) 380; ed. 3, 2 (1879) 335, t. 245; Miq., Pl. Jungh. (1854) 283; Mast., in Fl. Br. Ind. 1 (1875) 342; K. Sch., Bot. Jahrb. 9 (1887) 209; King, J. As. Soc. Beng. n.s. 60, ii (1891) 44, *excl. synonym. p.p. major.*; O.K., Rev. Gen. Pl. 1 (1891) 67; Gürke, in Fl. Bras. 12, 3 (1892) 570; Ridley, Trans. Linn. Soc. Bot. II, 3 (1893) 279; Trimen, Handb. Fl. Ceyl. 1 (1893) 156; Stapf, Trans. Linn. Soc. Bot. II, 4 (1894) 136; Koord., Med. Lands Plantent. 19 (1898) 358; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 152, var. *genuinus* Hochr.; op. cit. 15 (1911) 243; Backer, Fl. Bat. 1 (1907) 141; Gagn., in Fl. Gén. I.-C. 1 (1910) 434; Backer, Schoolfl. Java (1911) 126; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 4, p.p.; Koord., Exk. Fl. Java 2 (1912) 586; Koord.-Schum., Syst. Verz. 3 (1914) 81;

Gibbs, J. Linn. Soc. Bot. 42 (1914) 61; ? Ridley, J. Fed. Mal. St. Mus. 8, 4 (1917) 22; Fl. Mal. Pen. 1 (1922) 258; Baker f., J. Bot. 62, Suppl. (1924) 11; Craib, Fl. Siam. En. 1 (1925) 156; C. T. White, J. Arn. Arb. 10 (1929) 239; Steen., Fl. Schol. Indon. (1949) 267. — *Bamia moschata* Wall., Cat. (1829) n. 1915. — *Hibiscus pseudo-abelmoschus* Blume, Bijdr. 2 (1825) 70; Span., Linnaea 15 (1841) 169. — *A. pseudo-abelmoschus* (Bl.) Walp., Rep. Bot. Syst. 1 (1842) 308. — *A. haenkeanus* Presl, Reliq. Haenk. 2 (1835) 134; Miq., Fl. Ind. Bat. 1, 2 (1858) 152; Hochr., Candollea 2 (1924) 86. — *Hibiscus haenkeanus* (Presl) Fern.-Vill., Novis. App. (1880) 25; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 152. — *A. moschatus* var. *haenkeanus* (Presl) Merr., En. Philip. Fl. Pl. 3 (1923) 40. — *Catta-gasturi* Rheede, Hort. Malab. 2, p. 71, t. 38. — *Granum moschatum* Rumph., Herb. Amb. 4, p. 38, t. 15.

Types: *Hibiscus abelmoschus* L.: Hortus Cliffort. (lectotype: BM-Herb. Cliff.); *Hibiscus pseudo-abelmoschus* Blume: Java, Blume s.n. (lectotype: L 908.136-450); *A. haenkeanus* Presl: Luzon, Sorzogon, Haenke s.n. (holotype: PR, n.v.).

For description see the key on p. 90.

*Distribution*: India, Indo-Chinese Peninsula, South China, Malesia, and the Pacific islands; elsewhere in the tropics cultivated and occasionally run wild. In Malesia common in the more humid regions, rare in the Lesser Sunda Islands (Lombok, Timor) and South New Guinea (Fly R.), lacking in the Southeast Moluccas.

*Ecology*: Waste places, road-sides, young secondary vegetation, fallow fields, dams of rice-fields, teak-forests, etc., up to c. 1000 m.

*Notes*: *A. moschatus* Medicus was based on *Hibiscus abelmoschus* L. The protologue in Species Plantarum opens with a phrase taken from Hortus Cliffortianus ('*Hibiscus foliis subpeltato-cordatis septemangularibus serratis hispidis*'). In the Clifford collection (BM), there is still a good specimen, which consists of a retrorsely hispid stem with slightly lobate or angular leaves, and three flowers (with an appressed epicalyx). The specimen is in fair accordance with the Linnean phrase and has been chosen therefore as the lectotype.

*Hibiscus pseudo-abelmoschus* Blume represents a form with deeply incised leaf-blades of which the upper ones are sagittate. A good specimen in the Leyden Herbarium with on a label the annotation in Blume's handwriting '*Hibiscus pseudo-abelmoschus* Bl. Bijdr.' has been designated as a lectotype. At Leyden and at Paris are some more authentic specimens, judging from the somewhat careless handwriting presumably from a later date.

Concerning *A. haenkeanus* Presl, Merrill (1923, 40) wrote: 'This is merely a form or variety of *A. moschatus* Medic. [*sensu stricto*] with deeply and narrowly lobed leaves. I have examined the type in the Prague herbarium'. Although I have not seen that specimen, Presl's detailed description shows that his conclusion is correct.

*Hibiscus longifolius* Willd., referred by some authors to the present species, is in my opinion a form of *A. esculentus* (L.) Moench. (cf. p. 100).

The variability in the leaf-shape is extremely large. A subdivision based on the leaf-shape in the herbarium only is impossible, as the leaves differ even considerably in one plant; in herbaria usually only fragments are available. If desirable, cultivating experiments are compulsory.

**Ab. var. betulifolius** (Mast.) Hochr., Nova Guinea 14 (1924) 165, *pro nomen, excl. specim.* — *Hibiscus abelmoschus* var. *betulifolius* Mast., in Fl. Br. Ind. 1 (1875) 342. — *Bamia betulifolia* Wall., Cat. (1829) n. 1918, *nom. nud.* — *Hibiscus longifolius* (non Willd.) Miq., Pl. Jungh. (1854) 283; Mor., Syst. Verz. (1846) 29, p.p. — *Hibiscus abelmoschus*



(non L.) Hall. f., Med. Rijksherb. 14 (1912) 13. — *A. moschatus* var. *longibracteatus* Borss., *inedit.*, in sched.

Type: Birma, Prome, *Wallich n. 1918* (holotype: K-W).

For description see the key on p. 90.

*Distribution*: Indo-Chinese Peninsula, rare in Malasia, in the Lesser Sunda Islands only in Lombok, not in the Moluccas, from New Guinea only one old record.

*Ecology*: See under var. *moschatus*.

*Note*: The most important characters of the variety are in the epicalyx segments, which are longer, wider, and less in number than in var. *moschatus*. With respect to the epicalyx segments the variety may be considered a transition between *A. moschatus* Medicus *sens. str.* and *A. manihot* (L.) Medicus. The capsules match those of var. *moschatus*. The variability of the leaf is as wide as in var. *moschatus*, though more or less orbicular, hardly or non lobed ones often occur. Frequently the stems are glabrous or nearly so, and then mostly purple-blotched, e.g. the type, *Wallich n. 1918* (though purple blotches not very clear), and *Elbert 474* from Trinil in Java.

**B. ssp. *biakensis*** (Hochr.) Borss., *stat. nov.* — *A. biakensis* Hochr., Nova Guinea 14 (1924) 165.

Type: Biak I. in NW. New Guinea, *Feuilletau de Bruyn 300* (holotype: L).

Undershrub, up to 2 m. Stems fistular, as the petioles and pedicels minutely stellate-hairy. *Leaves* large, orbicular, 10–19 cm  $\varnothing$ , palmilobed with acuminate lobes and rounded incisions, crenate, on both surfaces minutely stellate-hairy, in particular on the upper surface glabrescent; petiole 6–13 cm. *Stipules* subulate, 4–7 mm. Pedicel 16½–19 cm, accrescent after flowering. *Epicalyx segments* 8, lanceolate, 15–20 by 3½–4 mm, minutely stellate-hairy. *Calyx* 2–2½ cm long, minutely stellate-hairy. *Corolla* large, white (type) or yellow with a dark purple centre; petals *c.* 8 by 4 cm. *Capsule* ovoid, stout, rostrate, with the rostrum *c.* 7½ cm long, *c.* 4 cm  $\varnothing$ , outside black, minutely stellate-hairy; valves inside glabrous, white. *Seeds* globose to reniform, *c.* 4½ mm  $\varnothing$ , warty, short-hairy, black.

*Distribution*: New Guinea (Biak I., Sepik, and Misima I.), three collections.

*Ecology*: The type was found near the beach, and *Brass 27634* in 'low rainforest second growth off coast, alt. 5 m'.

*Note*: This striking form with its comparatively long, stout pedicels and capsules, is reported by Feuilletau de Bruyn as having white flowers, by Brass as possessing yellow ones. The absence of stiff, simple hairs points to a possibility that the plant is cultivated as a vegetable like *A. esculentus* (L.) Moench and forms of *A. manihot* (L.) Medicus.

**C. ssp. *tuberosus*** (Span.) Borss., *stat. nov.* — *Hibiscus longifolius* var. *tuberosus* Span., *Linnaea* 15 (1841) 170. — *Hibiscus pseudo-palmatus* Span., in Hook., *Comp. Bot. Mag.* 1 (1836) 344, *nom. nud.* — *A. rugosus* Wall. [*Bamia rugosa* Wall., *Cat.* (1829) n. 1923, *nom. nud.*] *ex W. & A.*, *Prod.* (1834) 53; *Backer & Bakh. f.*, *Fl. Java* 1 (1963) 434. — *Hibiscus rugosus* (Wall. *ex W. & A.*) *Steud. Nomencl. ed. 2* (1840) 760; *Mast.*, in *Fl. Br. Ind.* 1 (1875) 342. — *Hibiscus abelmoschus* var. *rugosus* (W. & A.) Hochr., *Ann. Cons. Jard. Bot. Genève* 4 (1900) 152. — *A. moschatus* var. *rugosus* (W. & A.) Hochr., *Candollea* 2 (1924) 86. — *A. rhodopetalus* F. v. M., *Fragm. Phyt. Austr.* 2 (1861) 112; Hochr., *Candollea* 2 (1924) 86. — *Hibiscus rhodopetalus* (F. v. M.) F. v. M. *ex Benth.*, *Fl. Austr.* 1 (1863) 209; *Bailey, Queensl. Fl.* 1 (1899) 124; Hochr., *Ann. Cons. Jard. Bot. Genève* 4 (1900) 150; *Ewart & Davies, Fl. North. Terr.* (1917) 186; *Domin, Bibl. Bot.* 22 (1928) 956. — *A. sharpei* Copel. *ex Merr.*, *Publ. Gov. Lab. Philip.* 17 (1904) 29; *En. Philip.*

Fl. Pl. 3 (1923) 41; Hochr., Candollea 2 (1924) 86. — *Hibiscus sharpei* (Merr.) Hochr. Ann. Cons. Jard. Bot. Genève 20 (1917) 161. — *Hibiscus subnudus* Craib ex Kerr, Kew Bull. (1911) 19; Craib, Fl. Siam. En. 1 (1925) 160; Gagn., in Suppl. Fl. Gén. I.-C. 1 (1945) 384. — *A. todayensis* Elmer, Leaf. Philip. Bot. 8 (1915) 2752; Hochr., Candollea 2 (1924) 86. — *Hibiscus todayensis* (Elmer) Hochr., Ann. Cons. Jard. Bot. Genève 20 (1917) 162. — *Hibiscus brevicapsulatus* Hochr., l.c. 160. — *A. brevicapsulatus* (Hochr.) Hochr., Candollea 2 (1924) 86; Nova Guinea 14 (1924) 166. — *A. vanoverberghii* Merr., Philip. J. Sc. 13 (1918) Bot. 29. — *A. coccineus* Hu, Fl. China, fam. 153 (1955) 39, t. 18 f. 5, ex descr. — *A. esquirolii* (Léveillé) Hu, l.c. 40, ex descr. — *Hibiscus esquirolii* Léveillé, in Fedde, Rep. 12 (1913) 184. — *Hibiscus sagittifolius* var. *septentrionalis* Gagn., in Fl. Gén. I.-C. 1 (1910) 435; Rehder, J. Arn. Arb. 15 (1934) 95. — *Hibiscus sagittifolius* (non Kurz) Gagn., in Fl. Gén. I.-C. 1 (1910) 434; Backer, Bull. Jard. Bot. Btzg II, 12 (1913) 18; Craib, Fl. Siam. En. 1 (1925) 159; Merr., Lingn. Sc. J. 5 (1927) 125; Steen., Fl. Mal. I, 4 (1948) xxi, f. 4. — *A. sagittifolius* (Kurz) Merr., Lingn. Agr. Rev. 2 (1924) 40, pro specim.; Lingn. Sc. J. 5 (1927) 126; Steen., Trop. Nat. 25 (1936) 120, f. 17; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 30. — *A. moschatus* var. *multiformis* (non Mast.) Hochr., Nova Guinea 14 (1924) 164.

Types: *Hibiscus longifolius* var. *tuberosus* Span.: Roti, Spanoghe s.n. (holotype: L 908.135-574); *A. rugosus* Wall. ex W. & A.: Birma, s. loc., Wallich n. 1923A (holotype: K-W); *A. rhodopetalus* F. v. M.: North Australia, Brisbane R., F. von Mueller s.n. (syntype: BM, MEL); *A. sharpei* Copel. ex Merr.: Mindanao, Davao, Copeland 364 (isotypes: K, US); *Hibiscus subnudus* Craib ex Kerr: Siam, Meh Mau, Kerr 1004 (holotype: K); *A. todayensis* Elmer: Mindanao, Mt Apo, Elmer 11028 (isotypes: A, BM, BO, FI, G, K, L, US); *Hibiscus brevicapsulatus* Hochr.: New Guinea, Sentani Lake, Gjellerup 465 (isotypes: BO, G, K, L); *A. vanoverberghii* Merr.: Luzon, Bontoc Subprov., Vanoverbergh 1221 (isotypes: L, P); *A. coccineus* Hu: Hainan, How 70670 (n.v.); *Hibiscus esquirolii* Léveillé: Hainan, Esquirol 531 (n.v.); *Hibiscus sagittifolius* var. *septentrionalis* Gagn.: Tonkin, Balansa 1331 (syntype: K, P).

Erect or decumbent herb, 40—75 cm, with tuberosus tap-root. Stems, petioles and pedicels usually densely clothed with patent, occasionally prickly, rarely retrorse simple hairs, towards the ends also with minute stellate hairs, rarely glabrous. Leaves  $3\frac{1}{2}$ —15 by  $1\frac{1}{2}$ —15 cm; petiole 1—15 cm. Stipules 5—15 mm. Pedicel  $1\frac{1}{2}$ —4 cm, accrescent to c. 7 cm. Epicalyx segments 9—10, spreading, finally often reflexed, linear to filiform, 10—20 mm, sometimes accrescent to 25 mm, ciliate or hispid by simple hairs. Calyx c. 15 mm long. Corolla mostly white or pink with a darker centre, sometimes red, often yellow with a dark purple centre; petals  $2\frac{1}{2}$ —7 cm long. Staminal column c.  $1\frac{1}{2}$  cm; filaments and anthers up to  $\frac{1}{2}$  mm. Style arms c. 3 mm. Capsule globose to shortly ovoid, 2—5 by  $1\frac{1}{2}$ — $2\frac{1}{2}$  cm (rostrum 2—10 mm), usually densely hispid by sometimes prickly, simple hairs, mostly also with minute stellate hairs, rarely glabrous. Seeds 3— $3\frac{1}{2}$  mm, mostly tomentose, occasionally glabrous.

*Distribution*: Indo-Chinese Peninsula, Hainan, Malasia, and North Australia.

*Ecology*: Lalang-fields, young secondary vegetation, and road-sides up to 400 m, particularly in regions subject to an annual dry period where the vegetation is periodically set on fire. Thanks to the tuber-like swollen tap-roots specimens are fire-resistant. The ecology is similar to that of *A. crinitus* Wall.

*Notes*: At Leyden two specimens are preserved collected by Spanoghe on Roti I. A specimen with a fine tuber, matching Spanoghe's description in his Prodrromus florae timorensis under n. 59 ("variet.? tuberosus Span.") should be considered the holotype. On a label is written the name *Hibiscus pseudo-palmatus* Span., which was published

as a *nomen nudum* in a preliminary list (Spanoghe, 1836), and also 'Insulae Rotty in oryzetis', the habitat given in the protologue. The other specimen corresponds with n. 58 ('*H. longifolius* Willd.') of the Prodomus. It differs by shorter capsules, prickly hairs on the stems, and filiform epicalyx segments slightly longer than the capsule (see below).

I have not seen all specimens on which *A. rhodopetalus* F. v. M. and *Hibiscus sagittifolius* var. *septentrionalis* Gagn. were based. Lectotypes could therefore not be designated.

*Hibiscus abelmoschus* var. *multiformis* Wall. ex Mast. (in Fl. Br. Ind. 1, 1875, 342), as well as its synonym *Hibiscus sagittiformis* Kurz (J. As. Soc. Beng. n.s. 40, ii, 1871, 46), represent a form of *A. moschatus* Medicus ssp. *moschatus* with narrow, sagittate leaves, which has not been encountered in Malasia.

The collection chosen by Merrill as an illustration for Rumphius's *Granum moschatum* — which undoubtedly belongs to var. *moschatus* — belongs to the present subspecies.

Under ssp. *tuberosus* (Span.) Borss. are united a number of forms which cannot be distinguished sharply. The variability of the leaf-shape and the density of the indumentum is comparably as large as that in ssp. *moschatus*. Many forms were described as separate species in the Philippines; Merrill (1923) already united some of them into one species, *A. sharpei* Copel. ex Merr., adding: 'As here interpreted this species presents as great a range of variation in vegetative characters as does the allied *A. moschatus* Medicus. It differs constantly in its thickened woody base, smaller flowers and fruits, and non-musky seeds'.

A striking fact is that the colour of the corolla is in most cases white or pink instead of yellow.

The specimens from Java, Mt Ringit (*Clason 87B* and *Clason & Van Slooten 43*), a specimen from Mt Semongkrong (*Jeswiet 152*), one of Spanoghe of Roti, and one of R. Brown from Kupang (L 908.136-11) differ by prickly hairs on the stems, and long filiform epicalyx segments; the seeds are as in most specimens of ssp. *tuberosus* rusty-tomentose. These specimens can be considered to be intermediate forms between *A. moschatus* Medicus and *A. crinitus* Wall.

**2. *Abelmoschus manihot* (L.) Medicus, Malv. (1787) 46; ampl. Hochr., Candollea 2 (1924) 87. — *Hibiscus manihot* Linné, Sp. Pl. (1753) 696; ampl. Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 153.**

*See for synonyms and types under the subspecies and varieties.*

Erect, branched, perennial herb or undershrub, 1—3 (—7½) m. Stems stout, terete, fistular, glabrous or hispid by stiff, shining, simple or stellate hairs, sometimes interposed by a tomentum of minute stellate hairs, glabrescent. *Leaves* extremely variable in shape and size, in outline orbicular to widely ovate, at base cordate, occasionally hastate, sometimes entire but mostly 3—7-lobed to -parted, 3—30 cm Ø; segments triangular, ovate, obovate, elliptic, oblong, spathulate, lanceolate, or linear, entire or more or less coarsely dentate to serrate, often pennilobed to -parted; blade at base 5—9-nerved, glabrous or on both surfaces more or less densely stellate-hairy, sometimes tomentose beneath or on both faces, often hispid on the nerves; petiole 3—25 cm Ø; glabrous or hispid, sometimes also stellate-tomentose, glabrescent. *Stipules* filiform, linear, or lanceolate, acute to acuminate, 5—12 mm, glabrous or stellate-hairy. *Flowers* axillary, solitary, by the reduction or abortion of the upper leaves in racemes. Pedicel 1—5 cm, accrescent to c. 7 cm, usually hispid, occasionally also tomentose, rarely glabrous. *Epicalyx segments* 4—6 (—8), free, ovate to oblong, acute to acuminate, 1—3 by ½—1 cm, on both surfaces hirsute by stiff, simple or 2-armed stellate hairs or tomentose with a white pubescent

margin, rarely glabrous. *Calyx* 2—3 by  $1\frac{1}{2}$ —2 cm, outside velutinous to tomentose, inside sericeous. *Corolla* large, white or sulphur-yellow with a small dark purple centre. *Petals* obovate to orbicular, at apex rounded, at base fleshy,  $3\frac{1}{2}$ —8 by 3—6 cm, glabrous. *Staminal column*  $1\frac{1}{2}$ —3 cm, yellow or white, glabrous; filaments and anthers  $\frac{1}{2}$ —1 mm long. Style arms yellow or white, 3—5 mm; stigmas simply hairy, dark purple. *Capsule* oblong-ovoid, pentagonous, acuminate,  $3\frac{1}{2}$ —6 by 2— $2\frac{1}{2}$  cm, with 5 prominent costae, between the costae concave, usually densely hispid especially on the costae, and often stellate-tomentose; valves inside shining, yellow, hirsute by white, simple hairs. *Seeds* ∞, globular to reniform, 3—4 mm  $\varnothing$ , with minute warts and stellate hairs in concentric rows, glabrescent, dark brown or black.

*Notes:* Similarly as in *A. moschatus* Medicus, I have accepted the wide species concept of Hochreutiner. For the distinction into infraspecific taxa his splitting appears too finely knit and largely based on leaf characters which are as variable as they are in *A. moschatus*. For this reason his subdivision (1900, 154—155 and 1924, 87) has been simplified. If desired, a more detailed subdivision should be carried out after a study of populations in the field and growing experiments.

Two subspecies are distinguished here, ssp. *manihot* comprising all cultivated forms and ssp. *tetraphyllus* (Hornem.) Borss., covering the wild ones. The cultivated forms, as grown in Indonesia, have been studied and named by Bakhuizen van den Brink (in Ochse & Bakh., Ind. Groenten, 1931, 463—472). They are not listed here as I feel that they fall beyond the scope of this work and are rather cultivars than botanical varieties. Ssp. *tetraphyllus* can be subdivided more or less sharply in two varieties by the indumentum of the margin of the epicalyx segments as done by Hochreutiner (1900, 154—155). Though the difference is small, the varieties possess more or less a geographical distribution of their own.

#### KEY TO THE SUBSPECIES AND VARIETIES

1. Stems devoid of prickly hairs; pedicel sometimes with prickly hairs. Cultivated or escaped from cultivation . . . . . **A. ssp. manihot**
1. Stems more or less densely covered with prickly hairs . . . . . **B. ssp. tetraphyllus**
  2. Epicalyx segments white-margined by a dense cloth of short, soft, simple hairs, never hispid.
    - Ba. var. tetraphyllus**
    2. Epicalyx segments with a margin hispid by stiff, simple hairs . . . . . **Bb. var. pungens**

**A. ssp. manihot.** — *Hibiscus manihot* Linné, Sp. Pl. (1753) 696; Cav., Diss. 3 (1787) 172, t. 63 f. 2; Sims, in Curtis, Bot. Mag. 42 (1815) t. 1702; DC., Prod. 1 (1824) 448; Koord., Med. Lands Plantent. 19 (1898) 358; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 154, var. *genuinus* Hochr.; Backer, Schooffl. Java (1911) 126; Koord.-Schum., Syst. Verz. 3 (1914) 81. — *A. manihot* (L.) Medicus, Malv. (1787) 46; Hochr., Candollea 2 (1924) 87, var. *genuinus* (Hochr.) Hochr.; Heyne, Nutt. Pl. (1927) 1037; Bakh., in Ochse & Bakh., Ind. Groenten (1931) 463—472, f. 288—294; Holth. & H. J. Lam, Blumea 5 (1942) 212; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 29; Mendoza Philip. J. Sc. 88 (1959) 260; Backer & Bakh. f., Fl. Java 1 (1963) 434. — *Bamia manihot* (L.) Wall. Cat. (1829) n. 1926, *comb. inval.* — *Hibiscus palmatus* Cav., Diss. 3 (1787) 168, t. 168 f. 1, non Forsk. 1775. — *Hibiscus manihot* var. *palmatus* (Cav.) DC., Prod. 1 (1824) 448; Hook., in Curtis, Bot. Mag. 59 (1832) t. 3152. — *Hibiscus timorensis* DC., Prod. 1 (1824) 488; Decne, Herb. Timor. (1835) 103; Span., Linnæa 15 (1841) 170; Miq., Fl. Ind. Bat. 1, 2 (1858) 156. — *Hibiscus manihot* var. *timorensis* (DC.) Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 132. — *A. manihot* var. *timorensis* (DC.) Hochr.,

Candollea 2 (1924) 87. — *Hibiscus japonicus* Miq., Ann. Mus. Bot. Lugd.-Bat. 3 (1867) 19.

Types: *Hibiscus manihot* L.: Hortus Cliffortianus, s.n. (lectotype: BM-Herb. Cliff.); *Hibiscus palmatus* Cav.: Hortus Issy, s.n. (lectotype: P-JU n. 12365); *Hibiscus timorensis* DC.: Timor, Gaudichaud s.n. (holotype: G-DC); *Hibiscus japonicus* Miq.: Japan, Siebold s.n. (holotype: L 908.135-244).

Undershrub, up to 8 m. Stems, petioles and leaf-blades glabrous or pubescent by minute stellate (or) and short simple hairs, devoid of prickly hairs. Pedicels sometimes hispid by prickly hairs, often also with minute stellate (or) and short simple hairs.

*Distribution*: Cultivated as a vegetable mainly in SE. Asia; in other regions, even in temperate Europe, as an ornamental, sometimes escaping from cultivation. In Malesia cultivated particularly in Celebes and the Moluccas. Without doubt ssp. *manihot*, which is known in cultivation since the seventeenth century (Dillenius, Plukenet), is a cultigen; it must have originated by deliberate selection by man of more useful, ultimately glabrous and smooth forms from wild, hairy and prickly ones.

*Ecology*: Bakhuizen van den Brink (1931, 471) observed that in Java the cultivated forms rarely flower; such plants become more or less perennial and may become up to 8 m high. At Bogor I have observed that indeed plants producing flowers and capsules behave as annuals and remain much lower.

*Notes*: *Hibiscus manihot* L. was primarily based on an entry in the Hortus Cliffortianus. In the Herbarium Clifford (BM) there are two sheets. One of them bears a stem with scattered, short, stiff hairs, leaves, two flowers and a flowerbud; the other one has a stem without stiff hairs, leaves and a flower. Both specimens match the Linnean phrase: 'Hibiscus foliis palmato-digitatis septempartitis', but the last mentioned one fits best for typification on account of the complete smoothness of the stem. It is considered to be the lectotype here. In the Linnean Herbarium there is a sheet, numbered 875.30, bearing a poor specimen with a smooth stem, and marked '13', the species number in Species Plantarum, and 'manihot', both in the handwriting of Linnaeus. According to Savage's Catalogue the specimen is from the Herbarium Clifford and is thus probably a duplicate of the lectotype.

According to Cavanilles *Hibiscus palmatus* Cav. was described after material collected in the Royal Garden at Paris. I have not found any specimen from that garden. In the Herbarium De Jussieu at Paris, however, there is a good specimen with a label 'H. Palmatus Cav. Issy 1786 †' in the handwriting of Cavanilles. It has a glabrous, rubromaculate stem with 5-fid leaves, and a flower with six ovate, obtuse, hispido-ciliate epicalyx segments, matching Cavanilles's description. Since it is known that Cavanilles grew in a private garden at Issy, a suburb of Paris, many plants from seeds mainly originating from the said Royal Garden (cf. An. Jard. Bot. Madrid 6, 1946, 17), the specimen is chosen as the lectotype. The rubromaculate stem points to a relationship with *A. moschatus* var. *betulifolius* (Mast.) Hochr.

The leaves are very variable as elaborated by Bakhuizen van den Brink (1931); it is therefore useless to maintain *Hibiscus timorensis* DC., even as a variety.

The type of *Hibiscus japonicus* Miq. is a dwarfed plant with a root, six leaves of which the lower ones are lobed to angular and the upper ones palmiparted, a flower, a flowerbud, and an immature capsule. The stem is thin and glabrous or nearly so. The precise origin of the specimen is not indicated, neither on the label, nor in the description.

**B. ssp. tetraphyllus** (Roxb. ex Hornem.) Borss., *stat. nov.* — *Hibiscus tetraphyllus* Roxb. ex Hornem., Hort. Hafn. (1815) 661, basionym.

Undershrub, up to 3 m. Stems, petioles, pedicels, and often also the nerves of the

leaves more or less densely covered with prickly hairs, for the rest glabrous or with minute stellate hairs, sometimes tomentose.

*Distribution*: India, Pakistan, Indo-Chinese Peninsula, South China, Malesia, and North Australia.

*Ecology*: Young secondary vegetation, waste places, clearings, and fallow fields, in particular in the seasonal regions, up to c. 1600 m.

The varieties differ in altitudinal distribution.

**Ba. var. *tetraphyllus*.** — *Hibiscus tetraphyllus* Roxb., [Hort. Beng. (1814) 52, *nom. nud.*] ex Hornem., Hort. Hafn. (1815) 661; Roxb., Fl. Ind. ed. Carey 3 (1832) 211; Mast., in Fl. Br. Ind. 1 (1875) 341; Forbes, Natur. Wand. (1885) 354; Hemsl., Rep. Voy. Chall. (Bot.) 1, 3 (1885) 124. — *A. tetraphyllus* (Roxb. ex Hornem.) R. Graham, Cat. Bomb. (1839) 14; K. Sch., in K. Sch. & Hollr., Fl. Kaiser Wilhelmsl. (1889) 56; K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 440. — *Bamia tetraphylla* Wall., Cat. (1829) n. 1925, *nom. nud.* — *Hibiscus manihot* var. *tetraphyllus* (Roxb. ex Hornem.) Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 155. — *A. manihot* var. *tetraphyllus* (Roxb. ex Hornem.) Hochr., Candollea 2 (1924) 87. — *Hibiscus ficulneoides* Lindl. Bot. Reg. 10 (1824) t. 938; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 153. — *A. ficulneoides* (Lindl.) Walp., Rep. Bot. Syst. 1 (1842) 309; Hochr., Candollea 2 (1924) 86. — *Hibiscus notho-manihot* F. v. M., Fragm. Phyt. Austr. 5 (1865) 57; Bailey, Queensl. Fl. 1 (1899) 124. — *Bamia magnifica* Wall., Cat. (1829) n. 1919, *nom. nud.* — *Hibiscus hostilis* Wall. ex Mast., in Fl. Br. Ind. 1 (1875) 342. — *A. luzoniensis* Merr., Philip. J. Sc. 1 (1906) Suppl. 207; En. Philip. Fl. Pl. 3 (1923) 40. — *A. manihot* var. *luzoniensis* (Merr.) Hochr., Candollea 2 (1924) 87. — *A. mindanaensis* Warb. ex Perk., Fragm. Fl. Philip. (1904) 111; Merr., En. Philip. Fl. Pl. 3 (1923) 40; Int. Rumph. Herb. Amb. (1917) 358, *quoad specim. ill. cit.* — *A. manihot* var. *mindanaensis* (Warb. ex Perk.) Hochr., Candollea 2 (1924) 87. — *A. moschatus* (*non* Medicus) Perk., Fragm. Fl. Philip. (1904) 111. — ? *Granum moschatum agreste* Rumph., Herb. Amb. 4, p. 39.

Types: *Hibiscus tetraphyllus* Roxb. ex Hornem.: Hort. Bot. Calc. Wallich n. 1925 (isotype: K-W); *Hibiscus ficulneoides* Lindl.: Lindl., Bot. Reg. 9, t. 938 (holotype); *Hibiscus notho-manihot* F. v. M.: North Australia, Rockingham Bay, Dallachy s.n. (isotypes: BO, K, MEL); *Hibiscus hostilis* Wall. ex Mast.: Birma, Rangoon, Wallich n. 1919 (isotypes: K-W); *A. luzoniensis* Merr.: Luzon, Bosoboso, Ahern's Coll. For. Bur. 1864 (isotypes: BO, K, SING, US); *A. mindanaensis* Warb. ex Perk.: Mindanao, Sibulan, Warburg 14449 (holotype: B †); Mindanao, Mt Apo, Elmer 11060 (neotype: L; isotypes: BM, BO, FI, G, K, US).

For description see the key on p. 96.

*Distribution*: East Java (and adjacent Kangean I.), Lesser Sunda Islands (Lombok, Sumba, Timor, Alor), SW. Celebes, Philippines (Luzon, Mindanao), Moluccas (Sula, Ceram, Ambon, Tanimbar, Key Is.), East New Guinea, and New Ireland.

*Ecology*: From sea-level up to 400 m. Obviously preferring areas subject to an annual dry season.

*Notes*: *Hibiscus tetraphyllus* Roxb. ex Hornem. was described after specimens which Wallich collected in the Calcutta Botanic Garden and sent to Hornemann. I have not seen the holotype, but two sheets of Wallich n. 1925 at Kew, from the Calcutta Garden, provided with Roxburgh's name, match the original description. These are considered to be isotypes.

After having examined the plate, description, and notes which accompany the publication of *Hibiscus ficulneoides* Lindl., I believe that this is merely a form of the present

variety. Judging from the description *Hibiscus ficulneoides* as interpreted by Hasskarl (and Miquel) belongs to *Hibiscus pedunculatus* L. f.

*Hibiscus notho-manihot* F. v. M. also belongs here. The stems have scattered stiff hairs; the leaf-blades are palmiparted with lanceolate, coarsely serrate segments, the epicalyx segments 5—6 in number, and 'marginè pubescenti-ciliata'. The authentic material was distributed among several herbaria; a lectotype could not be chosen, but this seems superfluous.

*Hibiscus hostilis* Wall. ex Mast. was based on *Wallich n. 1919* (named *Bamia magnifica* Wall.). The three specimens under that number do not differ much, and a choice of a lectotype has not been made. Masters distinguished the material on account of the number of epicalyx segments being 5—6, and the blade of the leaves being angular to palmilobed.

The type material of *A. luzoniensis* Merr. differs by 5—7 epicalyx segments, penniparted leaf-segments, and by prickly stiff hairs embedded in a stellate tomentum. The epicalyx segments of *Ramos 2021*, which resembles that material very much, are somewhat connate at base, and slightly enlarged after flowering. This sheet is somewhat intermediary with *A. angulosus* W. & A.

*A. mindanaensis* Warb. ex Perk. is based on *Warburg 14449*, from Sibulan, Davao Distr., Mindanao. The material at Berlin was destroyed during the second world war. *Elmer 11060* from Mt Apo, in the same district, has been designated as a neotype. It was identified by Elmer as *A. mindanaensis*; it fits the description and also agrees with a rough drawing (in G) which Hochreutiner made after the type material at Berlin.

With respect to the characters of *A. mindanaensis*, Perkins (or Warburg) wrote: 'Die Art steht dem *A. pungens* (Roxb.) Warb. von Vorder-Indien nahe, doch besitzt letzterer viel dichter und stärker gezähnte Blattzipfel, und keine samtartige sondern eine sehr rauhe abstehende Behaarung der Blatt- und Blütenstiele'. The leaves of *Elmer 11060* are palmiparted with oblong to lanceolate segments. The 5 epicalyx segments are densely stellate pubescent, inconspicuously white-margined, and lack stiff hairs. The stems have, apart from minute stellate hairs ('samtartige Behaarung') scattered stiff simple hairs.

Merrill (1923, 40) referred *Granum moschatum agreste* of Rumphius to *A. mindanaense* Perk., but there is no certainty that he was right.

**Bb. var. *pungens*** (Roxb.) Hochr., *Candollea* 2 (1924) 87; Hu, Fl. China, fam. 153 (1955) 36, t. 18 f. 6. — *Hibiscus pungens* Roxb., [Hort. Beng. (1814) 52, *nom. nud.*] Fl. Ind. ed. Carey 3 (1832) 213; Mast., in Fl. Br. Ind. 1 (1875) 341; Britten, in Forbes, Natur. Wand., App. 6 (1885) 500; Gagn., in Suppl. Fl. Gén. I.-C. 1 (1945) 384. — *A. pungens* (Roxb.) Voigt, Hort. Calc. (1845) 119; Warb. ex Perk., Fragm. Fl. Philip. (1904) 111; Merr., En. Philip. Fl. Pl. 3 (1923) 41. — *Hibiscus manihot* var. *pungens* (Roxb.) Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 155. — *Bamia pungens* Wall., Cat. (1829) n. 1924, *nom. nud.* — *Hibiscus vrieseanus* Hassk., Tijds. Nat. Gesch. Phys. 5 (1838) 263; Flora II, 25 (1842) Beibl. 38; Ridley, J. Str. Br. R. As. Soc. 45 (1906) 176. — *A. vrieseanus* (Hassk.) Hassk., Tijds. Nat. Gesch. Phys. 10 (1843) 134; Cat. Hort. Bog. (1844) 198; Pl. Jav. Rar. (1848) 304; Miq., Fl. Ind. Bat. 1, 2 (1858) 152. — *A. multilobatus* Merr., Philip. J. Sc. 1 (1906) Suppl. 208; En. Philip. Fl. Pl. 3 (1923) 41; Hochr., *Candollea* 2 (1924) 87.

Types: *Hibiscus pungens* Roxb.: India, Botanic Garden Calcutta (from Nepal?), *Roxburgh s.n.* (lectotype: BR-Herb. Mart.); *A. multilobatus* Merr.: Luzon, Bauang, *Fenix 14* (isotype: BO).

For description see the key on p. 96.

*Distribution*: Central Sumatra, Christmas I. (Indian Ocean), Lesser Sunda Islands (Bali, Flores, Timor), and the Philippines (Luzon, Babuyan Is., Mindoro).

*Ecology*: From 400—1600 m.

*Notes*: Roxburgh stated under *Hibiscus pungens* Roxb.: 'From Nepal Dr. Buchanan sent the seeds to the Botanic Gardens, where plants blossom about the close of the rain and in the cold season'. The specimen in the Herbarium Martius (BR), accompanied by a label with the name in Roxburgh's handwriting, was collected, no doubt, in the Calcutta Garden. Since it matches the description it is chosen as the lectotype. In Wallich's herbarium (K), there is under n. 1924-2 a corresponding specimen (in Wallich's Catalogue annotated 'H.B.C. e Nepalia'), which can be considered an isotype. The type material resembles that of *Hibiscus tetraphyllus* Roxb. ex Hornem., but differs by the hispid epicalyx segments, which are 4—5 in number.

In nature not seen authentic material of *Hibiscus vrieseanus* Hassk., but judging from the description it may belong here. The specimens collected by Ridley in Christmas I., and labelled by him with that name certainly do.

The type collection of *A. multilobatus* Merr. is characterized by palmiparted leaves with penniparted segments, and 7—8 epicalyx segments; otherwise it resembles the type of *Hibiscus pungens* Roxb.

**3. *Abelmoschus esculentus* (L.) Moench, Meth. Pl. (1794) 617; W. & A., Prod. (1834) 53; Miq., Fl. Ind. Bat. 1, 2 (1858) 152; Suppl. (1860) 163; Fern.-Vill., Novis. App. (1880) 24; ? K. Sch., Notizbl. Berl.-Dahl. 2 (1898) 133; K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 439; Merr., Fl. Manila (1912) 321; En. Philip. Fl. Pl. 3 (1923) 40; Hochr., Candollea 2 (1924) 86; Heyne, Nutt. Pl. (1927) 1037; Bakh., in Ochse & Bakh., Ind. Groenten (1931) 462, f. 287; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 30; Hochr., in Fl. Madag. fam. 129 (1955) 7, t. 2 f. 1—4; Exell, Fl. Zamb. 1 (1961) 423, t. 84; Backer & Bakh. f., Fl. Java 1 (1963) 435. — *Hibiscus esculentus* Linné, Sp. Pl. (1753) 696; Cav., Diss. 3 (1787) 168, t. 61 f. 2; DC., Prod. 1 (1824) 450; Blume, Bijdr. 2 (1825) 69; Mor., Syst. Verz. (1846) 29; Mast., in Fl. Br. Ind. 1 (1875) 343; O. K., Rev. Gen. Pl. 1 (1891) 69; Gürke, in Fl. Bras. 12, 3 (1892) 569; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 150; Backer, Fl. Bat. 1 (1907) 140; Gagn., in Fl. Gén. I.-C. 1 (1910) 433; Backer, Schoolfl. Java (1911) 126; Koord., Exk. Fl. Java 2 (1912) 586. — *Hibiscus longifolius* Willd., Sp. Pl. 3 (1800) 827; DC., Prod. 1 (1824) 450; Roxb., Fl. Ind. ed. Carey 3 (1832) 210.**

*Types*: *Hibiscus esculentus* L.: *Herb. Linn. n. 875.31* (holotype: LINN); *Hibiscus longifolius* Willd.: India, *Klein s.n.* (holotype: B).

Stout, erect annual herb,  $\frac{1}{2}$ —2 m. Stems thick, often fistular, slightly rough by scattered short stiff simple hairs, glabrescent, often tinged red. *Leaves* transversally elliptic to orbicular in outline, at base cordate, 5—25 by 5—30 cm, angular to 5—7-lobed to -parted, with widely triangular, ovate, oblong or lanceolate, coarsely serrate to crenate segments, at base 5—7-nerved, on both surfaces with scattered short stiff simple hairs, glabrescent; petiole 5—35 cm, often with a line of short simple hairs on the upper side, often tinged red. *Stipules* filiform, 5—10 mm, frequently split to the base. *Flowers* axillary, solitary. Pedicel 5—15 mm, strongly accrescent, up to 5 cm, with scattered simple hairs. *Epicalyx segments* 7—10(—12), linear to lanceolate, acute, 5—18 by 1—2 $\frac{1}{2}$  mm, soon falling, densely covered with appressed, simple hairs. *Calyx* in bud acuminate, 2—3 cm long, outside rough by stiff simple hairs, inside sericeous. *Corolla* yellow or white, with a dark purple centre; petals obovate, with fleshy base and rounded apex, 3 $\frac{1}{2}$ —4 $\frac{1}{2}$  by 3—4 cm, glabrous or nearly so. *Staminal column* 2—2 $\frac{1}{2}$  cm; filaments  $\frac{1}{2}$ —1 mm; pollen yellow. *Ovary*



conical to ovoid, c. 12 mm high, sericeous, 5(—9)-celled; style 5(—9)-armed; stigmas discoid, purple. *Capsule* long fusiform, acuminate, 10—25 by 1½—3 cm, terete or somewhat angular, sulcate, with scattered short simple hairs or glabrous. *Seeds* 5—15 per cell, globose to reniform, 3—6 mm, striped, minutely warty, glabrous, dark brown or grey.

*Distribution*: In most tropical countries, including Malesia, cultivated as a vegetable. As the genus as a whole is mainly of Asiatic distribution, the species is, no doubt, of Asiatic origin. In floras it is reported to escape occasionally from cultivation, but it is not known in a really wild state. The indigenous North Indian *A. tuberculatus* Pal & Singh (Bot. Gaz. 113, 1952, 458) — in my opinion a form of *A. esculentus* — which mainly differs by a strigose indumentum and shorter capsules (5—7½ cm) densely studded with bristle-bearing tubercles, may be one of the ancestors.

*Notes*: In Species Plantarum Linnaeus used for *Hibiscus esculentus* L. a new phrase; consequently a specimen in the Linnean herbarium should be the lectotype. There is a specimen in that herbarium under n. 875.31, consisting of a stem with leaves, a young flower, and a damaged fruit. On the sheet is written in Linnaeus's handwriting the epithet 'esculentus', and the number '15' which corresponds with the serial number in Species Plantarum; this is consequently the holotype.

The original description of *Hibiscus longifolius* Willd. does not make mention of the fruit. They also lack in the type material, but the general habit, the shape of the leaves, and the acuminate flowerbuds strongly suggest identity with the present species. Unlike most authors, who listed Willdenow's name in the synonymy of *A. moschatus* Medicus *sens. str.*, Roxburgh reached the same conclusion.

4. *Abelmoschus ficulneus* (L.) W. & A. *ex* Wight, Cat. (1833) 14; Prod. (1834) 53; Wight, Ic. 1 (1839) t. 154; Miq., Fl. Ind. Bat. 1, 2 (1858) 152; Hochr., Candollea 2 (1924) 86; Backer, Bekn. Fl. Java (em. ed.) 4 C (1943) fam. 109, p. 28; Hochr., in Fl. Madag. fam. 129 (1955) 6, t. 1 f. 5—6; Backer & Bakh. f., Fl. Java 1 (1963) 434.—*Hibiscus ficulneus* Linné, Sp. Pl. (1753) 695; Blume, Bijdr. 2 (1825) 67; Decne, Herb. Timor. (1835) 103; Span., Linnæa 15 (1841) 169; Thw., En. Pl. Zeyl. (1858) 27; Benth., Fl. Austr. 1 (1863) 209; Mast., in Fl. Br. Ind. 1 (1875) 340; Trimen, Handb. Fl. Ceyl. 1 (1893) 155; Bailey, Queensl. Fl. 1 (1899) 123; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 153; Backer, Schoolfl. Java (1911) 125; Bull. Jard. Bot. Btzg II, 12 (1913) 18; Ewart & Davies, Fl. North. Terr. (1917) 186; C. T. White, Proc. R. Soc. Queensl. 34 (1922) 43; J. Arn. Arb. 10 (1929) 239. — *Hibiscus sinuatus* Cav., Diss. 3 (1787) 147, t. 52 f. 2. — *Laguna aculeata* Cav., l.c. 173, t. 71 f. 2; Willd., Sp. Pl. 3 (1800) 734 ('*Lagunæa*'); DC., Prod. 1 (1824) 474 ('*Lagunæa*'). — *Solandra aculeata* (Cav.) Poir., in Lamk, Encycl. 7 (1806) 225. — *A. albo-ruber* F. v. M., Fragm. Phyt. Austr. 1 (1859) 67; Benth., Fl. Austr. 1 (1863) 209 ('*albo-rubens*').

*Types*: *Hibiscus ficulneus* L.: Dillenius, Hort. Elth., t. 157 f. 190 (lectotype); *Hibiscus sinuatus* Cav.: India, *Sonnerat s.n.* (holotype: P-LA); *Laguna aculeata* Cav.: India, Pondichéri, *Couzier s.n.* (holotype: P-JU 12175); *A. albo-ruber* F. v. M.: North Australia, Victoria R., *F. von Mueller s.n.* (syntype: BM, MEL).

Erect branched undershrub, ½—1½ m. with tap-root. Stem thick, usually thick and fistular, at apex with short simple hairs, rarely prickly with small bulbous-based prickles, glabrescent. *Leaves* orbicular in outline, at base cordate, 2—15 cm ø, 3—5-palmiparted; segments obovate to spatulate, at apex rounded or obtuse, serrate, 1½—10 by 1—5 cm; leaves on both surfaces ± rough with scattered stiff short simple hairs, beneath also with scattered 3-armed stellate hairs, glabrescent; petiole 2—20 cm, with a line of short simple hairs above. *Stipules* linear to filiform, 5—12 mm, hirsute by short simple hairs.

*Flowers* by decrescence of leaves upwards (mostly represented only by their caducous stipules), in racemes, inferior ones solitary, axillary. Pedicel 1—1½ cm, accrescent to 3½ cm, densely set with short simple hairs, glabrescent. *Epicalyx segments* 5—6, usually falling before anthesis, linear to lanceolate, acute at apex, 4—12 by ½—1½ mm, hirsute by simple hairs. *Calyx* in bud lageniform, with 5 linear 3 mm long segments, c. 1½ cm long, outside harshly tomentose by simple hairs, inside sericeous. *Corolla* white, finally pink, with dark purple centre; petals obovate, rounded at apex, 2—3 by 1½—2½ cm, glabrous. *Staminal column* c. 1½ cm long, glabrous; filaments short, ¼—½ mm. *Capsule* <sup>1)</sup> ovoid, 5-angular, at base truncate, at apex obtuse, sometimes shortly acuminate, 3—3½ by 1½—2 cm, harshly tomentose by short simple hairs, glabrescent; hairs on the ribs stouter and stiffer than those between the ribs; valves inside hirsute by long soft white simple hairs. *Seeds* globular, c. 3 mm ø, striate, glabrous to tomentose by minute stellate hairs, black.

*Distribution*: North Australia, Peninsular India, Ceylon, Pakistan, East Africa, and Madagascar; in Malesia in NE. Java (Semongkrong, Baluran, Banjuwangi), Lesser Sunda Islands (Sumba, Timor), and in SE. New Guinea (Laloki R.).

*Ecology*: Fields, road-sides, and waste places in the lowlands, but distinctly restricted to areas which are subject to a long and severe annual dry season.

*Notes*: The typification of *Hibiscus ficulneus* L. gave some difficulty. Linnaeus used in *Species Plantarum* a phrase which he already published in the *Hortus Cliffortianus*, and in the *Flora Zeylanica*, and which is also quoted by A. van Royen in the *Catalogue of the Leyden Botanic Garden*. A more detailed description is found in the *Flora Zeylanica*, but any certainty as to the identity cannot be obtained with the phrase and description only. Such an inconvenience is not surprising in the polymorphous genus *Abelmoschus*.

I have failed to trace good specimens corresponding with *Hibiscus ficulneus* L. as dealt with in the last-named three works. In the Linnean herbarium there is a sheet (n. 875.25) bearing in the handwriting of Linnaeus the epithet 'ficulneus', and the number '10', which corresponds with the species number in *Species Plantarum*. The material on the sheet consists of two leaves and two damaged flowers certainly not belonging to *A. ficulneus* (L.) W. & A. ex Wight of modern Floras and other publications, but to *A. esculentus* (L.) Moench. On the back of the sheet is written in an unknown handwriting 'Fructus oblongus edulis ab Indis', which also points to that species. *A. ficulneus* is never used for human consumption. It seems unlikely that later authors have misinterpreted the Linnean species.

A solution of the typification is offered by the reference to Dillenius, which is also quoted under the protologue: 'Ketmia zeylanica, fici folio, perianthio oblongo integro. Dill. elth. 190. t. 157. f. 190.' The excellent plate of Dillenius undoubtedly depicts *A. ficulneus* and explains the interpretation of the Linnean species by later authors. The character 'fici folio', moreover, was perpetuated in the epithet 'ficulneus'. All facts considered the plate of Dillenius serves best as the lectotype.

Cavanilles (1787) dealt with the present species twice, viz. under the names of *Hibiscus sinuatus* Cav. and *Laguna aculeata* Cav. The type sheet of the last-named is a specimen with roots, leaves, flowers (of which the epicalyx is lacking), and fruits.

The genus *Laguna* Cav. (synon. *Solandra* Murr.) was supposed to be related to the genus *Sida* (sens. lat.), and to differ by stamens scattered on a prolonged column (as in *Hi-*

<sup>1)</sup> The pedicels seem to strain after a vertical position, so that the capsules are usually more or less secund on the lateral branches.

*biscus*), and in the fruit being a capsule. Most species were recognized by most later authors as *Hibiscus* species (sect. *Solandra*) with abortive or caducous epicalyx (cf. p. 77). *A. ficulneus* (L.) W. & A. *ex* Wight also has that character, but the typical spathaceous calyx and the unbranched style with a capitate stigma stamp it as a species of *Abelmoschus*.

F. von Mueller, when describing *A. albo-ruber* F. v. M. in his extensive and precise way, gave as the locality solely: 'In planitiibus basalticis Australiae tropicae et subtropicae'. Material from Victoria R. with the name in his handwriting is considered here a syntype.

*A. ficulneus* can always be recognized by the characteristic bottle-shaped calyx in bud, and the blunt, short-hairy capsules. The leaves often resemble those of *Ficus carica*, hence the specific epithet.

**5. *Abelmoschus crinitus*** Wall., Pl. As. Rar. 1 (1830) 39, t. 44; Hochr., Candollea 2 (1924) 85; Merr. & Chun, Sunyatsenia 2 (1935) 280; Backer & Bakh. f., Fl. Java 1 (1963) 435. — *Bamia crinita* Wall., Cat. (1829) n. 1922, nom. nud. — *Hibiscus crinitus* (Wall.) G. Don, Gen. Syst. 1 (1831) 380; Rehder, J. Arn. Arb. 15 (1934) 94. — *Bamia cancellata* Wall., Cat. (1829) n. 1920, nom. nud. — *Hibiscus cancellatus* Roxb., [Hort. Beng. (1814) 51, nom. nud.] Fl. Ind. ed. Carey 3 (1832) 201, non L. f. 1781; Mast., in Fl. Br. Ind. 1 (1875) 342; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 149; Backer, Fl. Bat. 1 (1907) 139, excl. synonym. *Hibiscus lunariifolius*; Gagn., in Fl. Gén. I.-C. 1 (1910) 435; Backer, Schoolfl. Java (1911) 126; Koord., Exk. Fl. Java 2 (1912) 586. — *A. cancellatus* (Roxb.) Voigt, Hort. Calc. (1845) 119; Merr., Lingn. Sc. J. 5 (1927) 125; Steen., Trop. Nat. 25, Suppl. (1936) 120; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 30. — *A. hainanensis* Hu, Fl. China, fam. 153 (1955) 37, t. 18 f. 1.

Types: *A. crinitus* Wall.: Birma, Prome, Wallich n. 1922 (holotype: K-W); *Hibiscus cancellatus* Roxb.: Nepal, Wallich n. 1920-1 (neotype: K-W); *A. hainanensis* Hu: Hainan, Lau 1811 (isotype: P).

Erect herb,  $\frac{1}{2}$ —1 $\frac{1}{2}$  m, usually with tuber-like tap-root. Stems, petioles, and pedicels more or less densely hispid or hirsute by shining, simple hairs and 3-armed stellate hairs, often also pubescent to tomentose by minute stellate hairs, glabrescent. *Leaves* in outline orbicular or transversally elliptic, 10—15 cm  $\varnothing$ , angular or shallowly 5—7-palmilobed to palmiparted, at base cordate, with triangular or oblong to ovate segments, coarsely dentate to serrate, 5—7-nerved, on both surfaces hirsute by simple hairs, occasionally pubescent to tomentose by minute stellate hairs; petiole  $\frac{1}{2}$ —18 cm. *Stipules* linear to filiform, 1—2 cm, with some simple hairs. *Flowers* axillary, solitary, by reduction of upper leaves (if aborted only represented by their stipules) partly in racemes. Pedicel c. 2 cm, accrescent to c. 3 cm. *Epicalyx segments* 10—16, spreading, after flowering curving upwards and convergent, linear, 25—40 by  $\frac{1}{2}$ —1 mm, ciliate by simple hairs, also with scattered, minute stellate hairs. *Calyx* 2—2 $\frac{1}{2}$  cm long, densely puberulous to tomentose. *Corolla* yellow with small purple centre; petals broadly obovoid, 6—8 by c. 4 cm, glabrous or nearly so. *Staminal column* c. 2 cm, antheriferous throughout, puberulous or glabrous. Style arms short; stigmas purple. *Capsule* shortly ovoid to globular, shortly acuminate or rounded, 3 $\frac{1}{2}$ —5 by c. 3 $\frac{1}{2}$  cm, slightly ribbed, hirsute or hispid by simple hairs, often also with some stellate hairs; valves inside hirsute. *Seeds* globular to reniform, c. 3 $\frac{1}{2}$  mm, mostly rusty-tomentose, rarely glabrous, with concentric ribs.

*Distribution*: India, Pakistan, Birma, Indo-Chinese Peninsula, Hainan, and South China; in Malesia restricted to Java (Djakarta eastwards; also Madura I.) and the Philippines (Mindoro: Visaya). Fig. 3.

*Ecology*: Grass-fields, waste places, and teak-forests, restricted to lowland areas subject to a pronounced dry season. The tuber-like swollen tap-root enables the species to

withstand periodic burning of the vegetation, similarly to *A. moschatus* ssp. *tuberosus*.

Notes: *A. crinitus* Wall. was based on material from Prome in Birma. A specimen from that locality, viz. *Wallich n. 1922* (K-W), is considered here the holotype of the species.

The binomium *Hibiscus cancellatus* Roxb. was mentioned for the first time in the *Hortus Bengalensis* (1814) as a *nomen nudum*, and referred to living material in the Calcutta Botanic Garden, grown from seeds collected by F. Buchanan-Hamilton in Nepal. That material is also mentioned under the validating description in the second edition of the *Flora Indica*. Wallich listed Roxburgh's species in his Catalogue under *n. 1920* as *Bamia cancellata* Wall.; he mentioned two collections, the first from 'Napalca 1821' (sheet 1 in K-W); this fits Roxburgh's description very well. Since an indubitably authentic Roxburgh specimen apparently does not exist, the Wallich specimen is designated as a neotype.

As all *Abelmoschus* species *A. crinitus* is variable in the degree of incision of the leaves and the density of the indumentum. In addition the length of the epicalyx segments varies; they are mostly longer than the capsule in the types of *Hibiscus cancellatus* and *A. hainanensis*, but may be somewhat shorter than the capsule in the type of *A. crinitus*.

**6. *Abelmoschus angulosus* Wall. ex W. & A., Prod. (1834) 53; Wight, Ic. 3 (1845) t. 951; Hochr., Candollea 2 (1924) 87; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 29; Backer & Bakh. f., Fl. Java 1 (1963) 434. — *Hibiscus angulosus* (W. & A.) Steud., Nomencl. ed. 2, 1 (1840) 758; Mast., in Fl. Br. Ind. 1 (1875) 341; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 156; Gagn., in Fl. Gén. I.-C. 1 (1910) 432; Backer, Schoolfl. Java (1911) 126; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 4; Koord., Exk. Fl. Java 2 (1912) 588. — *Bamia angulosa* Wall., Cat. (1829) n. 1927, nom. nud. — *A. angulosus* var. *grandiflorus* Thw., En. Pl. Zeyl. (1858) 26. — *Hibiscus angulosus* var. *grandiflorus* (Thw.) Mast., in Fl. Br. Ind. 1 (1875) 341; Trimen, Handb. Fl. Ceyl. 1 (1893) 156, atlas t. 17. — *Hibiscus primulinus* Alston, Handb. Fl. Ceyl. 6, Suppl. (1931) 29. — *A. angulosus* var. *purpureus* Thw., En. Pl. Zeyl. (1858) 26. — *Hibiscus angulosus* var. *purpureus* (Thw.) Mast., in Fl. Br. Ind. 1 (1875) 341; Trimen, Handb. Fl. Ceyl. 1 (1893) 157. — *Hibiscus molochinus* Alston, Handb. Fl. Ceyl. 6, Suppl. (1931) 29. — *Hibiscus setinervis* Dunn, Kew Bull. (1914) 324. — *A. moschatus* (*non* Medicus) Merr., Contr. Arn. Arb. 8 (1934) 102.**

Types: *A. angulosus* W. & A.: India, Nilgiri Hills, *Wallich n. 1927-1* (lectotype: K-W); *A. angulosus* var. *purpureus* Thw. and *Hibiscus molochinus* Alston: Ceylon, *Thwaites 1117* (isotypes: BM, K); *A. angulosus* var. *grandiflorus* Thw. and *Hibiscus primulinus* Alston: Ceylon, *Thwaites 2567* (isotypes: BM, K); *Hibiscus setinervis* Dunn: India, Pulney Hills, *Saulière 409* (syntype: K), India, Budan Hills, *Law s.n.* (syntype: K).

Stout erect perennial herb or undershrub, c. 1—2 m. Stems stout, up to 10 mm  $\varnothing$ , hollow, hispid by patent, more or less rigid mostly somewhat prickly yellowish simple to few-armed stellate hairs, occasionally  $\pm$  glabrous, sometimes also minutely stellate-hairy. Leaves in outline transversally elliptic to orbicular,  $3\frac{1}{2}$ —20 cm  $\varnothing$ , at base cordate, palmilobed to -parted, with 3—7 triangular to ovate to lanceolate segments (segments acute, crenate to serrate) 5—7-nerved, on both surfaces with short, appressed, stiff simple hairs, glabrescent, rarely also stellately soft-hairy; petiole  $\frac{1}{2}$ —20 cm, hispid. Stipules caducous, lanceolate to linear, 5—15 mm, hispid, sometimes also stellate-hairy. Flowers large, solitary, axillary, by decrescence of leaves upwards often in long, erect racemes. Pedicel 3—7 cm, accrescent to 10 cm, terete, densely hispid, rarely also stellately hairy. Epicalyx large, angular, completely enveloping the bud, 4—5-parted, splitting at one or more places at anthesis; segments triangular to ovate, acute, 2— $3\frac{1}{2}$  by c. 1—2 cm,

outside slightly hispid and rarely stellately hairy, inside densely covered with appressed simple hairs, along the margin white-velutinous by stellate hairs, in fruit to 5 cm long,  $\pm$  enveloping the capsule. *Calyx* c. 3½ cm long, membranaceous, with minute stellate and simple hairs. *Petals* broadly obovate, rounded at apex, c. 8 cm by 6 cm, glabrous, yellow with deep purple base, rarely white, sometimes finally deep pink. *Staminal column* c. 2 cm, glabrous; filaments  $\frac{1}{2}$ —1 mm. *Ovary* hispid, between the long hairs usually velutinous; style 5-armed. *Capsule* ovoid to oblong, acute to acuminate, 3—5 cm long, rigid, very densely hispid by  $\pm$  prickly shiny simple hairs, between the simple hairs mostly densely stellate-hairy, glabrescent; valves inside puberulous. *Seeds* globular to reniform, c. 3 mm, with concentric, minutely stellate-hairy ribs.

*Distribution*: Ceylon, India, Pakistan, Indo-Chinese Peninsula, N. Sumatra, and throughout Java; according to Backer & Bakh. f. (1963, 434) rarely cultivated in Java as a hedge-plant. Fig. 4.

*Ecology*: Waste places, young secondary vegetation, and forest-edges, mainly in the mountains, 750—2000 m.

*Notes*: *A. angulosus* Wall. ex W. & A. was primarily based on Wallich n. 1927, which accordingly is chosen as the lectotype. The second sheet mentioned by Wight and Arnott, Wight n. 202, is a paratype.

It can be recognized by its somewhat angular, accrescent, and fissiparous epicalyx, consisting of 4 or 5 connate segments. This distinguishes it readily from forms of *A. manihot* (L.) Medicus, with which it is often confused.

Like other species of the genus it is extremely variable, in particular in the indumentum, the shape of the leaves, and apparently also with respect to the colour of the corolla. For the purpose of distinguishing forms or varieties a careful study of more specimens from the whole area and of living populations is required. Thwaites distinguished two varieties: var. *purpureus* Thw. being different from var. *grandiflorus* Thw. by being very densely hispid, by smaller, solitary flowers (young specimens?), and by corollas which are initially white instead of yellow, finally becoming deep pink. Alston raised those varieties to new species, *Hibiscus primulinus* Alston and *Hibiscus molochinus* Alston respectively. He wrote (1931, 30) of the last mentioned one: 'This seems near *H. setinervis* Dunn but Mr. Fischer of the Kew Herbarium assures me that they are not the same'. *Hibiscus setinervis* Dunn represents another form of the species, 'foliorum nervis setosis nec tomentosis distinctus'. All these forms fall within the range of variability of the present species as conceived in a similar wide sense as *A. manihot* (L.) Medicus and *A. moschatus* Medicus.

#### 4. THESPESIA

Sol. ex Correa, Ann. Mus. Herb. Paris 9 (1807) 290, t. 8 f. 1, *nom. cons.*; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 50; J. B. Hutchinson, New Phytologist 46 (1947) 134; Kearney, Am. Midl. Nat. 46 (1951) 111; Exell & Hillcoat, Contr. Fl. Moçamb. 2 (1954) 58. — *Bupariti* Duhamel, Semis Pl. Arbr., Add. (1760) 5. — *Azanza* Alefeld, Bot. Zeit. 19 (1861) 298. — *Cephalohibiscus* Ulbr., Notizbl. Berl.-Dahl. 12 (1936) 495.

*Holotype*: *T. populnea* (L.) Sol. ex Correa.

Trees or shrubs with an indumentum of scales or stellate hairs. *Leaves* entire or palmilobed, palminnerved, often with extrafloral nectaries. *Flowers* solitary, axillary, often in racemes by reduction of the upper leaves. Pedicel mostly inarticulate, at apex thickened into a hypanthium. *Epicalyx segments* 3—6, free, small, caducous. *Calyx* usually ligneous, cupular, entire or with 5 minute teeth, persistent. *Corolla* large and showy, mostly yellow with a dark purple centre. *Staminal column* much shorter than the petals, (except in *T.*

*peekelii*) antheriferous throughout. Ovary 5- or (as a result of 5 false dissepiments) 10-celled; style 1, short; stigma clavate, 5-sulcate or rarely 5-lobed. Capsule with a thick woody pericarp, whether or not (loculicidally) dehiscent, 5- or 10-celled. Seeds 3—∞ per cell, obovoid, glabrous, pubescent or tomentose.

*Distribution:* About 15 spp. in the tropics of both hemispheres; in the wide sense of J. B. Hutchinson (New Phytologist 46, 1947, 123—142) accepted here, the genus also includes the genera *Azanza* Alefeld, *Montezuma* Sessé & Moç. ex DC., *Ulbrichia* Urb., *Atkinsia* How., and *Thespesiopsis* Exell & Hillcoat.

*Note:* Howard (Bull. Torr. Bot. Club 76, 1949, 89—100) and Exell & Hillcoat (Contr. Fl. Moçamb. 2, 1954, 55—59) are in favour of a much narrower delimitation in this group of *Malvaceae*. If desired, however, generic variability can equally well be expressed by the distinction of infrageneric taxa, similarly as accepted in *Hibiscus*. Apart from this consideration a thorough revision of the genus as a whole, in connection with a study of related taxa, in particular *Hibiscus* sect. *Azanza* DC. and *Kosteletzkyia* sect. *Azanzoides* Hochr. is much needed.

#### KEY TO THE SECTIONS

1. Fruit usually indehiscent; seeds 2—4 per cell. Leaves regularly not lobed (of watersprouts occasionally trilobed), without nectary on the midrib beneath. Spp. 1—5 . . . . . 1. sect. *Thespesia*
1. Fruit a dehiscent capsule; seeds numerous. Leaves usually 3—5-lobed, with a linear nectary on the midrib beneath; leaves with flowers in the axils often not lobed. Spp. 6—7 . . . . . 2. sect. *Lampas*

#### KEY TO THE SPECIES

1. Leaves without nectary on the midrib beneath, not lobed.
  2. Calyx with 5 minute teeth. Epicalyx segments 3, fallen before the expansion of the corolla. Indumentum mainly consisting of minute scales . . . . . 1. *T. populnea*
  2. Calyx entire, often splitting in anthesis or rarely later during the setting of the fruit.
    3. Epicalyx segments falling before anthesis. Calyx not splitting in anthesis, sometimes during the development of the fruit, inside without a cushion of long hairs.
      4. Epicalyx segments 3. Calyx free from the fruit. Indumentum mainly consisting of minute stellate hairs. . . . . 2. *T. patellifera*
      4. Epicalyx segments 8—10. Calyx closely enveloping the fruit, but not adnate to it. Indumentum mainly consisting of minute scales . . . . . 3. *T. robusta*
    3. Epicalyx segments persistent. Calyx splitting in anthesis, as a result seemingly lobed, inside on the bottom with a cushion consisting of longhairs. Indumentum mainly consisting of minute scales.
      5. Epicalyx segments 6—8, not split. Petals c. 3½ cm long, entire . . . . . 4. *T. fissicalyx*
      5. Epicalyx segments 18—22, partly longitudinally split. Petals 5—6 cm long, apically lacerated. . . . . 5. *T. multibracteata*
1. Leaves with a linear nectary on the midrib beneath, usually 3—5-lobed, except those sustaining a flower.
  6. Staminal column shorter than the petals, antheriferous throughout or nearly so. Capsule ovoid to globose, up to 3 cm long. Seeds glabrous or short-hairy . . . . . 6. *T. lampas*
  6. Staminal column longer than the petals, antheriferous in the apical part. Capsule 5-sided prismatic, c. 4 cm long. Seeds with a whorl of hairs up to 2 cm long . . . . . 7. *T. peekelii*

#### I. Section *Thespesia*

*Bupariti* Duhamel, Semis Pl. Arbr. Add. (1760) 5.

1. *Thespesia populnea* (L.) Sol. ex Correa, Ann. Mus. Herb. Paris 9 (1807) 290, t. 8 f. 1; DC., Prod. 1 (1824) 456; Blume, Bijdr. 2 (1825) 73; W. & A., Prod. (1834) 32; Decne, Herb. Timor. (1835) 105; Wight, Ic. 1 (1838) t. 7; Span., Linnaea 15 (1841) 171; Blanco, Fl. Filip. ed. 2 (1845) 381; ed. 3, 2 (1879) 337, t. 247; Thw., En. Pl. Zeyl. (1858) 27; Miq., Fl. Ind. Bat. 1, 2 (1858) 150; Suppl. (1860) 163; Dalz. & Gibs., Bombay Fl. (1861) 18; Benth., Fl. Austr. 1 (1863) 221; Beddome, Fl. Sylv. (1870) t. 63; Mast., in Fl. Br. Ind. 1 (1875) 345; Fern.-Vill., Novis. App. (1880) 25; Forbes, Natur. Wand.

(1885) 354; Hemsl., Rep. Voy. Chall. (Bot.) 1, 3 (1885) 125; Vidal, Rev. Pl. Vasc. Filip. (1886) 64; King, J. As. Soc. Beng. n.s. 60, ii (1891) 47; Trimen, Handb. Fl. Ceyl. 1 (1893) 158; Koord. & Val., Bijdr. Booms. Java 2 (1895) 118; Baker f., J. Bot. 35 (1897) 51; Bailey, Queensl. Fl. 1 (1899) 132; Perk., Fragm. Fl. Philip. (1904) 112; Brandis, Ind. Trees (1906) 75, f. 35; Merr., Philip. J. Sc. 1 (1906) Suppl. 92; Val., Bull. Dép. Agr. Ind. Néerl. 10 (1917) 33; Backer, Fl. Bat. 1 (1907) 146; Merr., Philip. J. Sc. 3 (1908) Bot. 78, 419; Talbot, For. Fl. Bomb. Pres. 1 (1909) 125, f. 76; Gagn., in Fl. Gén. I.-C. 1 (1910) 436; Backer, Schoolfl. Java (1911) 128; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 9; Merr., Fl. Manila (1912) 324; Koord., Exk. Fl. Java 2 (1912) 588; Kawakami, Bot. Mag. Tokyo 26 (1912) 49; Ewart & Davies, Fl. North. Terr. (1917) 187; Merr., Int. Rumph. Herb. Amb. (1917) 360; Sp. Blanc. (1918) 255; En. Born. Pl. (1921) 375; Ridley, Fl. Mal. Pen. 1 (1922) 260; Doct. van Leeuwen, Ann. Jard. Bot. Btzg 32 (1922) 173; Merr., En. Philip. Fl. Pl. 3 (1923) 42; Hochr., Nova Guinea 14 (1924) 166; Baker f., J. Bot. 62, Suppl. (1924) 11; Craib, Fl. Siam. En. 1 (1925) 162; Lane-Poole, For. Res. Papua (1925) 112; Merr., Philip. J. Sc. 29 (1926) 393; Heyne, Nutt. Pl. (1927) 1038; Merr., Lingn. Sc. J. 5 (1928) 126; C. T. White, J. Arn. Arb. 10 (1929) 239; Guillaumin, J. Arn. Arb. 12 (1931) 229; Degener, Fl. Haw. fam. 221 (1932) *descr. c. tab.*; Doct. van Leeuwen, Blumea 2 (1937) 271; Corner, Wayside Trees Mal. (1940) 444, f. 146; Kanch. & Hatus., Bot. Mag. Tokyo 55 (1941) 390; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 31; Steen., Fl. Schol. Indon. (1949) 265; Merr., J. Arn. Arb. 31 (1950) 277, 278; Meijer Drees, Comm. For. Res. Inst. 33 (1951) 76; Exell & Hillcoat, Contr. Fl. Moçamb. 2 (1954) 60; Hochr., in Fl. Madag. fam. 129 (1955) 124, t. 30; Hu, Fl. China, fam. 153 (1955) 69, t. 22 f. 9; van Royen, Nova Guinea, Bot., n.s. 10 (1960) 59; Backer & Bakh. f., Fl. Java 1 (1963) 435; Fryxell, Austr. J. Bot. 13 (1965) 98. — *Hibiscus populneus* Linné, Sp. Pl. (1753) 694; in Stickman, Herb. Amb. (1754) 10; Amoen. Acad. 4 (1759) 121; Cav., Diss. 3 (1787) 152, t. 56 f. 1; Roxb., Fl. Ind. ed. Carey 3 (1832) 150; Blanco, Fl. Filip. (1837) 544. — *Malvaviscus populneus* (L.) Gaertn., Fruct. 2 (1791) 253, t. 135 f. 3. — *Bupariti populnea* (L.) Rothmaler, in Fedde, Rep. 53 (1944) 6. — *Ipomoea campanulata* Linné, Sp. Pl. (1753) 160, *quoad specim., excl. synonym. 'Adamboe'* Rheede; Hall. f., Med. Rijksherb. 1 (1910) 26; Ooststr., Blumea 3 (1940) 568; Kerr, Kew Bull. (1941) 18; Ooststr., Fl. Mal. I, 4 (1953) 485. — *Hibiscus bacciferus* Forster f., Fl. Ins. Austr. (1786) 48. — *T. macrophylla* Blume, Bijdr. 2 (1825) 73; Miq., Fl. Ind. Bat. 1, 2 (1858) 151; Fern.-Vill., Novis. App. (1880) 25; Vidal, Sinops. Pl. Filip., Atlas (1883) 16, t. 16 f. D; Baker f., J. Bot. 35 (1897) 52; K. Sch. & Hollr., Fl. Kaiser Wilhelmsl. (1889) 56; Warb., Bot. Jahrb. 13 (1891) 373; Koord. & Val., Bijdr. Booms. Java 2 (1895) 119; K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 440; Merr., Bull. Bur. For. Philip. 1 (1903) 37; Backer, Fl. Bat. 1 (1907) 147; Schoolfl. Java (1911) 128; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 9; Koord., Exk. Fl. Java 2 (1912) 588; Koord.-Schum., Syst. Verz. 2 (1913) 6. — *Hibiscus macrophyllus* (Bl.) Oken, Allg. Naturgesch. 3, 2 (1841) 1223, *non* Roxb. *ex* Hornem., 1819. — *T. banalo* Blanco, Fl. Filip. ed. 2 (1845) 382; ed. 3, 2 (1879) 338, t. 269. — *T. populneoides* (Roxb.) Voigt, Hort. Calc. (1845) 120. — *Hibiscus populneoides* Roxb., [Hort. Beng. (1814) 51, *nom. nud.*] Fl. Ind. ed. Carey 3 (1832) 190. — *T. populnea* var. *populneoides* (Roxb.) Pierre, Fl. For. Coch. 3 (1888) t. 173; Baker f., J. Bot. 35 (1897) 51; Gagn., in Fl. Gén. I.-C. 1 (1910) 437. — *T. populnea* var. *macrocarpa* Pierre, Fl. For. Coch. 3 (1888) t. 173A; Baker f., J. Bot. 35 (1897) 51; Gagn., in Fl. Gén. I.-C. 1 (1910) 437. — *T. populnea* var. *rheedii* Pierre, Fl. For. Coch. 3 (1888) t. 173; Baker f., J. Bot. 35 (1897) 51. — *T. howii* Hu, Fl. China, fam. 153 (1955) 69, t. 22 f. 3. — *Bupariti* Rheede, Hort. Malab. 1, p. 51, t. 29. — *Novella litorea* Rumph., Herb. Amb. 2, p. 224, t. 74.

Types: *Hibiscus populneus* L.: Ceylon, Herb. Hermann, Vol. IV, fol. 34, *Lin. n.* 258 (lectotype: BM); *T. macrophylla* Blume: Java, *Blume s.n.* (lectotype: L 908.140-983; isotypes: L, P, U); *T. populnea* var. *macrocarpa* Pierre: Cochín-China, *Pierre 3726* (isotypes: K, P); *Hibiscus populneoides* Roxb.: India, *Wallich 1888F* (lectotype: K-W); *T. populnea* var. *rheedii* Pierre: *Pierre 3727* (holotype: P); *Hibiscus bacciferus* Forster f.: Friendship Is., *Forster s.n.* (syntypes: BM, P); *T. banalo* Blanco: Luzon, *Llanos 188* (holotype: MA); *T. howii* Hu: Hainan, *How 70921 (n.v.)*.

Shrub or small tree, 3—15(—20) m. Twigs brown to silvery by a dense cover of minute scales, glabrescent. *Leaves* orbicular, deltoid, ovate or oblong, at base deeply cordate, rarely truncate, at apex acute to acuminate or long attenuate, rarely obtuse, occasionally tricuspidate, 7—23½ by 5½—16 cm, entire, at base 7-nerved, in the axils of the basal nerves beneath mostly with small saccate nectaries, when young brown or bronze-green by a dense covering of minute scales, glabrescent; petiole 5—16 cm, scaly. *Stipules* lanceolate to subulate, acute, 3—10 mm, scaly. *Flowers* axillary, solitary, large. Pedicel fairly rigid, 2½—8 cm, slightly accrescent, at apex with a discoid hypanthium 6—8 mm  $\varnothing$ , scaly, glabrescent. *Epicalyx segments* 3, caducous, subcoriaceous, oblong to lanceolate, acute, 4—17 by c. 2 mm, densely scaly. *Calyx* coriaceous, cupular, with 5 minute teeth or practically entire, 12—14 mm high and c. 18 mm  $\varnothing$ ,  $\pm$  accrescent and flattened by the growing fruit, outside densely scaly, glabrescent, inside densely sericeous by simple hairs. *Corolla* campanulate, at base closely embraced by the calyx, light yellow with a dark purple centre, finally orange; petals obliquely obovate, at apex rounded, 6—7 by 4½—6 cm, at base fleshy, outside on the covering margin densely scaly, at base ciliate. *Staminal column* glabrous; filaments c. 4 mm; anthers c. 1½ mm. *Ovary* globose to ovoid, c. 8—10 mm  $\varnothing$ , scaly, 10-celled; cells with 4 ovules; style c. 4 cm; stigmas connate to a clavate, 5-sulcate body, 5 by 3 mm. *Fruit*  $\pm$  globose, faintly 5-angular, at apex obtuse or slightly depressed, often with a short mucro, 2—4½ cm  $\varnothing$ , initially scaly, glabrescent, usually not dehiscent; pericarp 1½—4½ mm; exocarp c. ½ mm, ligneous; mesocarp ½—3 mm, spongy; endocarp c. ½ mm, ligneous, in particular upwards strongly 5-costate; fruit 5-celled, inside smooth but with five, longitudinal, up to 1 mm high ridges alternating with the dissepiments, representing the remains of the false dissepiments. *Seeds* 4 per cell, obovoid, angular, 8—15 by 6—9 mm, at base acute to shortly acuminate, at apex rounded, densely rusty short-hairy or glabrous, at base sometimes long-hairy, veined.

*Distribution*: Widely distributed in the tropical countries of the world; also cultivated as a shade-tree; throughout Malesia confined to the sea-shore, though not as common as *Hibiscus tiliaceus* L. ssp. *tiliaceus*.

*Ecology*: Sandy sea-shores, in the Barringtonia formation; never in the mangrove and never on river-banks, lake-shores or elsewhere (cf. Guppy, *Observ. Natur. Pacif.* 2, 1906, 547). It is one of the few tree species which can be used as a road-side tree in very dry, tropical countries. Its wide distribution is due to the capacity of the seeds to float in seawater and staying alive in that condition. Guppy (l.c. 529) stated that the seeds can float for months. Hemsley (*Ann. Bot.* 5, 1891, 406) reported on Guppy's observation on the Keeling Islands: Seeds were kept dry during 20 months, and then put in seawater, where they remained for twelve months. Subsequently placed in conditions suitable for germination, they began to sprout in less than a fortnight.

It has about the same ecology as *Hibiscus tiliaceus*, but that species also occurs on river-banks, and is also often planted by man in the inland on account of its usefulness.

Hillebrand found good arguments to consider *T. populnea* as introduced in the Pacific islands of Hawaii, Tahiti, Samoa, and Tonga, where it is held sacred and used in religious ceremonies (*Fl. Haw. Is.* 1888, xvi, 50).



*Notes:* Linnaeus based *Hibiscus populneus* primarily on an entry in the Flora zeylanica. In Hermann's herbarium (in BM) there is corresponding material consisting of some leaves, possessing distinct nectaries in the axils of the basal nerves, and two damaged flowers. This is considered the lectotype.

Hallier f. (Bull. Herb. Boiss. 6, 1898, 723; Med. Rijksherb. 1, 1910, 26; Rec. Trav. Bot. Néerl. 15, 1918, 571) found that the specimen in Linnaeus' herbarium of *Ipomoea campanulata* L. and the description belong to *T. populnea*. *Adamboe* Rheede (Hort. Malab. II, p. 115, t. 56), which is cited in the protologue, is probably *Stictocardia* (cf. Van Oostroom, Fl. Mal. I, 4, 1953, 485). *Adamboe* Adans. (Fam. Pl. 2, 1763, 88, 513) based on Rheede, Hort. Malab. 4, t. 20, is *Lagerstroemia*.

Judging from the description *Hibiscus bacciferus* Forster f. can only belong to *T. populnea*. In the British Museum (Nat. Hist.) and at Paris there are specimens collected by Forster in the Friendship Is. (one of the type localities), which match the description, and are treated here as syntypes. Forster f. also mentioned Easter I. as a locality, but I have not traced specimens from there.

Blume differentiated *T. macrophylla* Blume from *T. populnea* mainly by being not scaly, having 5- instead of 7-nerved leaves and pedicels shorter than the petiole.

I cannot maintain *T. macrophylla* Blume as a separate species, and not even as a variety. The type collection shows stout twigs with long internodes and large, nearly glabrous leaves with long petioles. Such branches can be found on either tree of *T. populnea* along the beach, and may be suckers or shade-branches (within the crown). As in other tree species the leaves of such branches possess usually a less dense indumentum (scales).

Subsequent authors have used Blume's name in floristic lists and Floras. Koorders & Valeton (1895) concluded that *T. populnea* var. *macrocarpa* Pierre (1888) was conspecific with Blume's species. Pierre characterized his variety as follows: 'Pétiole plus long que le pédoncule. Glandes présentes ou absentes à la base dorsale du limbe, entre les nervures. Fruit ovale plus large que long, sillonné au sommet, sans pointe styloïde, plus gros que celui des variétés précédentes. Endocarpe fibreux, mou, inséparable du mésocarpe. Cloisons de même nature que l'endocarpe. Graines en partie tomenteuses et plus grosses que celles des variétés, a et b.'

The last named varieties, var. *rheedii* Pierre and var. *populneoides* (Roxb.) Pierre, more or less agree with *T. populnea* (L.) Sol. ex Correa as conceived by Blume. These two varieties would differ from each other by characters of the fruit (cf. Backer's key below) and the presence or absence of nectaries in the axils of the basal nerves of the leaves.

Backer (1907, 1911) and Koorders (1912) followed Koorders & Valeton for the distinction of *T. macrophylla* Blume. Backer (1907) gave in a key the following differences (translated from the Dutch):

Leaves distinctly acuminate, between the base of the nerves on the lower surface with distinct, saccate glands. Fruit with indented apex, crowned by a styler remains. Exocarp separating from the endocarp.

Seeds short-hairy, 7—8 mm long . . . . . *T. populnea*

Leaves with gradually narrowed, not or hardly acuminate apex, usually without saccate glands between the base of the nerves on the lower surface. Apex of the fruit not indented, not crowned by a styler remains. Exocarp of the fruit not separating from the endocarp. Seeds at base long-hairy, 12—15 mm long.

*T. macrophylla*

Merrill wrote in 1918 (Sp. Blanc., 255) under *T. populnea*: 'There are two forms in the Philippines, one with pedicels about as long as the petioles, and one with much shorter pedicels, but I am not convinced that two species are represented.'

In 1943 Backer considered *T. macrophylla* Blume a synonym of *T. populnea*, with the remark 'variable; the forms pass into each other'. This was maintained by Backer & Bakhuizen van den Brink f. in 1963.

A similar case is *T. howii* Hu, distinguished from *T. populnea* mainly by deltoid leaves, somewhat longer pedicels, and smaller papillose seeds.

I have not only studied a large number of herbarium sheets but made also observations in the field (e.g. in Djakarta, P. Panaitan, W. Sumatra, and the SE. Moluccas). From these studies the following conclusions are drawn.

There is a great variability with respect to the shape of the leaves, which may be deltoid, ovate, oblong, or orbicular, mostly with a cordate base, but sometimes with a truncate one. The apices range from obtuse (rarely) to acute to acuminate to long attenuate. Sometimes the leaves are 3-apiculate [Mindoro, *Conklin P. N. H.* 18633 (L)]. The saccate nectaries are mostly distinct, but may also be hardly visible. The relative length of the petiole and the pedicel have already been dealt with above. The density of the indumentum (scales) also varies. In general there is a correlation between a dense indumentum and thick, smaller leaves, and between a thin or lacking indumentum and thin, larger leaves. These correlations point to a protection by the indumentum against dry, and sunny conditions (cf. the case of *Hibiscus tiliaceus* L., on p. 33).

The characters of the fruit described by Koorders & Valeton and Backer under *T. populnea* (L.) Correa can only have been derived from immature ones. Seeds of immature fruits are not full-grown, smaller, and also short-hairy. If such a fruit is dried (in the field by unfavourable weather-conditions or in the herbarium) the shriveling inner layer contracts and breaks away from the more rigid outer layer. In addition, as a result of a contraction of the dissepiments, the apex becomes indented. Also, the shrivelled style, usually fallen in full-grown, mature fruits, may be still visible in the centre of the dent. The fruits are indehiscent as a whole, but often the outer layer, especially when free from the inner one, splits ('loculicidally') along the angles (costae), thus only simulating a dehiscence, as the inner layer remains closed. Ultimately the seeds are released by the decay of the inner layer, which, in case the outer layer has split, is initiated in the parts opposite to the splits. In herbarium material the inner layer may split or rather break by pressure along the decayed strips, thus completing the delusive picture of a genuine dehiscence.

Many authors have described the fruit as being 10-celled, as in *Hibiscus tiliaceus* L. and relatives, but I deem it better to qualify them as 5-celled. On the inner wall, opposite to the costae, there are five ridges, up to 1 mm high, that is 1/10 of the radial dimension of the cells: these can hardly be considered to represent false dissepiments, although they are remains of them from the juvenile stage.

*T. banalo* Blanco (1845) is, judging from the description (cf. Merrill, 1918, 255) comparable with *T. populnea sens. str.* and certainly not with *T. macrophylla* Blume, to which Fernandez-Villar (1880) referred it. In Madrid there is in the so-called Herbarium Llanos a specimen from Luzon which is in fair agreement with the description. Quisumbing, who studied that herbarium, assigned (*in sched.*) that specimen as the lectotype, assuming (in contrast with Merrill) that the herbarium was indeed collected by Llanos.

*Hibiscus populneoides* Roxb. can be typified by *Wallich 1880F*, a specimen with the name in Roxburgh's handwriting and corresponding with the description. Pierre reduced the species to a variety of *T. populnea*, and arranged it next to his varieties *macrocarpa* Pierre and *rheedii* Pierre.

## 2. *Thespesia patellifera* Borss., *Blumea*, Suppl. 4 (1958) 154, f. 2.

Type: New Guinea, near Embi Lakes, *L. S. Smith N. G. F.* 1277 (holotype: LAE).

Fairly tall tree, 10—30 m. Twigs ± angular, ultimately terete, 3—5 mm ø, as the petioles, stipules, and pedicels puberulous by minute stellate hairs, glabrescent. *Leaves*

coriaceous, ovate or broadly elliptic, at base  $\pm$  cordate or rounded, at apex shortly obtusely acuminate, entire, 9—18 by 6—11 cm, at base 5-nerved, without nectaries; above glabrous or nearly so, beneath with scattered, minute, stellate hairs, glabrescent; petiole 3—11 cm, robust. *Stipules* coriaceous, broadly ovate, at apex acute, more or less concave, 3—4 mm by c. 3 mm, caducous. *Flowers* solitary, axillary. Pedicel  $1\frac{1}{2}$ —2 cm,  $\pm$  accrescent, robust, near the apex with a joint, over the joint abruptly thickened to an obconical hypanthium, 6—7 by 8—10 mm  $\varnothing$ . *Epicalyx segments* 3, as observed from their scars. *Calyx* coriaceous, patelliform,  $1\frac{1}{2}$ —2 cm  $\varnothing$ , accrescent to c.  $2\frac{1}{2}$  cm, entire, outside densely set with minute stellate hairs, inside by appressed simple and minute stellate hairs. *Petals* obovate, narrowed toward the base, at apex rounded,  $3\frac{1}{2}$ —4 by  $1\frac{1}{2}$ —2 cm, crenate or entire, fleshy towards the base, outside near the base densely stellate-hairy, yellow with a dark purple patch near the base, finally discolouring reddish. *Staminal column* c.  $1\frac{1}{2}$  cm, glabrous; filaments 3—4 mm; anthers c.  $1\frac{1}{2}$  mm. *Ovary* pyriform, acuminate, 4 by c. 5 mm, stellate-hairy, 10-celled; ovules 1—2 per cell; style  $1\frac{1}{2}$ —2 cm, sulcate, stellate-hairy; stigma clavate, c. 8 mm, 5-sulcate. *Fruit* remaining free from the calyx and not closely enveloped, probably dry, indehiscent, sphaeroid, c.  $1\frac{1}{2}$ —2 by  $2\frac{1}{2}$  cm, outside velutinous with minute stellate hairs, thick-walled, ligneous, 10-celled. *Seeds* 1—2 per cell.

*Distribution*: East New Guinea and on the adjacent islands Normanby and Goodenough.

*Ecology*: Primary and secondary forests, from about sea-level to c. 300 m.

### 3. *Thespesia robusta* Borss., sp. nov. — Fig. 14a-b.

Type: N. G. F. 1288 (holotype: LAE).

Arbor sat alta. Ramuli subangulares, denique teretes, squamis minutis dense vestiti, glabrescentes, denique lenticulis dispersis ornati. *Folia* rigide coriacea, orbicularia vel late ovata, basi paulum cordata, apice acuta vel brevissime acuminata, margine integra, basi 5—7-nervata; costa validissima, ad apicem percurrrens, nectario nullo; nervi laterales utrinque 3—4, sicut basales erecto-patentes, sursum curvati et ante marginem in venas ramosi; nervi omnes in pagina inferiore valde prominentes; folia utrinque squamis subfimbriatis minutis vestita; petiolus robustus, rigidus, lamina brevior, squamis minutis dense vestitus, glabrescens. *Stipulae* appressae, orbiculares, basi rotundatae, apice obtusae, concavae, utrinque squamis fimbriatis minutis pilisque stellatis minutis dense vestitae. *Flores* in axillis superioribus solitarii. Pedicellus robustus, petiolo annexo circiter aequilongus, sulcatus, paulum infra apicem articulatus, supra articulum in hypanthium obconicum incrassatus, in articulo verticillo cicatricum (ut videtur prophyllorum) instructus, squamis minutis dense vestitus, post anthesin paulo elongatus et incrassatus. *Epicalycis segmenta* 8—10, in marginem hypanthii posita, coriacea, lanceolata, apice et basi acuta, extus squamis minutis dense vestita, intus dense stellato-pilosa, ante explicationem corollae caduca. *Calyx* coriaceus, cupulatus, margine 5 dentibus minutis instructus, extus squamis fimbriatis dense vestitus, intus sericeus, post anthesin amplificatus et partim fissilis. *Petala* obovata, basi angustata, apice rotundata, extus praecipue ad basin et ad marginem obtegentem stellato-pilosa, intus ad marginem obtegentem sparse pilosa, ceterum glabra. *Columna staminalis* petalis brevior, a basi usque ad apicem stamina gerens, glabra. *Ovarium* pyriforme, acuminatum sericeum, 5-loculare; ovula numerosa; stylus brevis, appresse pilosus; stigma clavatum, 5-sulcatum. *Fructus* — specimen unicam immaturum visum — globosus, extus pilis simplicibus longis appressis pilisque stellatis minutis dense vestitus.

Tree, 30 m, bole 20 m, 60 cm  $\varnothing$ . Twigs 4—5 mm  $\varnothing$ . *Leaves* 9—14 by 7—12 cm; petiole 3—11 cm by c. 2 mm. *Stipules* c. 4 mm  $\varnothing$ . Pedicel 4—5 cm. *Epicalyx segments* c.

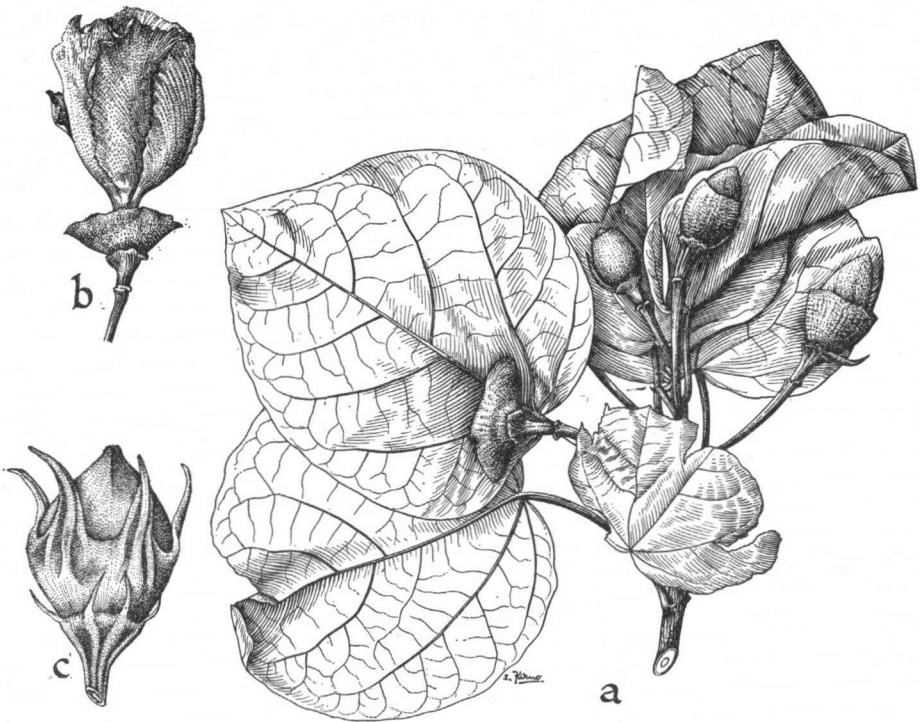


Fig. 14. *Thespesia robusta* Bors. a. Habit,  $\times \frac{1}{2}$ , b. flower,  $\times \frac{1}{2}$  (NGF 1288, type). — *T. lamps* (Cav.) Dalz. & Gibs. var. *longispala* Bors. c. Bud,  $\times \frac{1}{2}$  (bb 629, type).

5 by 2 mm. Calyx c. 2 cm wide,  $1\frac{1}{2}$  cm high, brown. Petals c. 5 by  $3-3\frac{1}{2}$  cm. Staminal column c. 2 cm; filaments 4—5 mm; anthers c. 1 mm. Ovary c. 7 mm  $\varnothing$ ; style c.  $1\frac{1}{2}$  cm; stigma c. 7 by  $3\frac{1}{2}$  mm. Immature fruit c.  $1\frac{1}{2}$  cm  $\varnothing$ .

NEW GUINEA. Eastern part: N. of Waigani Plantation, on the slope of an ironstone-gravel, capped ridge, 23 m, L. S. Smith N.G.F. 1288 (LAE, holotype), tree c. 30 m, bole c. 20 m high and 60 cm thick breast high, calyx brown, corolla outside brown, inside yellow with dark red centre, vern. name *porvorva* (Waigani dial.), March, 1945.

*Distribution*: East New Guinea, in lowland, one collection.

4. *Thespesia fissicalyx* Bors., *sp. nov.* — Fig. 15.

Type: Brass & Versteegh 13554 (holotype: L; isotypes: BO, GH).

Arbor sat alta. Ramuli subangulares, denique teretes, dense squamis fimbriatis minutissimis vestiti, glabrescentes, lenticulis prominentibus dispersis praediti. Folia coriacea, late ovata vel elliptica vel suborbicularia, basi rotundata vel truncata vel subcordata, apice breviter et obtuse acuminata, integra, basi 5-nervata; costa validissima, usque ad apicem percurrans, nectario nullo; nervi laterales utrinque 4—5, sicut basales erecto-patentes, inferne recti, marginem versus curvati et in venas ramosi; folia supera glabra, subtus disperse pilis stellatis minutissimis vestita, glabrescentia; petiolus lamina brevior, robustus, squamis fimbriatis minutissimis dense vestitus, glabrescens. Stipulae caducae, haud visae.

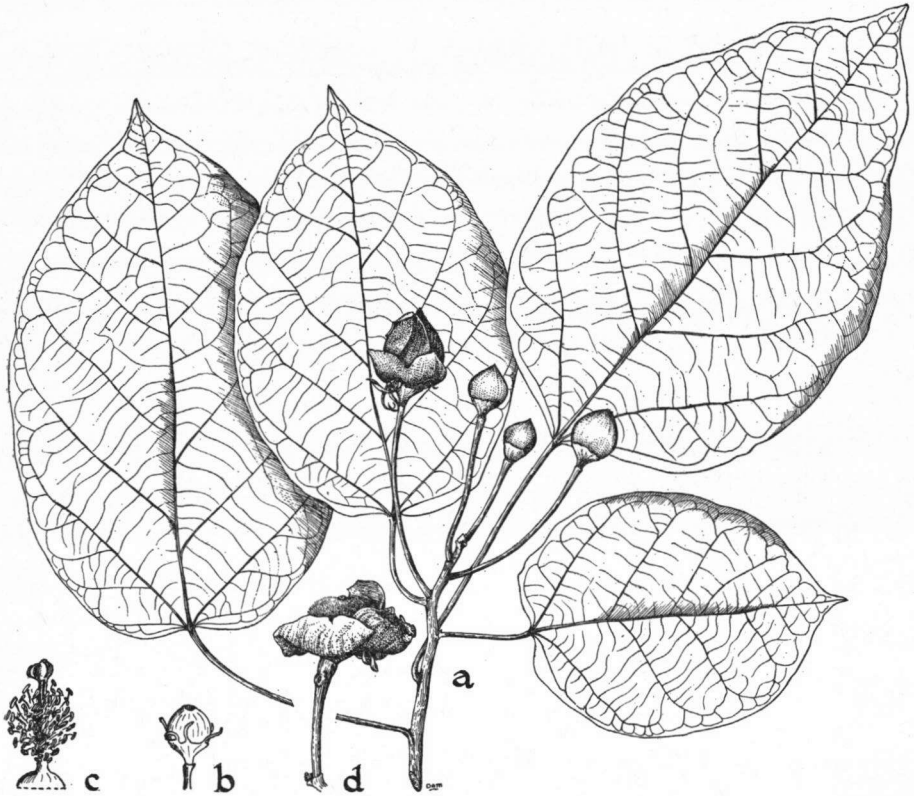


Fig. 15. *Thespesia fissicalyx* Bors. a. Habit,  $\times \frac{1}{2}$ , b. bud,  $\times \frac{1}{2}$ , c. staminal column, nat. size, d. fruit,  $\times \frac{1}{2}$  (a. Versteegh BW 34, b-d. Brass & Versteegh 13554, type).

*Flores* in axillis superioribus solitarii. Pedicellus robustus, ligneus, elongatus, sed petiolo annexo brevior, sulcatus, paulo infra apicem articulus, supra articulum subito in hypanthium obconicum incrassatus, in articulo frequenter prophylo coriaceo, spatulato vel orbiculari praeditus, glaber, sed in hypanthio dense squamis fimbriatis minutissimis vestitus, post anthesin paulo elongatus et incrassatus. *Epicalycis segmenta* persistentia, 6—8, in margine hypanthii posita, libera, remota, patentia vel reflexa, coriacea, linearia, obtusa vel acuta, squamis fimbriatis minutissimis dense vestita. *Calyx* in statu alabastris globosus, rigide coriaceus, late cupulatus, integer sed per explicationem corollae findens, quasi spurie lobatus, extus dense squamis fimbriatis minutissimis vestitus, intus basi pulvinulo annulato molli pilorum longorum ornatus, intus ad apicem sericeus, post anthesin amplificatus. *Petala* obovata, basi angustata, apice rotundata, extus densius minute stellato-pilosa, intus in parte obtecta minute stellato-pilosa, ceterum glabra. *Columna staminalis* brevis, petalis brevior, a basi usque ad apicem stamina gerens, glabra. *Ovarium* semiglobosum vel conicum, pilis simplicibus erecto-patentibus pilisque stellatis minutis dense vestitum, 5-loculare; ovula 2 per loculum; stylus brevis, 5-sulcatus, stellato-pilosus; stigma clavatum vel capitatum, 5-sulcatum. *Fructus*, ut videtur, siccus et non dehiscens, subapplanato-globosus, apice reliquo styli praeditus, pilis simplicibus

appressis pilisque stellatis minutis dense vestitus; pericarpium grossum, ligneum; septimenta et semina in speciminibus visis putrida, sed pili longi lanosi indumenti seminum residentia.

Tree, 10—26 m, 20 cm  $\varnothing$ . Twigs 2—7 mm  $\varnothing$ . *Leaves* 9—18 by 6½—14 cm; petiole 2—10½ cm by 1—2½ mm. Pedicel 2—4 cm by c. 1½ mm; hypanthium c. 10 mm  $\varnothing$ , c. 5 mm high. *Epicalyx segments* c. 10 by 1—2 mm. *Calyx* 10—13 mm high, 25—30 mm  $\varnothing$ , in fruit up to 35 mm  $\varnothing$ . *Petals* c. 3½ by 3½ cm. *Staminal column* c. 20 mm; filaments 4—5 mm; anthers c. 2 mm. *Ovary* c. 5 mm high and across; style c. 20 mm; stigma c. 3 mm. *Fruit* 2—2½ cm  $\varnothing$  and c. 2 cm high; pericarp c. 3 mm  $\varnothing$ .

NEW GUINEA. Western part: Idenburg R., Bernhard Camp, occasional in the primary rain-forest on the lower slopes, 70 m, *Brass & Versteegh 13554* (holotype: L; isotypes: BM, BO, GH), tree 26 m, flowers yellow; Sabronsaman, SW. of Sentani Lake, secondary forest, steep slope, 180 m, *Kalkman BW 6210* (L, duplicates to be distributed), tree 10 m, corolla yellow, outside brownish, stamens and stigma yellow; Genjem, forest on level ground, clayish soil, 100 m, *Rosendahl BW 5424* (L, duplicates to be distributed), young tree, flowers yellow; Holtekang, clayish soil, primary forest, 2 m, *Versteegh BW 34* (BO, L), tree 22 m, flowers yellow, wood used for boats, vern. name *tuobur* (Njau dial.); Holtekang, secondary forest, 3 m, *A. Brouwer BW 1534* (L), tree 19 m, flowers in bud, vern. name *tangling* (Skou dial.). Eastern part: Kaiser Wilhelmsland, Kaulo R., 200 m, *Schlechter 16835* (BM, GH, K, L); Sepik Distr., near Angoram Along, 50 m, rain-forest, *Pullen 1799* (L), tree 25 m; Sepik Distr., Sumo Village, Rhainbrum R., tall forest on river flats, 15 m, *Darbyshire & Hoogland 8095* (L), tree 25 m, trunk 20 cm thick breast-high, flowers lemon yellow, vern. names *borku* (Orne lang.), *borabora* (Pogatumo lang.).

*Distribution*: New Guinea.

*Ecology*: Primary, rarely secondary rain-forest, up to 200 m.

##### 5. *Thespesia multibracteata* Borss., sp. nov. — Fig. 16.

Type: *Brass 27276* (holotype: L; isotype: K).

Arbor. Ramuli angulares, denique teretes, dense squamis fimbriatis minutissimis vestiti. *Folia* coriacea, orbicularia vel fere deltoidea, basi cordata, apice abrupte et breviter acuminata, margine integra, basi 5—7-nervata; costa validissima, ad apicem percurrens, nectario nullo; nervi laterales utrinque 5—6, sicut nervi basales erecto-patentes, curvati et prope marginem in venas ramosi; folia in utraque pagina dense squamis fimbriatis minutissimis vestita. Petiolus lamina paulum brevior, robustior, teres, dense squamis fimbriatis minutissimis vestitus. *Stipulae* caducae, haud visae. *Flores* in axillis, solitarii. Pedicellus elongatus, petiolo annexo circiter aequilongus, teres, paulum infra apicem articulatus, supra articulum gradatim in hypanthium obconicum incrassatus, in articulo cicatricibus prophyllorum praeditus, dense squamis fimbriatis minutissimis vestitus. *Epicalycis segmenta* persistentia, numerosa, densa, nec remota, linearia vel lanceolata, acuta, partim longitudinaliter fissa, dense squamis fimbriatis minutissimis vestita. *Calyx* rigide coriaceus, late cupulatus, integer sed per explicationem corollae findens, ut spurie lobatus, extus dense squamis fimbriatis minutissimis vestitus, intus dense molliter sericeus. *Petala* obovata, basi angustata, apice rotundata, lacerata, extus dense pilis stellatis minutis vestita, intus in parte oblecto minute stellate pilosa, ceterum glabra. *Columna staminalis* brevis, petalis brevior, a basi usque ad apicem stamina gerens, glabra. *Ovarium* semi-globosum vel conicum, pilis simplicibus erecto-patentibus et pilis stellatis minutis dense vestitum, 5-loculare; ovula 2 per loculum; stylus brevis, 5-sulcatus, stellato-pilosus; stigma clavatum vel capitatum, 5-sulcatum. *Fructus* ignotus, sed probaliter eo *Thespesiae fissicalycis* similis.

Tree. Twigs 4—5 mm  $\varnothing$ . *Leaves* 10—15 by 10—15 cm; petiole 5—10 cm by c. 2 mm. Pedicel 6½—7 cm by c. 2½ mm; hypanthium c. 8 mm  $\varnothing$ . *Epicalyx segments* 12—15 by c. 2 mm. *Calyx* c. 3 cm  $\varnothing$ . *Petals* 5—6 by c. 4 cm. *Staminal column* c. 1½ cm; filaments

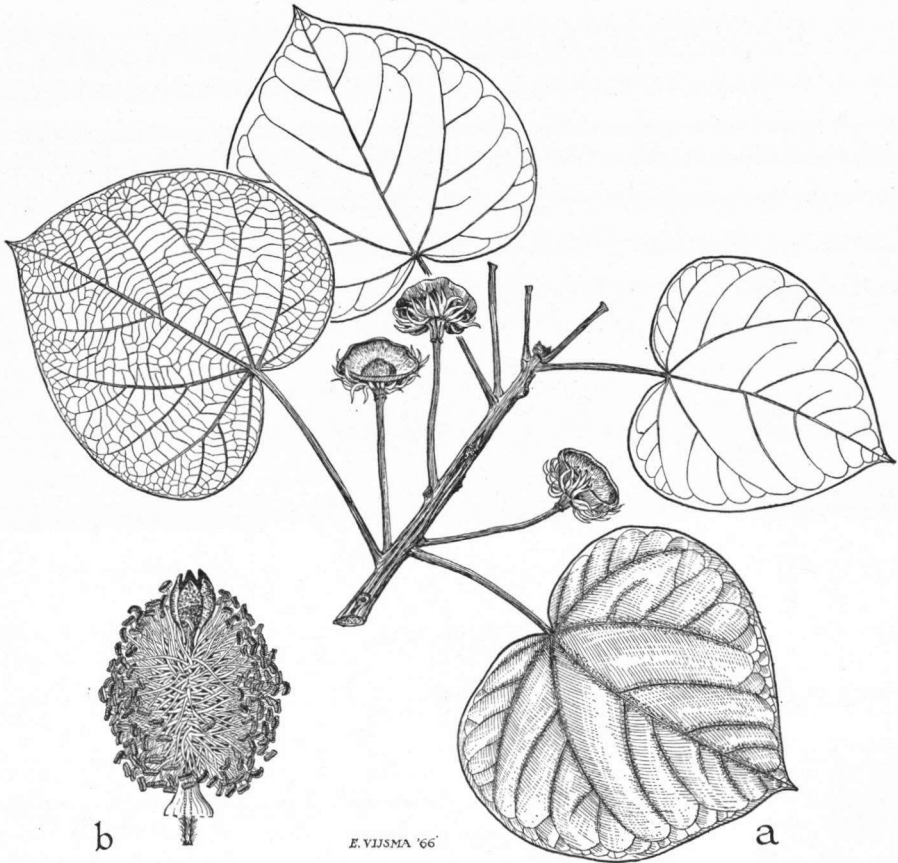


Fig. 16. *Thespesia multibracteata* Borss. a. Habit,  $\times \frac{1}{3}$ , b. staminal column and style, nat. size (Brass 27276, type).

5—10 mm; anthesis 1—1½ mm. Ovary c. 7 mm  $\varnothing$ ; style c. 2 cm; stigma c. 8 mm long.

NEW GUINEA. Eastern part: Ferguson I., Agamoia, primary rain-forest, 200 m, Brass 27276 (holotype: L; isotype: K), canopy tree, flowers yellow, later brown, petals crinkled, June 22, 1956.

*Distribution*: NE. New Guinea: (Ferguson I.), once collected.

*Ecology*: Primary rain-forest, at c. 200 m.

*Note*: This species differs from *T. fissicalyx* by the great number of epicalyx segments, by a larger corolla, lacerate petals, and possibly also by the shape of the leaves and the density of their indumentum.

## 2. Section *Lampas*

(Ulbr.) Borss., *comb. nov.* — *Hibiscus* sect. *Lampas* Ulbr. Notizbl. Berl.-Dahl. 8 (1922) 158. — *Azanza* Alefeld, Bot. Zeit. 19 (1861) 298. — *Cephalohibiscus* Ulbr. Notizbl. Berl.-Dahl., 12 (1936) 495.

Holotype: *T. lampas* (Cav.) Dalz. & Gibs.

*Note:* A number of authors, including Hochreutiner, included *T. lampas* in *Hibiscus*. Exell & Hillcoat (1954, 58) re-established it under the genus *Azanza* Alefeld. I agree that in *Thespesia* it occupies a special position, which I have recognized by giving it sectional status. Apart from the unbranched style, some characters, viz. habit, a nectary on the midrib, the shape of the stipules, and the dehiscent capsule point to a linkage with *Hibiscus* sect. *Azanza* DC.

6. *Thespesia lampas* (Cav.) Dalz. & Gibs., Bombay Fl. (1861) 19; Mast., in Fl. Br. Ind. 1 (1875) 345; Kurz, For. Fl. Burma 1 (1877) 128; Fern.-Vill., Novis. App. (1880) 25; Hemsl., Rep. Voy. Chall. (Bot.) 1, 3 (1885) 125; Trimen, Handb. Fl. Ceyl. 1 (1893) 158; Baker f., J. Bot. 35 (1897) 52; Perk., Fragm. Fl. Philip. (1904) 11; Merr., Philip. J. Sc. 1 (1906) Suppl. 92; Brandis, Ind. Trees (1906) 76; Backer, Fl. Bat. 1 (1907) 144; Talbot, For. Fl. Bomb. Pres. 1 (1909) 124, f. 75; Gagn., in Fl. Gén. I.-C. 1 (1910) 437; Backer, Schoolfl. Java (1911) 127; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 8; Koord., Exk. Fl. Java 2 (1912) 588; Merr., Fl. Manila (1912) 324; Sp. Blanc. (1918) 256; En. Born. Pl. (1921) 375; En. Philip. Fl. Pl. 3 (1923) 41; Craib, Fl. Siam. En. 1 (1925) 161; Heyne, Nutt. Pl. (1927) 1038; Merr., Contr. Arn. Arb. 8 (1934) 102; Doct. van Leeuwen, Blumea 2 (1937) 260; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 32; Hu, Fl. China, fam. 153 (1955) 69, t. 12; Backer & Bakh. f., Fl. Java 1 (1963) 435; Fryxell, Austr. J. Bot. 13 (1965) 96. — *Hibiscus lampas* Cav., Diss. 3 (1787) 154, t. 56 f. 2; DC., Prod. 1 (1824) 447; Blume, Bijdr. 2 (1825) 66; W. & A., Prod. (1834) 48; Decne, Herb. Timor (1835) 102; Wight, Ic. (1840) t. 5; Span., Linnaea 15 (1841) 169; Mor., Syst. Verz. (1846) 29; Miq., Pl. Jungh. (1854) 280; Fl. Ind. Bat. 1, 2 (1858) 153; Thw., En. Pl. Zeyl. (1858) 26; O. K., Rev. Gen. Pl. 1 (1891) 69; Hochr., Ann. Cons. Jard. Bot. Genève 4 (1900) 57; Koord., Nat. Tijd. Ned. Ind. 63 (1904) 46; Hochr., in Fl. Madag. fam. 129 (1955) 11, t. 3 f. 4—6. — *Azanza lampas* (Cav.) Alefeld, Bot. Zeit. 19 (1861) 298; Exell & Hillcoat, Contr. Fl. Moçamb. 2 (1954) 58. — *Bupariti lampas* (Cav.) Rothmaler, in Fedde, Rep. 53 (1944) 7. — *Hibiscus callosus* Blume, Bijdr. 2 (1825) 67; Hassk., Cat. Hort. Bog. (1844) 197; Tijds. Nat. Gesch. Phys. 12 (1845) 82; Nat. & Geneesk. Arch. 2 (1845) 701; Pl. Jav. Rar. (1848) 301. — *Hibiscus tetralocularis* Roxb., Fl. Ind. ed. Carey 3 (1832) 198. — *Pariti gangeticum* G. Don, Gen. Syst. 1 (1831) 485 ('*Paritium*'). — *Hibiscus gangeticus* [Willd., En. Hort. Berol. Suppl. (1814) 49, *nom. nud.*] Roxb. ex W. & A., Prod. (1834) 49, in *synon.*, *nom. inval.* — *T. sublobata* Blanco, Fl. Filip. ed. 2 (1845) 382; ed. 3, 2 (1879) 338, t. 355. — *Azanza zollingeri* Alefeld, Bot. Zeit. 19 (1861) 298. — *Abelmoschus zollingeri* (Alefeld) C. Muell., in Walp., Ann. Syst. 7 (1868) 407.

Types: *Hibiscus lampas* Cav.: Philippines, *Sonnerat s.n.* (holotype: P-JU 12356); *Hibiscus callosus* Blume: Java, *Blume s.n.* (holotype: P; ? isotypes: L 908.140-991, 1005); *Hibiscus tetralocularis* Roxb.: Coromandel, *Roxburgh s.n.* (lectotype: K); *T. sublobata* Blanco: Luzon, Antipolo, *Merrill, Sp. Blanc. 561* (neotype: GH; isotypes: BO, K, L, P, US).

Shrub,  $\frac{1}{2}$ —2 $\frac{1}{2}$  m. Twigs as the petioles and pedicels  $\pm$  densely tomentose by minute stellate hairs, glabrescent. Lower leaves large, orbicular, at base cordate, deeply 3—5-lobed, with deltoid, acuminate, rarely acute or even obtuse segments; upper leaves smaller, broadly ovate to oblong, at base shallowly cordate to rounded, at apex acuminate to acute; 2—22 by 1—25 cm, entire, herbaceous to slightly coriaceous, at base 5—7-nerved, on base of midrib beneath with a 3—7 mm long linear nectary, above with scattered, minute, stellate, and short simple hairs, glabrescent, beneath more or less densely tomentose by minute stellate hairs; petiole  $\frac{1}{2}$ —16 cm. *Stipules* small, lanceolate to subulate,



5—10 mm, stellate-hairy. *Flowers* solitary, axillary, or by reduction of upper leaves in axillary, often seemingly sympodial, long stalked racemes of 1—5 flowers. *Pedicels* 4—8 mm, slightly accrescent, sulcate, hypanthium  $2\frac{1}{2}$ —6 by 5—7 mm, obconical; in 1-flowered inflorescence pedicel 10—35 mm, jointed above the middle. *Epicalyx segments* 4—6, free, remote, usually subulate, 4—10 mm, minutely stellate-hairy, caducous. *Calyx* cupular, coriaceous, 7—9 mm  $\varnothing$  and high, slightly accrescent and spreading, with 5 small, spaced subulate to triangular segments 1—3 mm long, rarely much longer, outside densely stellate-hairy, glabrescent, inside on the segments stellate-hairy, on the bottom with a ring of short, sericeous hairs. *Corolla* campanulate to infundibuliform, light yellow with a dark purple centre; petals obovate, at apex rounded, 6—7 by 5—6 cm, downwards on the covering half fleshy and densely clothed with minute stellate hairs and sometimes also with fimbriate scales, outside with scattered minute, stellate hairs and gland-hairs, inside glabrous. *Staminal column*  $1\frac{1}{2}$ —2 cm, glabrous; filaments *c.* 3 mm; anthers *c.* 1 mm. *Ovary* conical, acuminate, *c.* 8 mm  $\varnothing$ , densely erecto-patently hairy, 5-celled; style *c.* 18 mm, glabrous; stigma *c.* 3 mm long. *Capsule* globose to ovoid, shortly acuminate, 5-angular, 18—30 by 18—20 mm, minutely stellate-hairy, glabrescent, black, usually dehiscent, rarely releasing the seeds by decay of the pericarp; valves thick and woody ( $1\frac{1}{2}$  mm), inside stellate-hairy on the costae, for the rest glabrous. *Seeds* 8—14 per cell, obovoid, angular, *c.* 4 mm long, more or less densely clothed with short, appressed, simple hairs, especially around the hilum, glabrescent, black.

*Distribution:* East Africa, S.—SE. Asia, almost throughout Malesia, in New Guinea only near Port Romilly, not found in the Malay Peninsula. Merrill (1918, 256) wrote: 'It has all the appearance of being an introduced plant in the (Philippine) Archipelago'. However that may be, the holotype is from the Philippines, and it has been collected in almost all large islands. In N. and W. Australia a different variety occurs (see below).

*Ecology:* Both in everwet and in seasonal dry regions, inalang-fields, secondary vegetation, and in teak-forest, up to *c.* 900 m.

*Notes:* *Hibiscus lampas* Cav. was based exclusively on a specimen collected by Sonnerat in the Philippines and preserved in the Herbarium de Jussieu at Paris. This consists of a twig with some 3-lobed or unincised, slightly tomentose, upper leaves. In addition there is an envelope containing a corolla and a few faded flowers. On a label the name *Hibiscus philippinensis* in the handwriting of Cavanilles is written but the epithet is crossed out and replaced by *lampas*.

Blume published *Hibiscus callosus* Blume after treating *Hibiscus lampas* Cav., adding: 'An a precedente satis differt?' I have not traced specimens named *Hibiscus lampas* Cav. in Blume's handwriting although he quoted to have seen material grown in the Bogor Botanic Gardens introduced from Bengal, presumably from the Calcutta Gardens. Blume's species is clearly conspecific with *T. lampas*. At Paris there is a good specimen with the name *Hibiscus callosus* Blume in the neat handwriting which Blume apparently used for the specimens on which the 'Bijdragen' were based. In the Rijksherbarium at Leyden there are two specimens bearing the name, though in another handwriting, but obviously belonging to the type collection.

*Paritium gangeticum* G. Don was based, no doubt, on a Roxburgh specimen. Don's description clearly falls under the present species. He moreover mentions under the protologue a '*Hibiscus gangeticus* Roxb.', presumably a *nomen nudum* taken from such a specimen.

Roxburgh wrote of his *Hibiscus tetralocularis* that it 'is allied to *H. lampas*, . . . . but differs from it in having a fourcelled capsule'. An authentic specimen could not be found, but, no doubt, it was one with a capsule with an empty or obliterated carpel.

It is strange that Fryxell (1965) described the fruits of *T. lampas* as 4-celled, although he stated that he examined numerous specimens from SE. Asia. The species as occurring there has always been described as having 5-merous ovaries and fruits. I have never seen fruits with 4 cells. Without doubt he had for the study of the fruits a specimen similar to the type of *Hibiscus tetralocularis* Roxb.

*T. sublobata* Blanco can be neo-typified by Sp. Blanc. 561 of which the material is matching Blanco's description.

*Azanza zollingeri* Alefeld was based on a Zollinger specimen formerly preserved in the herbarium of Darmstadt, which was destroyed during the second world war. Alefeld did not state a number, and thus an isotype cannot be designated with certainty. The characters of the description fall within the range of variability of the present species, except for the colour given for the pollen, viz. 'lebhaft violett' instead of yellow, which may have been due to a discoloration during the drying process.

The species is extremely variable concerning the density of indumentum and the form of the leaves. Just as in many other Malvaceous species an attempt to a subdivision according to these characters does not seem worthwhile. A new variety based on material showing calyx segments much longer than normally, is created below.

**a. var. *lampas*.**

Calyx segments subulate to triangular, 1—3 mm long

**b. var. *longisepala* Borss., var. nov. — Fig. 14c.**

Type: Borneo, Martapura, *bb. 629* (holotype: BO).

Calyx segmentis longe triangularibus vel sublinearibus acuminatis vel acutis 8—10 mm longis, sinibus rotundatis.

JAVA. West Java: Bogor, Botanic Gardens, *culta*, from Siam, *s.n.* (BO).

BORNEO. SE. Borneo: Martapura, *Ramali 1930 = bb. 629* (holotype: BO).

Fryxell (1965) found that *Fugosia thespesioides* R. Br. *ex Benth.*, Fl. Austr. 1 (1863) 220, represents a variety of *T. lampas*, viz. *T. lampas* var. *thespesioides* (R. Br. *ex Benth.*) Fryxell, l.c. 97. It differs by a denser hairy calyx and capsule, by stellate hairs with more arms, and acute to obtuse instead of acuminate leaf apices. For the capsule he recorded 3—4 cells. It occurs in N. and W. Australia, not in Malesia.

**7. *Thespesia peekelii* (Ulbr.) Borss., comb. nov. — *Cephalohibiscus peekelii* Ulbr., Notizbl. Berl.-Dahl. 12 (1936) 495, t. 6.**

Type: New Guinea, Kani Mts, *Schlechter 17860* (lectotype: K; isotypes: GH, L, NY).

Tree, up to *c.* 30 m. Twigs somewhat angular, finally terete, 3—4 mm  $\varnothing$ , as the petioles and pedicels velutinous by minute stellate hairs, glabrescent. *Leaves* chartaceous to coriaceous, ovate to orbicular, at base usually cordate, occasionally obtuse to truncate, of upper leaves often entire and at apex obtuse, acute or acuminate, but usually 3-lobed in the upper half, 4—12 by 4—15 cm with  $\pm$  deltoid, acute to acuminate segments, entire, at base 5—7-nerved, at base of midrib beneath with an 8—15 mm long, linear nectary, on both surfaces velutinous by minute stellate hairs, glabrescent; petiole 1—12 cm. *Stipules* subulate or linear to lanceolate, often slightly falcate, acute, 7—20 mm long. *Flowers* axillary, solitary, or in a 2-flowered, axillary cyme on a 5—10 cm long, stout axis, with a small leaf as prophyll. Pedicel stout, 1—2 cm, accrescent to 4 cm, without joint. *Epicalyx segments* caducous, 3—5, remote, linear to subulate, 5—7 by *c.* 1 mm, velutinous, leaving prominent scars. *Calyx* coriaceous, campanulate to cupular, *c.* 15 mm long, 12—15 mm  $\varnothing$ , truncate, entire, outside stellate-velutinous, glabrescent, inside in the lower half sericeous by long simple hairs. *Corolla* medium-sized, white (*Darbyshire*

174); petals at base connate in a tube 8—10 by 4—5 mm, oblique, irregularly oblong, at apex obtuse to acute, *c.* 30 by 7 mm, fleshy, apically on the right side with an orbicular, undulate, membranaceous appendix *c.* 10 mm  $\varnothing$ ; petals outside densely stellate-hairy, along the margin in particular downwards ciliate by longibrachiate, stellate hairs. *Staminal column*  $\pm$  as long as the petals, *c.* 35 mm, densely short-hairy, in the upper third antheriferous; filaments 2—5 mm; anthers *c.*  $\frac{1}{2}$  mm  $\varnothing$ . *Ovary* ovoid, *c.* 5 mm high, obtusely 5-angular, at apex obtuse, stellate-velutinous; style *c.* 4—5 mm, at base hairy; stigma conical to capitate, 5-costate, *c.* 2 mm  $\varnothing$ . *Capsule* 5-angularly prismatic, 3—4 cm long, outside densely stellate-hairy, glabrescent, 5-celled, dehiscent; valves chartaceous, 7—8 mm wide, inside smooth, shining. *Seeds*  $\infty$ , reniform, *c.* 4 mm  $\varnothing$ , densely covered by patent, up to 2 cm long, straight, ferruginous hairs.

*Distribution*: East New Guinea (viz. Huon Peninsula and adjacent area) and on the Solomon Islands (Bougainville, S. Isabel). In the Bismarcks (New Ireland) it has probably been introduced (cf. Ulbrich, 1936, 500).

*Ecology*: Forests, at 150—1000 m.

*Notes*: The species is named after Peekel, who collected one of the specimens Ulbrich had at hand (viz. New Ireland, Lamekot, village, probably introduced, *Peekel 1043*). That specimen was destroyed at Berlin during the war. Another number mentioned by Ulbrich (viz. Bougainville I., Siwai, *Waterhouse B345*) has not been traced either. A third number cited by Ulbrich, *Schlechter 17860* (K), which has been distributed to various herbaria, has therefore been designated as a lectotype.

I have classified this species in *Thespesia*, as in my opinion the differences with e.g. *T. lampas* (Cav.) Dalz. & Gibs. are not sufficient to retain it as a separate genus.

#### EXCLUDED SPECIES

*Thespesia altissima* (Bl.) Spreng., Syst. 4, 2 (1828) 257 = *Esenbeckia altissima* Blume, Bijdr. 3 (1825) 119 = *Neesia altissima* (Bl.) Blume, Nov. Act. Ac. Nat. Cur. 17 (1833) 75, t. 6 (*Bombacaceae*).

*Thespesia garckeana* F. Hoffmann, Beitr. Fl. Centr.-Ost. Afr. (1889) 12. — *Azanza garckeana* (F. Hoffmann) Exell & Hillcoat, Contr. Fl. Moçamb. 2 (1954) 60; Dale & Greenway, Kenya Trees Shrubs (1961) 262, f. 53. — *T. trilobata* Baker f., J. Bot. 35 (1897) 52; Hochr., Bull. Inst. Bot. Btzg 19 (1904) 9; op. cit. 22 (1905) 132.

In the herbarium at Bogor there are two sheets with sterile specimens, labelled 'Borneo, Teijsmann HB 16350'. The specimens are identical with sterile specimens collected in the Botanic Gardens of Bogor, numbered XVI. G. 16, also present in the Bogor Herbarium and distributed to other herbaria. The tree of that number is still alive and belongs to the species mentioned above, which occurs in east and south tropical Africa. No doubt the two sheets were derived from the Bogor garden and were erroneously labelled.

#### 5. GOSSYPIUM

Linné, Gen. Pl. ed. 5 (1754) 764; Sp. Pl. (1753) 693; B. & H., Gen. Pl. 1 (1862) 209; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 51; Watt, Cott. Pl. (1907) 53; J. B. Hutchinson, Silow & Stephens, Evol. Goss. (1947) 14; Kearney, Am. Midl. Nat. 46 (1951) 110. — *Hibiscus* Linné *ampl.* O. K., Rev. Gen. Pl. 1 (1891) 67, *p.p.*

Lectotype: *G. herbaceum* L. (cf. Hitchcock & Green, Int. Rules Bot. Nomencl. ed. 3, 1935, 141).

Annual herbs, undershrubs, or perennial shrubs, rarely small trees; nearly all parts dotted with black oil-glands. *Leaves* mostly palmilobed to -parted, occasionally entire, entire margin, palminerved, usually with 1, 3 or 5 nectaries on the central basal nerves beneath. *Flowers* solitary, axillary, usually on sympodial branches. Pedicel inarticulate, at apex mostly with a nectary below the insertion of the epicalyx segments. *Epicalyx*

*segments* 3, free or shortly connate, usually foliaceous, entire or dentate to deeply gashed into long triangular segments. *Calyx* cupular, truncate, undulate or 5-dentate to 5-lobed, commonly provided outside at the base with 3 nectaries diagrammatically alternating with the epicalyx segments. *Corolla* medium-sized to large, yellow or white, rarely red or purple, often with a purple or purple-spotted centre. *Staminal column* much shorter than the petals, antheriferous throughout. *Ovary* 3—5-celled, each cell with 2— $\infty$  ovules; style 1, short; stigma clavate, 5-sulcate, rarely divided at the very tip. *Capsule* globular to ovoid, rarely fusiform, acute or acuminate, 3—5-celled. *Seeds* ovoid, (in Malesia) with a dense covering of long woolly hairs (lint or floss), and whether or not with a fine, short tomentum (fuzz).

*Distribution*: Pantropical, also in Hawaii, also cultivated in the subtropics. According to J. B. Hutchinson *et al.* (1947) 20 species of which 3 are cultivated, according to previous authors (e.g. Watt, 1907), who had a much narrower species concept, a great number (more than 70) occurring wild or cultivated in the tropical and subtropical parts of the world. The cultivated species may be found occasionally as escapes. These can be divided into two groups according to morphological differences (cf. key) and differences in chromosome number. One group of which the species have  $n = 13$  chromosomes is restricted to the Old World; the other group consisting of species with  $n = 26$  chromosomes originated, as generally accepted, in the New World, but has been spread throughout the tropics and subtropics of the Old World in post-Columbian time. In Malesia several forms are cultivated of old.

*Ecology*: With respect to ecological particulars of the forms cultivated in Malesia, I refer to the agricultural literature on *Gossypium*, especially to the paper by Paerels in Van Hall & Van den Koppel, *De landbouw in de Indische Archipel* 3 (1950) 7—52. The possibility for growing cotton mainly depends on the local climate, in particular the occurrence of intermittant dry periods coinciding with the time of flowering and especially the time of harvest.

*Notes*: The literature dealing with the genus *Gossypium*, taxonomy included, has increased since the appearance of Linnaeus's *Species Plantarum* to such an enormous extent, that an author who is to deal with the genus for a regional Flora cannot be expected to struggle through all this, let alone to verify all the authentic specimens on which the various botanists have based their interpretations. The present revision of *Gossypium* in Malesia is mainly based on the work of Watt ('The wild and cultivated cotton plants of the world', 1907), who gave ample evidence of the original sources and illustrations of types, and that of Robery (*Candollea* 7, 1938, 297—360; *op. cit.* 9, 1942, 19—103; *op. cit.* 10, 1946, 345—398; *op. cit.* 13, 1950, 9—165). The latter, guided by genetical principles, has elaborated in a series of more or less 'concentric' articles an extremely complicated and detailed system for the genus. I have not used this for the present publication, because such a system cannot be applied very well to incomplete herbarium specimens such as Robery has attempted, with the material he had at hand. This proved unsatisfactory to much more material which I studied from Malesia.

I have accepted the delimitation of the species by J. B. Hutchinson *et al.* ('The evolution of *Gossypium*', 1947), who have been guided by the views of Clausen, Keck and Hiesey (*Carn. Inst. Wash., Ann. Rep. Div. Plant Biol.* 1936, 208—214, *etc.*). Hutchinson *et al.* divide their species into varieties amongst others according to the criterion whether a plant is annual or perennial. Such a classification will be, no doubt, very important for growers, and might have some theoretical value too, but it is worthless when one has to classify herbarium specimens which are often poor and incomplete. The infraspecific classification accepted here differs therefore partly from that of the last mentioned authors.

I have omitted O. Kuntze's classification (Rev. Gen. Pl. 1, 1891, 67, 68), as this is very confused; he merged *Gossypium* with *Hibiscus*.

Little attention is given here to the history and evolution of the cultivated cottons. Conclusions with respect to that subject may be drawn only by botanists who have a sound knowledge of social history, archaeology, philology, etc. Merrill's 'The botany of Cook's voyages' (Chron. Bot. 14, 1954, 161—384), which also deals with some *Gossypium* species, urges to great caution in this matter. See also J. B. Hutchinson *et al.* (1947) and the survey by J. B. Hutchinson in Endeavour 21 (1962) 5—15.

Backer (Schoolfl. Java, 1911, 129) listed nearly all known cultivated species of *Gossypium*. Many of those have never been encountered with certainty or have only been tried by experiment stations; accordingly I have not evaluated all the names he mentioned.

#### KEY TO THE SPECIES

1. Epicalyx segments united for 1 cm or more, entire or remotely serrate. Corolla mostly more or less campanulate. Seeds with floss and fuzz; flos firmly attached to the seed. . . . . 1. *G. arboreum*
1. Epicalyx segments free, or united only at the very base for not more than c. 5 mm, deeply gashed, with long triangular to almost linear teeth. Corolla infundibuliform.
  2. Leaves palmilobed to -fid, with deltoid to ovoid segments. Petals 2½—5 cm long. Staminal column 1—2 cm. Stamens loosely arranged, the higher inserted ones longest. Seeds with floss, whether or not removable; fuzz throughout or only at the hilum . . . . . 2. *G. hirsutum*
  2. Leaves palmiparted, with ovate to oblong segments. Petals 5—8 cm long. Staminal column 3½—4 cm. Stamens compactly arranged, with short filaments of equal length. Seeds with floss; fuzz restricted to the hilum; floss easily removed . . . . . 3. *G. barbadense*

**1. *Gossypium arboreum* Linné, Sp. Pl. (1753) 693; emend. J. B. Hutchinson *et al.*, Evol. Goss. (1947) 32, t. 4; Roberty, Candollea 13 (1950) 32, p.p.**

*See for synonyms and types under the varieties.*

Annual or perennial shrub, 1—2 m. Twigs slender, often prostrate, terete, as the petioles and pedicels ± densely covered with minute stellate hairs and patent simple hairs, glabrescent or glabrous. *Leaves* in outline ovate to orbicular, at base cordate, 2—12 cm ø, palmilobed to -parted, with (3—)5(—7) segments, frequently with an extra tooth in the sinuses; at base 5—7-nerved; 1(—3) nerves with an oblong nectary; ± densely covered with minute stellate hairs and appressed simple hairs, glabrescent, sometimes glabrous; petiole 1½—14 cm. *Stipules* rather small, linear to lanceolate, often falcate, acuminate, 4—15 mm. Pedicels short, ½—2 cm, mostly without apical nectaries. *Epicalyx segments* closely embracing the corolla and capsule, rarely spreading, more or less deeply cordate at base, at apex acute, 1½—3½ by 1½—3 cm, slightly accrescent, entire or toothed, more or less densely covered with minute stellate hairs and simple hairs, glabrescent. *Calyx* cupular, c. 5 mm high, c. 7 mm ø, truncate, inconspicuously 5-dentate, usually at base with 3 nectaries alternating with the epicalyx segments, mostly glabrous or nearly so. *Corolla* mostly light yellow, whether or not with a purple or purple-spotted centre, occasionally entirely red or purple; petals obovate, 3—4 cm long, outside especially on the covering side stellately pubescent. *Staminal column* 1½—2 cm; filaments 1½—2 mm. *Capsule* shortly ovoid to globular, 1½—2½ cm ø, with a 3—5 mm long beak, after dehiscence and splitting often reflexed, outside densely pitted and glabrous, 3—4-celled. *Seeds* 5—8 per cell, ovoid to globular, 5—8 mm ø, with floss and fuzz; floss copious, fairly long, white or (not in Malesia) rusty.

*Distribution*: Tropical and subtropical of the Old World, extremely polymorphous.

*Note*: On the Malesian herbarium material at my disposal I could go no further than a subdivision into two varieties. This has some practical value as the forms of var.

*arborescens* are only used for experimental or ornamental purposes, whereas those regularly cultivated for commercial purpose belong exclusively to var. *obtusifolium* (Roxb.) Roberty.

## KEY TO THE VARIETIES

1. Leaves palmiparted, with linear to lanceolate segments . . . . . a. var. *arborescens*  
 1. Leaves palmilobed to -fid, with obovate, ovate or oblong segments . . . . . b. var. *obtusifolium*

**a. var. *arborescens*.** — *G. arborescens* Linné, Sp. Pl. (1753) 693; Blume, Bijdr. 2 (1825) 74; Miq., Fl. Ind. Bat. 1, 2 (1858) 163; Suppl. (1860) 26; Parl., Sp. Cot. (1866) 23, t. 1; Fern.-Vill., Novis. App. (1880) 26; Backer, Fl. Bat. 1 (1907) 149; Watt, Cott. Pl. (1907) 81, t. 7, 8; Backer, Schoolfl. Java (1911) 129; Koord., Exk. Fl. Java 2 (1912) 588; Merr., Sp. Blanc. (1918) 256; En. Philip. Fl. Pl. 2 (1923) 43; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 32. — *G. perenne* Blanco, Fl. Filip. (1837) 537; ed. 2 (1845) 376; ed. 3, 2 (1879) 330. — *G. sanguineum* Hassk., Cat. Hort. Bog. (1844) 200. — *G. arborescens* var. *sanguineum* (Hassk.) Watt, Cott. Pl. (1907) 91; Heyne, Nutt. Pl. (1927) 1046; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 33; Roberty, Candollea 13 (1950) 50; Backer & Bakh. f., Fl. Java 1 (1963) 436. — *G. neglectum* Todaro, Relaz. Cult. Cot. (1878) 169. — *G. arborescens* var. *neglectum* (Todaro) Watt, Cott. Pl. (1907) 95, t. 10, 11, 12; Heyne, Nutt. Pl. (1927) 1045; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 33; Backer & Bakh. f., Fl. Java 1 (1963) 436. — *G. cernuum* Todaro, Oss. Sp. Cot. (1863) 31. — *G. arborescens* var. *cernuum* (Todaro) J. B. Hutchinson & Ghose, Ind. J. Agr. Sc. 7 (1937) 248; Roberty, Candollea 13 (1950) 47. — *G. herbaceum* (non L.) Vidal, Phan. Cuming. Philip. (1885) 97. — *G. purpurascens* (non Poir.) Miq., Fl. Ind. Bat. 1, 2 (1858) 163; Merr., Int. Rumph. Herb. Amb. (1917) 361. — *Gossipium floribus fusco-rubentibus* Rumph., Herb. Amb. 4, p. 34.

Types: *G. arborescens* L.: s. loc., Linn. Herb. n. 874.3 (holotype: LINN); *G. sanguineum* Hassk.: Botanic Garden Bogor, Hasskarl s.n. (lectotype: BO 56637).

*Distribution*: At present var. *arborescens* is not any longer in regular cultivation in Malasia. The form described by Hasskarl as *G. sanguineum* Hassk., which possesses glabrescent herbaceous parts and dark red flowers, is sometimes found in gardens as an ornamental. Another form, named *G. neglectum* Todaro, with hairy green parts and yellow, purple-centred flowers, has been used in experiments only.

*Notes*: Watt (1907, 84) selected a plate with description of Plukenet (Phyt. 2, 1692, t. 188 f. 3) as the type of *G. arborescens* L., because Linnaeus, as Watt says, 'republished the description given by Plukenet'. In Species Plantarum, however, Linnaeus gives a new phrase, and Plukenet's phrase is cited as a synonym. Therefore the specimen in the Linnean herbarium is the holotype; it is also mentioned by Watt who qualified it as exactly matching Plukenet's plant.

The reduction of *G. perenne* Blanco to *G. arborescens* L. was made by Fernandez-Villar (1880, 26), which, judging from Blanco's description, is correct.

Of *G. sanguineum* Hassk. I found in the Bogor Herbarium a good specimen matching the original description; judging from the pencil-written label it was collected by order of Hasskarl himself. I consider this specimen the type of Hasskarl's species.

**b. var. *obtusifolium*** (Roxb.) Roberty, Candollea 13 (1950) 38, *ampl.* Borss. — *G. obtusifolium* Roxb., [Hort. Beng. (1814) 51, *nom. nud.*] Fl. Ind. ed. Carey 3 (1832) 183; Watt, Cott. Pl. (1907) 139, t. 19, 20; Backer, Schoolfl. Java (1911) 129; Merr., En. Philip. Fl. Pl. 3 (1923) 44; Heyne, Nutt. Pl. (1927) 1039; Backer, Bekn. Fl. Java (em. ed.)

4C (1943) fam. 109, p. 33; Wouters, Bull. Jard. Bot. Brux. 17 (1946) 245, t. 3; Backer & Bakh. f., Fl. Java I (1963) 436. — *G. herbaceum* var. *obtusifolium* (Roxb.) Mast., in Fl. Br. Ind. I (1875) 437. — *G. indicum* Lamk, Encycl. 2 (1786) 134; Cav., Diss. 6 (1788) 314, t. 169; Decne, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 433; Herb. Timor. (1835) 105; Span., Linnaea 15 (1841) 171; Mor., Syst. Verz. (1846) 29; Miq., Fl. Ind. Bat. 1, 2 (1858) 162; Merr., Int. Rumph. Herb. Amb. (1917) 361; Chevalier, Rev. Bot. Appl. Agr. Trop. 19 (1939) 540, t. II. — ? *G. eglandulosum* Cav., Diss. 6 (1788) 345; Roberty, Candollea 9 (1942) 22. — *G. nangking* Meyen, Reise 2 (1836) 323; Watt, Cott. Pl. (1907) 114, t. 15; Backer, Schoolfl. Java (1911) 129; Merr., En. Philip. Fl. Pl. 3 (1923) 44; Heyne, Nutt. Pl. (1927) 1047; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 33; Backer & Bakh. f., Fl. Java I (1963) 436. — *G. obtusifolium* var. *typicum* Roberty, Candollea 7 (1938) 315. — *G. nangking* var. *typicum* Roberty, l.c. 317. — *G. herbaceum* (non L., 1753) Linné, in Stickman, Herb. Amb. (1754) 15; Amoen. Acad. 4 (1759) 126; Merr., Bull. Bur. For. Philip. 1 (1903) 37; Perk., Fragm. Fl. Philip. (1904) 112; Hall. f., Med. Rijksherb. 12 (1912) 13. — *G. herbaceum* var. *acerifolium* [(Guill. & Perr.) Chevalier?] Backer & Bakh. f., Fl. Java I (1963) 436. — *G. obtusifolium* var. *wightianum* (non *G. wightianum* Todaro) Backer, Schoolfl. Java (1911) 129; Heyne, Nutt. Pl. (1927) 1042; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 33. — *Gossypium* Rumph., Herb. Amb. 4, p. 33, t. 12.

Types: *G. obtusifolium* Roxb.: India, *Roxburgh s.n.* (lectotype: BR-Herb. Mart.; cf. Wouters, 1946, 245, t. 3); *G. indicum* Lamk: India, *Sonnerat s.n.* (holotype: P-LA; cf. Chevalier, 1939, 540, t. II).

*Distribution*: *G. arboreum* var. *obtusifolium* has been cultivated in Malesia for many centuries, the first record dating back to Rumphius. It is the commonest group of cotton forms grown as a staple product. It is particularly cultivated in S. Sumatra (Palembang Res.) ('*kapas ulu*'), Java ('*kapas djawa*', '*kapas tēmbaga*'), and the Lesser Sunda Islands ('*kapas djantuk*'), but may be encountered as well in the Philippines, Celebes, and in the Moluccas.

*Note*: The hoary forms of the variety have been named by Heyne and Backer *G. obtusifolium* var. *wightianum* (Todaro) Watt. According to J. B. Hutchinson *et al.* (1947) *G. wightianum* Todaro (Relaz. Cult. Cot. 1878, 141, t. 4 f. 1—9) should be considered a form of *G. herbaceum* L. Since no Malesian specimens have been referred to *G. wightianum* Todaro by the specialists, I am inclined to believe that this form does not occur in Malesia.

**2. *Gossypium hirsutum* Linné, Sp. Pl. ed. 2 (1763) 975; *ampl.* J. B. Hutchinson *et al.*, Evol. Goss. (1947) 40; Roberty, Candollea 13 (1950) 55.**

*See for synonyms and types under the varieties.*

Annual herb or perennial shrub, 1—3 m. *Leaves* ± orbicular in outline, usually wider than long, rarely palmifid, mostly 3-lobed, lower ones sometimes 5-lobed, upper ones occasionally ovate and entire, at base cordate, 5—7-nerved, 3—15 cm Ø; segments broadly ovate to deltoid; acuminate; sinuses acute, obtuse or rounded, little or not thrown up in a fold; midrib nectary oblong; petiole 2—10 cm. *Stipules* ovate to lanceolate, often falcate, 6—13 by 2—5 mm. *Flowers* on axillary, sympodial shoots. Pedicel 1—2½ cm, at apex hypanthium with 3 nectaries. *Epicalyx* segments free or nearly so, closely enveloping the flower and the capsule, widely ovate to triangular, at base deeply cordate and auricled, 2—4 by 1½—3 cm, rarely 4—6½ by 2½—4 cm (*G. paniculatum* Blanco), slightly accrescent, with 7—9, rarely 10—12 (*G. paniculatum* Blanco) long triangular, acuminate teeth. *Calyx* campanulate to cupular, 6—7 mm high and 5½—

6 mm  $\varnothing$ , with 5 rounded, rarely with long acuminate segments (*G. taitense* Parl.), outside with 3, often inconspicuous nectaries, after flowering ruptured. *Corolla* usually pale yellow to white, when young often tinged purplish, rarely with a purple centre; petals obovate, 4—5½ cm long, outside stellately puberulous on the covering half. *Staminal column* 1—2 cm; filaments 3—4 mm. *Capsule* ovoid or rarely globular (*G. taitense* Parl.), at apex longer or shorter rostrate, 2—5 by 1—1½ cm, rarely *c.* 1½ cm high and  $\varnothing$  (*G. taitense* Parl.), coarsely pitted, 3—5-celled. *Seeds* ovoid, acute at the hilum, 3½—5 mm long, black or brown, with white, rarely rusty (*G. taitense* Parl.) floss, with fuzz throughout or only at the hilum.

*Note:* I have treated *G. hirsutum* L. in the wide sense proposed by J. B. Hutchinson *et al.* (1947, 40). They distinguish three varieties: var. *hirsutum*, var. *punctatum* (Schumach.) H.S. & S., and var. *marie-gallante* (Watt) H.S. & S., of which the latter variety does not seem to occur in Malesia. The distinction between these varieties is mainly based on habit and whether the plant is annual or perennial. As this evidence is lacking in herbarium specimens it was not possible to use these varieties. Besides, it has again appeared impossible to subdivide them further. The distinction of two varieties is not intended for cotton growers; to the taxonomist it offers some advantage, amongst others that the varieties show geographical replacement, var. *hirsutum* being American in origin, var. *taitense* Polynesian. They are in conformity with Watt's sections III (Watt, 1907, 163) and IV (l.c. 244) and Robertry's classification.

#### KEY TO THE VARIETIES

1. Stems, petioles, nerves, and pedicels more or less densely covered with patent, simple hairs, sooner or later glabrescent, green or tinged red. Capsule 3—5 cm long. Seeds with floss and fuzz; floss firmly attached to the seed . . . . . **a. var. hirsutum**
1. Stems, petioles, nerves, and pedicels glabrous or minutely stellate-hairy only, usually tinged dark purple. Capsule 1½—3 cm long. Seeds (in Malesia) with floss only (fuzz restricted to the hilum); floss easily removed . . . . . **b. var. taitense**

**a. var. hirsutum.** — *G. hirsutum* Linné, Sp. Pl. ed. 2 (1763) 975; Parl., Sp. Cot. (1866) 41, t. 5; Watt, Cott. Pl. (1907) 183, t. 29, 30, 31; Backer, Schoolfl. Java (1911) 129 ('*hirtum*'); Merr., Fl. Manila (1912) 324; En. Philip. Fl. Pl. 3 (1923) 43; Heyne, Nutt. Pl. (1927) 1046; J. B. Hutchinson & Ghose, Ind. J. Agr. Sc. 7 (1937) 251; Robertry, Candollea 9 (1942) 22; Backer, Bekn. Fl. Java (em. ed) 4C (1943) fam. 109, p. 35; J. B. Hutchinson *et al.*, Evol. Goss. (1947) 40, t. 6; Backer & Bakh. f., Fl. Java 1 (1963) 437. — *G. punctatum* Schumach., Kongl. Danske Vidensk. Selsk. Skr. 4 (1829) 83; Beskr. Guin. Pl. 2 (1829) 83; Watt, Cott. Pl. (1907) 168, t. 27, 28; Backer, Schoolfl. Java (1911) 129; Merr., Sp. Blanc. (1918) 256; En. Philip. Fl. Pl. 3 (1923) 44. — *G. hirsutum* f. *punctatum* (Schumach.) Robertry, Candollea 7 (1938) 330. — *G. hirsutum* var. *punctatum* (Schumach.) J. B. Hutchinson *et al.*, Evol. Goss. (1947) 40, t. 7 *p.p.* — *G. hirsutum* f. *typicum* Robertry, Candollea 7 (1938) 331. — *G. paniculatum* Blanco, Fl. Filip. (1837) 539; ed. 2 (1845) 378; ed. 3, 2 (1878) 331; C. B. Rob., Philip. J. Sc. 6 (1911) Bot. 343; Merr., Sp. Blanc. (1918) 256; En. Philip. Fl. Pl. 3 (1923) 44. — *G. latifolium* var. *paniculatum* (Blanco) Robertry, Candollea 9 (1942) 91. — *G. hirsutum* var. *paniculatum* (Blanco) Robertry, Candollea 13 (1950) 62. — *G. mexicanum* (non Todaro) Watt, Cott. Pl. (1907) 226, t. 39, 40, 41, 42; Backer, Schoolfl. Java (1911) 130; Heyne, Nutt. Pl. (1927) 1047; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 35; Backer & Bakh. f., Fl. Java 1 (1963) 437. — *G. indicum* (non Lamk) Blume, Bijdr. 2 (1825) 74. — *G. javanicum* (non Bl.) Mor., Syst. Verz. (1846) 29. — *G. barbadense* (non L.) Fern.-Vill., Novis. App. (1880)



25; Elbert, Med. Rijksherb. 12 (1912) 13. — *G. herbaceum* (non L.) Blanco, Fl. Filip, (1837) 534; ed. 2 (1845) 374; ed. 3, 2 (1879) 329; Fern.-Vill., Novis. App. (1880) 25. — *G. taitense* (non Parl.) Merr., En. Philip. Fl. Pl. 3 (1923) 44.

Types: *G. hirsutum* L.: Carolina, *Mary Duchess of Beaufort s.n.* (lectotype: BM-SL, Vol. 294, fol. 45); *G. paniculatum* Blanco: Luzon, Bontoc Subprov., *Vanoverbergh 3659* (iso-neotypes: FI, G, GRO, L, NY, U).

*Distribution*: Cultivated in tropical North and Central America, introduced into most tropical countries of the Old World. The forms cultivated in Malesia are distributed as follows:  $\alpha$ . The hairy form to be compared with *G. hirsutum* L. *sens. str.* and possibly with *G. punctatum* Schumach. (in the Malesian agricultural literature known as New Orleans cotton, *kapas bĕlanda*, and *kapas inggris*) is cultivated in Palembang Res. (cf. *Teijsmann s.n.*), locally in Java (cf. *Raap 871*), North Borneo (cf. *Felix Telado s.n.*), the Philippines (cf. *Merrill, Sp. Blanc. 761*), and possibly locally in the Moluccas; experiments have been carried out in the Lesser Sunda Islands with insufficient success.  $\beta$ . The form which can be compared with *G. mexicanum* (non Todaro) Watt (in Malesian agricultural literature denoted with Upland cotton, and, erroneously, with Bourbon cotton) is possibly cultivated locally judging from herbarium specimens, viz. in the Philippines (cf. *Vidal 2185, B.S. 16320*), and also in Java (cf. *Backer 17687*), Madura I. [cf. specimen of *G. indicum* (non Lamk) Blume], and the Kangean Arch. (cf. *Backer 27286*), in addition on Pulau Kabaena near Celebes (cf. *Elbert 3365*); it was also used for local experiments (Palembang Res., Sumatran East Coast, and in Flores), without satisfactory results.  $\gamma$ . The form known in literature as *G. paniculatum* Blanco (Ilocos cotton) is cultivated only in Luzon.

*Notes*: Roberty (1942, 22) attributed *G. hirsutum* L. to Miller (Gard. Dict. ed. 7, 1759), which is incorrect, as Miller in the 7th edition of his work still used merely pre-linnean phrase-names and no epithets.

In the Linnean herbarium there is a sheet (n. 874.4) with the epithet '*hirsutum*' in the handwriting of Linnaeus. This sheet belongs to *G. arboreum* L. *sens. lat.*, probably its var. *obtusifolium* (Roxb.) Roberty. It might be possible that Linnaeus had that plant in mind, since he cited in the twelfth edition of *Systema Naturae* (2, 1767, 462) a description and a figure of Plukenet (Alm. Bot. 2, 1696, 172, Phyt. 3, 1696, t. 299 f. 1). Watt, who examined the specimen in Plukenet's herbarium (Watt, 1907, 119, t. 15 f. A) on which the description and figure were based, classified it under *G. nangking* Meyen which is a form of *G. arboreum* var. *obtusifolium* (Roxb.) Roberty. However that may be, it seems to be unwise to change Watt's concept of *G. hirsutum* L. *sens. str.*, which is generally followed in literature. The specimen in Miller's herbarium (in herb. Sloane) is since Watt's monograph of 1907 generally considered the type of the species.

I do not know if there exists a type specimen of *G. punctatum* Schumach., but the original description of this form is fairly extensive, and provides almost all vital information on its characters. I have not seen any Malesian specimen showing these characters very clearly, though Merrill identified his specimens of *Sp. Blanc. 761* as *G. punctatum* Schumach. The chief distinctive character of the form appears to be the density of the glands (dots) on the leaves, which is greater than in any other form of *Gossypium*. Anyhow it belongs to the present variety.

The form *G. mexicanum* (non Todaro) Watt cannot be separated very well from either *G. hirsutum* L. *sens. str.* or *G. purpurascens* (non Poir.) Watt [cf. under *G. hirsutum* L. var. *taicense* (Parl.) Roberty]. It might be a hybrid between those two forms.

Roberty chose the specimen *Vanoverbergh 3659* (B) as the neotype for *G. paniculatum* Blanco. I propose to consider all duplicates of that number together as iso-neotypes.

The specimens are in fair accordance with the original description. *G. paniculatum* Blanco has been placed under the present variety, although it shows some affinity to *G. barbadense* L. *sens. lat.* with respect to the dimensions of the epicalyx segments and the number of teeth on these segments, as well as the depth of the incisions of the leaves. It is very likely, that the form is of hybrid origin.

I have seen only one specimen bearing the name '*Gossypium indicum*' in the handwriting of Blume. This specimen, consisting of a twig with leaves and a flower, cannot be conspecific with *G. indicum* Lamk, since the former possesses epicalyx segments with long teeth. Presumably it belongs to the present variety.

The three forms of var. *hirsutum* occurring in Malesia can very roughly and arbitrarily be distinguished according to the following key:

1. Epicalyx segments 4—6½ by 2½—4 cm, with 10—12 teeth. Leaves palmifid. Annual herb, with few or no vegetative branches . . . . . γ. '*G. paniculatum* Blanco'
1. Epicalyx segments 2—4 by 1½—3 cm, with 7—9 teeth. Leaves palmilobed.
  2. Stems, petioles and pedicels densely hairy, green or tinged red. Leaves densely hairy. Annual herb, rarely perennial shrub, with few or no vegetative branches . . . . . α. '*G. hirsutum* L.'
  2. Stems, petioles and pedicels glabrescent or glabrous, purple. Leaves glabrous or nearly so. Perennial shrub with many more or less scrambling vegetative branches. β. '*G. mexicanum* (non Todaro) Watt'

**b. var. *taitense*** (Parl.) Roberty, Candollea 13 (1950) 66, *ampl.* Borss. — *G. taitense* Parl., Sp. Cot. (1866) 39, t. 6 f. A; Watt, Cott. Pl. (1907) 248, *non* t. 43. — *G. latifolium* var. *taitense* (Parl.) Roberty, Candollea 9 (1942) 89. — *G. purpurascens* var. *taitense* (Parl.) Roberty, Candollea 7 (1938) 332. — *G. latifolium* J. A. Murray, Nov. Comm. Soc. Reg. Sc. Goetting. 7 (1776) 22, t. 1; Roberty, Candollea 9 (1942) 22, 69. — *G. purpurascens* (non Poir.) Watt, Cott. Pl. (1907) 250, ? t. 44; Backer, Schoolfl. Java (1911) 130; Merr., Int. Rumph. Herb. Amb. (1917) 361; Heyne, Nutt. Pl. (1927) 1048; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 35; Backer & Bakh. f., Fl. Java 1 (1963) 437. — *G. religiosum* (non L.) Miq., Fl. Ind. Bat. 1, 2 (1858) 163; J. B. Hutchinson & Ghose, Ind. J. Agr. Sc. 7 (1937) 251. — *G. javanicum* Blume, Bijdr. 2 (1825) 74; Decne, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1835) 433; Herb. Timor. (1835) 106; Miq., Pl. Jouv. (1854) 279; Koord., Exk. Fl. Java 2 (1912) 589. — *G. timorensis* Prokhanov, Bot. Zhur. S.S.S.R. 32 (1947) 64; Fryxell, Austr. J. Bot. 13 (1965) 92. — *G. taitense* f. *scandens* Hochr., Nova Guinea 14 (1924) 166. — *G. caespitosum* f. *subglabra* Backer, Fl. Bat. (1907), 151. — *G. micranthum* (non Cav.) Hassk., Tijd. Nat. Gesch. Phys. 12 (1845) 96; Miq., Fl. Ind. Bat. 1, 2 (1858) 162; Suppl. (1860) 163. — *G. latifolium* var. *pseudo-volubile* Roberty, Candollea 9 (1942) 96.

Types: *G. taitense* Parl.: Parlatore, Sp. Cot., t. 6 f. A (holotype); *G. latifolium* J. A. Murray: Murray, Nov. Comm. Soc. Reg. Sc. Goetting. 7, t. 1 (holotype); *G. javanicum* Blume: Java, *Blume s.n.* (holotype: L 908.133-1836); *G. taitense* f. *scandens* Hochr.: New Guinea, southcoast, Gelib, *Branderhorst* 155, 156 (syntypes: BO, G, L); *G. caespitosum* f. *subglabra* Backer: Java, Tandjungpriok, *Backer 35320* (holotype: BO; isotype: L); *G. latifolium* var. *pseudo-volubile* Roberty: India, *Wight 180* (holotype: G).

*Distribution*: The form *G. taitense* Parl. *sens. str.* (α, see below) is reported to occur wild in the Pacific islands and is not known to be cultivated. In Malesia it has been encountered only in S. New Guinea (Gelib, W. of Merauke).

The other form of the present variety occurring in Malesia, in botanical literature on that area denoted with *G. javanicum* Blume or erroneously with *G. purpurascens* Poir. (β), belongs to a group of races which is in the agricultural literature of Malesia known as 'Bourbon cotton', 'Caravonica cotton', '*kapas mori*', etc. It is cultivated in the Pacific islands, Southeast and South Asia, and Africa. In Malesia it is one of the forms,

which is locally cultivated on a fairly large scale, especially in the Lesser Sunda Islands, Celebes, the SE. Moluccas, but also in the drier parts of Sumatra and Java. It is also reported to run wild easily, which I could observe myself on the Babar and Tanimbar Islands, where it propagates spontaneously in coconut plantations.

*Ecology:* Obviously a variety which is bound to a seasonal climate.

*Notes:* *G. pupurascens* Poir. has been applied for the cultivated race in the greater part of the literature dealing with the genus *Gossypium* since Watt's monograph of 1907. Robery (1942, 66) correctly pointed out, however, that Poirlet described a form of *G. barbadense* L. In passing, it should be observed that Chevalier (cf. Rev. Bot. Appl. Agr. Trop. 19, 1939, 548) failed to find a type specimen of Poirlet's species in Paris. Robery then accepted *G. latifolium* J. A. Murray for *G. pupurascens* (non Poir.) which, when one compares the description and the plate, certainly covers Watt's interpretation of *G. pupurascens* Poir. Unfortunately there seems to be no type material of *G. latifolium* J. A. Murray which was apparently described after a living plant in the botanical garden of Göttingen. The specimens from Malesia belong in Robery's system of *G. latifolium* J. A. Murray to his var. *pseudo-volubile* Robery.

The form *G. pupurascens* (non Poir.) Watt has often been referred to *G. religiosum* L., but that name could be better treated as a *nomen confusum*, as explained extensively by Robery (1942, 24—41).

The fact that Decaisne (1835) named a plant from Timor *G. javanicum* can be explained only as that he referred to a Javanese species, viz. *G. javanicum* Blume, although this is not indicated clearly. Decaisne's description fairly matches Blume's plant, except perhaps for the statement '... involucri 3-phylo, foliolis linearibus...'. Prokhanov (1947) concluded that the epicalyx segments would be linear, and that Decaisne's plant was a representative of the subgenus *Sturtia*, a group of Australian wild species without floss on the seeds. Prokhanov created therefore a new name, *G. timorensis* Prokh. Fryxell (1965) followed him. I failed to find at Paris any authentic specimen examined or annotated by Decaisne. No species of subg. *Sturtia* has ever been collected since Decaisne's time in the relatively well explored island of Timor. In my opinion the linear leaflets ('foliolis') of Decaisne were not epicalyx segments or bracts, but just the long, tailed teeth as occurring in most cultivated species of *Gossypium*.

The type material of *G. taitense* f. *scandens* Hochr. consists of twigs of *G. taitense* Parl. entwined by some Convolvulaceous climber, probably a *Merremia* species. The annotation 'klimplant' on the labels refers, no doubt, to that climber.

The two Malesian forms can be distinguished very roughly and arbitrarily as follows:

1. Leaves 3-lobed; lateral segments pointing upward. Calyx with long acuminate ('tailed' cf. Watt) teeth. Capsule globular, c. 1½ cm Ø; lint rather short, rusty . . . . . α. '*G. taitense* Parl., sens. str.'
1. Leaves 3—5-lobed; segments diverging. Calyx with short rounded teeth. Capsule ovoid, 2—3 by 1—1½ cm; lint long, white. . . . . β. '*G. pupurascens* (non Poir.) Watt'

The form *G. pupurascens* (non Poir.) Watt cannot be distinguished sharply from *G. hirsutum* L. var. *hirsutum*, form '*G. mexicanum* (non Todaro) Watt' (cf. p. 125).

### 3. *Gossypium barbadense* Linné, Sp. Pl. (1753) 693; *emend.* J. B. Hutchinson *et al.*, *Evol. Goss.* (1947) 48.

*See for synonyms and types under the varieties.*

Annual undershrub, perennial shrub, sometimes small tree. Twigs primarily angled, soon terete, as the petioles and pedicels gland-dotted, minutely stellate-hairy, glabrescent, often tinged purple. *Leaves* orbicular to broadly ovate in outline, at base cordate, 3—5- (rarely 7-) palmiparted, or the superior ones undivided; central segment usually much

larger than the other ones; segments ovate to oblong, acuminate; sinuses rather narrow and usually thrown up in a fold; base 3—7-nerved, 1—3 central nerves slightly above base beneath, with an elliptical nectary; petiole as long as or somewhat longer than the blade, terete. *Stipules* large, leaf-like, linear to lanceolate to ovate, those of the flowering shoots often broadly ovate to orbicular and auricled at base. *Flowers* usually terminal on sympodial, axillary, leafy shoots. Pedicel mostly shorter than the petiole, sharply trigonous, at apex usually with nectaries, accrescent. *Epicalyx segments* erect, appressed against the corolla or the capsule, large, orbicular to ovate, at base cordate and strongly auricled, with 10—15 long triangular to linear, long acuminate teeth, after flowering slightly enlarged, gland-dotted, sparsely stellate-hairy, glabrescent. *Calyx* cupular, truncate or with 5 obtuse, short teeth, glabrous, densely gland-dotted; at base with 3 nectaries, after flowering splitting. *Petals* obovate, at apex truncate, usually emarginate, outside on the covering side stellate-puberulous, with scattered gland-dots. *Staminal column* erect, straight, glabrous. *Capsule* ovoid to fusiform, acuminate, beaked, glabrous, densely pitted, black. *Seeds* ovoid, with an acute hilum, with long, fine, white floss, usually only with fuzz at the hilum, black or dark brown.

## KEY TO THE VARIETIES

1. Corolla pale yellow, usually with purple centre. Capsule 3—5 cm long. Seeds free a. var. **barbadense**  
 1. Corolla pale yellow, inside often with red spots, changing to pink when fading. Capsule 5—7 cm long.  
 Seeds of one capsule sticking together in a fusiform, solid column . . . . . b. var. **acuminatum**

**a. var. barbadense.** — *G. barbadense* Linné, Sp. Pl. (1753) 693; Parl., Sp. Cot. (1866) 48, t. 3; Vidal, Sinops. Pl. Filip., Atlas (1883) 16, t. 16 f. E; Watt, Cott. Pl. (1907) 265, t. 46, 47, 48; Backer, Schoolfl. Java (1911) 130; Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 34; Roberly, Candollea 10 (1946) 385; op. cit. 13 (1950) 81; Backer & Bakh. f., Fl. Java 1 (1963) 437. — *G. peruvianum* Cav., Diss. 6 (1788) 313, t. 168; Watt, Cott. Pl. (1907) 213, t. 37, 38; Backer, Schoolfl. Java (1911) 130; Heyne, Nutt. Pl. (1927) 1047; Roberly, Candollea 10 (1946) 374. — *G. microcarpum* Todaro, Hort. Pan. 1 (1876) 63, t. 14; Watt, Cott. Pl. (1907) 210, t. 36; Backer, Schoolfl. Java (1911) 130 ('*macrocarpum*'); Merr., En. Philip. Fl. Pl. 3 (1923) 44. — *G. vitifolium* (non Lamk) Watt, Cott. Pl. (1907) 255, t. 1, 45; Backer, Schoolfl. Java (1911) 130; Heyne, Nutt. Pl. (1927) 1049; Chevalier, Rev. Bot. Appl. Agr. Trop. 19 (1939) t. 13. — *G. barbadense* ssp. *vitifolium* var. *vitifolium* Roberly, Candollea 10 (1946) 386. — *G. acuminatum* × *barbadense* Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 34; Backer & Bakh. f., Fl. Java 1 (1963) 437.

Types: *G. barbadense* L.: Barbados (lectotype: BM-SL, Vol. 100, Herb. Pluk., fol. 105); *G. microcarpum* Todaro: Palermo, *Todaro s.n.* (lectotype: NAP, n.v.).

*Distribution:* Cultivated in tropical and subtropical America, also introduced into Africa (mainly Egypt), tropical Asia, and the Pacific islands. In Malasia some races, especially the so-called 'Sea Island cotton', but also the races known as 'Peruvian cotton' and '*mit affi*' (from Egypt), have been introduced in the 20th century for experiments, all without sufficient results. *Vidal 2183*, which according to Watt (1907, 211) belongs to *G. microcarpum* Todaro, might have been descended from material introduced by the Spaniards.

*Notes:* Var. *barbadense* as accepted by J. B. Hutchinson *et al.* is rather polymorphic and comprises many races which, in general, cannot be recognized easily in herbarium specimens.

*G. barbadense* L. was primarily based by Linnaeus on a description and a figure of Plukenet (Alm. Bot. 2, 1696, 172, Phyt. 2, 1692, t. 188 f. 1), which were made after a

specimen in Plukenet's herbarium (pictured by Watt, 1907, t. 46 f. A, B). I follow Watt in considering this as the type of the species.

It can be taken for granted that *G. peruvianum* Cav. belongs to var. *barbadense* (in our wider sense). I failed to find a type specimen of Cavanilles's name.

*Vidal 2183* (K) was classified by Watt (1907, 211) under *G. microcarpum* Todaro, which, judging from the description and the plate of Todaro, seems to be right. I have not seen authentic material of Todaro. The form can be distinguished by fairly small capsules usually being not more than *c.* 3 cm long, containing few fuzz-covered seeds, which tend to stick to each other. It might be considered a transitional form between var. *barbadense* and var. *acuminatum* (Roxb.) Mast.

As pointed out on p. 130, it can be admitted that *G. vitifolium* Lamk is synonymous with var. *acuminatum* (Roxb.) Mast., at least when one accepts the specimen in Lamarck's herbarium as its type; as interpreted by most authors (except for e.g. Blume and Miquel) it belongs to the present variety (in its wider sense).

**b. var. acuminatum** (Roxb.) Mast., in Fl. Br. Ind. 1 (1875) 347. — *G. acuminatum* Roxb., [Hort. Beng. (1814) 51, *nom. nud.*] Fl. Ind. ed. Carey 3 (1832) 186; Wight, Ic. 1 (1838) t. 27; Backer, Fl. Bat. 1 (1907) 150; Schoolf. Java (1911) 130; Koord., Exk. Fl. Java 2 (1912) 588; Heyne, Nutt. Pl. (1927) 1045; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 34; Backer & Bakh. f., Fl. Java 1 (1963) 437. — *G. lapideum* ssp. *acuminatum* (Roxb.) Roberty, Candollea 13 (1950) 98. — *G. vitifolium* Lamk, Encycl. 2 (1786) 135; Blume, Bijdr. 2 (1825) 75; Miq., Fl. Ind. Bat. 1, 2 (1858) 163; Suppl. (1860) 163; Chevalier, Rev. Bot. Appl. Agr. Trop. 19 (1939) 542, t. 12, *non* t. 13. — *G. lapideum* Tussac, Fl. Antill. 2 (1818) 67; Roberty, Candollea 9 (1942) 22, 60; op. cit. 13 (1950) 96. — *G. brasiliense* Macfadyen, Fl. Jam. 1 (1837) 72; Todaro, Relaz. Cult. Cot. (1878) 265, t. 9 f. 1—9; Watt, Cott. Pl. (1907) 295, t. 49, 50; Merr., Fl. Manila (1912) 325; Int. Rumph. Herb. Amb. (1917) 360; En. Philip. Fl. Pl. 3 (1923) 43; Watt, Kew Bull. (1927) 355; Merr., Lingn. Sc. J. 5 (1928) 126; Roberty, Candollea 7 (1938) 335; op. cit. 13 (1950) 81; Hu, Fl. China, fam. 153 (1955) 67, t. 11 f. 3, t. 22 f. 8. — *G. barbadense* var. *brasiliense* (Macfadyen) J. B. Hutchinson *et al.*, Evol. Goss. (1947) 50. — *G. vitifolium* × *peruvianum* Watt, Kew Bull. (1927) 346. — *G. arboreum* (*non* L., 1753) Linné, in Stickman, Herb. Amb. (1754) 15; Amoen. Acad. 4 (1759) 126; Syst. Nat. ed. 10, 2 (1759) 1148; Sp. Pl. ed. 2 (1763) 975, *p.p.* — *G. religiosum* (*non* L.) Parl., Sp. Cot. (1866) 54, t. 4, *excl. synonym. p.p.* — *G. lapideum* f. *elmeri* Roberty, Candollea 13 (1950) 99. — *G. barbadense sensu* Vidal, Sinops. Fl. Filip., Atlas (1883) 16, t. 16 f. E; Ridley, J. Fed. Mal. St. Mus. 8, 4 (1917) 22. — *Gossipium latifolium* Rumph., Herb. Amb. 4, p. 37, t. 13.

Types: *G. acuminatum* Roxb.: Roxburgh, Icones, t. 1498 (cf. Watt, Cott. Pl., 1907, t. 50) (lectotype: CAL, K); *G. vitifolium* Lamk: Celebes, *Sonnerat s.n.* (lectotype: P-LA); *G. lapideum* f. *elmeri* Roberty: Luzon, *Elmer 15445* (holotype: G; isotypes: BM, BO, FI, GH, L, NY, P, U, US).

*Distribution*: According to J. B. Hutchinson *et al.* (1947, 51) cultivated mainly in eastern tropical South America, Central America and the Antilles, and sporadic in Africa and India. They do not record it from Malesia, where it is, however, cultivated of old (cf. Rumphius) though nowhere on a large scale, and only for local home industry. It is also cultivated in South China and on the Pacific islands. It might have been introduced in Malesia by Portuguese and Spanish traders or missionaries, as so many cultivated plants. In literature on Malesian agriculture it was mentioned under many names, of which 'Pernambuco cotton', 'nierkatoen', 'kidney cotton', and 'kapas kaju' are the most frequent ones. The wide distribution of the variety in Malesia is due to the fact, that it

is able to stand the tropical everwet climate quite well, and to produce under these conditions a fair staple. Although Roxburgh and Royle (sec. Voigt) regarded it as a native Indian plant, it is undoubtedly of American origin; occasionally it runs wild.

*Notes:* The present variety is generally known in agricultural literature under the name of *G. brasiliense* Macfadyen (of 1837), presumably mainly under the influence of Watt (1907), who says on pp. 300—301 of his book: 'I have chosen the name *G. brasiliense*, Macf., for this species because Macfadyen admits having derived his information from Sloane, who in 1697 combined under the name *G. brasilianum* two or more species which Macfadyen separated and distinguished with considerable accuracy. Moreover, Sloane's specimen collected in Jamaica and preserved in the British Museum (Sloane herb., vol. 6, fol. 65 also 66) is *G. peruvianum*, Cav., not *G. brasiliense*, Macf. By the rule of priority, however, it is probable that Roxburgh's name for the species — *G. acuminatum* — should have been adopted. He was apparently the first author who described it accurately, but his manuscript drawing (here reproduced, Plate No. 50), bears the name *G. vitifolium*, and from the standpoint of the planter there might be involved some ambiguity through acceptance of a name that of necessity is suggestive of a questionable indigenous (Indian) habitat.'

Watt's choice, though reasonable in a way, cannot be retained nomenclaturally, as Roxburgh's description deals undoubtedly with the present form. Since there seems to be no authentic specimen of *G. acuminatum* Roxb. available, the said plate of Roxburgh (the original one is preserved in Calcutta; a copy is at Kew, which is reproduced as plate 50 in Watt's book), which is in accordance with Roxburgh's description, and which shows the distinguishing characters clearly, could be treated as a lectotype. The identification of Roxburgh with *G. vitifolium* Lamk is understandable, since that species is convarietal (see below). *G. lapideum* Tussac (of 1818) was accepted by Roberty (1942, 55) as the correct name for the variety as a species. The short description of Tussac, undoubtedly pointing to var. *acuminatum* (Roxb.) Mast., has induced some authors (e.g. Merrill, 1923, Hu, 1955) to qualify Tussac's name as a *nomen subnudum*. I do not know if a type specimen exists.

*G. guyanense* var. *braziliense* Rafin., Sylva Tellur. (1838) 16, is said by some authors (Merrill, Prokhanov, Hu) to apply to the present variety, but I rather consider all names of Rafinesque as *nomina incerta*. The next oldest name for it is *G. barbadense* var. *acuminatum* (Roxb.) Mast. The description of Masters matches the one of Roxburgh, though he cited *Wallich n. 1875F*, which, as far as the specimen at Kew is concerned, according to Watt (1907, 365) would belong to *G. peruvianum* Cav. (*sensu* Watt). That specimen bears a capsule — which I have opened — containing free seeds without fuzz.

I agree with Merrill (1917, 360) that *Gossipium latifolium* of Rumphius probably belongs to the present form, although Rumphius does not say anything about the characters of the seeds. The other characters as mentioned and pictured hardly leave any doubt. Its identity with var. *acuminatum* (Roxb.) Mast. is the more likely, since this form occurs now as a cultivated plant throughout Malesia, whereas other forms of *G. barbadense* L. *sens. lat.* have only occasionally been introduced in the 20th century for experiments which never resulted in a regular cultivation.

There has been much confusion in literature about what has to be understood by *G. vitifolium* Lamk. Watt (1907, 255) considered it a separate species with free seeds related to *G. barbadense* L. (*sens. str.*), but he did not study any type material. Roberty (1946, 386) treated it as a variety of *G. barbadense* L., likewise supposing it to have free seeds. Older authors, as Blume (1825, 75), Miquel (1858, 163) used the name for specimens, positively belonging to the present variety, which, in part, may have been right.

Lamarck said of his species: 'Ce Cotonnier croît dans l'Isle de Célèbes, est cultivée à l'isle de France & vraisemblablement dans plusieurs contrées de l'Amérique méridionale, & nous a été communiqué par M. Sonnerat. (v. s.)'. His description does not make mention of the characters of the capsule or of the seeds, but certainly deals with a form of *G. barbadense* L. *sens. lat.*

In Lamarck's herbarium (at Paris) there is a sheet generally considered to be the type of his species (cf. Chevalier, 1939, t. 12). It consists of two twigs with leaves; each twig bears a flower, whereas capsules or seeds are not present. The dimensions point to *G. barbadense* L. var. *acuminatum* (Roxb.) Mast. On the sheet there is a label with 'cotton . . . Sonnerat. an G. Rumph. amb. 4, t. 13' in the handwriting of Lamarck. When this specimen originated from Celebes (see above) it can be admitted that it belongs to the present variety.

In the herbarium De Jussieu, there is a specimen (n. 12.405) collected by Commerson in Mauritius (Ile de France), to which Lamarck presumably refers in his note. That sheet, considered by Chevalier (1939, t. 13) a 'cotype', bears a twig with leaves, flowers and a young fruit, as well as a knot of cotton with free, fuzz-less seeds. The dimensions are more or less in accordance with those of our *G. barbadense* L. var. *barbadense*.

In Malesia the variability of var. *acuminatum* (Roxb.) Mast. is not large, as far as I have observed, but in other countries, especially in America, a number of races or cultivars occur, which cannot easily be discriminated in the herbarium. Hybrids with other forms of *G. barbadense* L. have been reported by several authors, but those records cannot be checked very well (cf. also under var. *barbadense*).

## II. Tribe URENEAE

B. & H., Gen. Pl. 1 (1862) 205; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 44; Gürke, in Fl. Bras. 12, 3 (1892) 458.

Holotype: *Urena* L.

### 6. MALVAVISCUS

Cav., Diss. 3 (1787) 131, *nom. cons. prop.* Taxon 15 (1966) 43; Ludwig, Defin. (1760) 77; Adans., Fam. Pl. 2 (1763) 399; DC., Prod. 1 (1824) 445; B. & H., Gen. Pl. 1 (1862) 206; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 46; Schery, Ann. Mo. Bot. Gard. 29 (1942) 203; Kearney, Am. Midl. Nat. 46 (1951) 107. — *Achania* Swartz, Prod. Veg. Ind. Occ. (1788) 102.

Holotype: *Hibiscus malvaviscus* L. = *M. arboreus* Cav. (cf. Schery, 1942, 204).

Shrubs, often scrambling or trailing. *Leaves* entire or palmilobed, palmnerved or penninerved with footnerves, without extrafloral nectaries. *Flowers* axillary, solitary. Pedicels inarticulate. *Epicalyx segments* 5—10, shortly connate, lanceolate to spatulate. *Calyx* without nectaries. *Corolla* medium-sized to large and showy, usually scarlet; petals erect, never spreading. *Staminal column* usually longer than the petals, antheriferous only near the apex. Carpels 5, each with 1 ovule; styles 10, connate at base; stigmas capitate. *Schizocarp* initially with a fleshy layer, ultimately drying and breaking up into indehiscent mericarps (*non vidi*).

*Distribution*: According to Schery (1942, 204) 3 spp., one of them, *M. arboreus* Cav., with many varieties, in tropical America; elsewhere cultivated as ornamentals, also in hothouses. Schery (l.c. 189) suggested that *Malvaviscus* occasionally runs wild in the Philippines and Malaya, but I have found no evidence for this.

*Ecology:* In America the flowers are visited by flower-birds, viz. kolibris (cf. Knuth, Handb. Blütenbiol. 3, 1, 1904, 478) which hover in front of the flowers when drinking the nectar. The rare setting of fruit in Malesia might, according to Cammerloher (Oest. Bot. Z. 77, 1928, 51) be due to absence of congenial birds, but there are no experiments to sustain this opinion.

The fruit is provided with a fleshy outer layer which according to literature ultimately dries and breaks up into mericaps.

*Notes:* I have followed the excellent monograph by Schery (1942), although this author had obviously no opportunity to examine all types of the numerous names. It may be desirable to raise some of his varieties with replacing areas to the rank of sub-species.

Bakhuizen van den Brink *f.* (in Fl. Java, 1, 1963, 429) noted that *Malvaviscus* is an illegitimate name. In the 1st edition of Genera Plantarum, 1737, Linnaeus distinguished *Trionum* L. and *Hibiscus* L., the latter to comprise the earlier concepts *Ketmia* Tourn. 1700 and *Malvaviscus* Dill. 1732.

In Species Plantarum ed. 1, 1753, and Genera Plantarum ed. 5, 1754, Linnaeus merged these two generic names, accepting then only *Hibiscus* L. This was then a distinctly heterogeneous entity.

Miller, Gard. Dict. abridged ed., 1754, was the first to split it up, unfortunately accepting *Ketmia* for what is now known as *Hibiscus*, expressly reserving the name *Hibiscus* for a single species now known as *Malvaviscus arboreus* Cav. (*Hibiscus malvaviscus* L.).

In 1759 Fabricius, En. Meth. Plantarum ed. 1: 155, merged again all three generic names but now under *Malvaviscus*. Hence, this name is illegitimate as it contained anyway the types of *Ketmia* Mill. and that of *Hibiscus* L.

It follows that these early typifications threaten both names, and for that reason it has recently be proposed to legalize the typification of *Hibiscus* by *H. syriacus* L. and to conserve the name *Malvaviscus* Cav. against *Malvaviscus* Fabr.

**1. *Malvaviscus arboreus* Cav.,** Diss. 3 (1787) 131, t. 48 f. 1; *ampl.* Schery, Ann. Mo. Bot. Gard. 29 (1942) 209.

*See for synonyms and types under the varieties.*

#### KEY TO THE VARIETIES

1. Leaves usually 3—5-lobed, 5—11 cm long. Corolla 2—3 cm long . . . . . **a. var. arboreus**  
 1. Leaves entire, rarely 3-lobed, 10—20 cm long. Corolla 6—7 cm long. . . . . **b. var. penduliformis**

**a. var. arboreus.** — *M. arboreus* Cav., Diss. 3 (1787) 131, t. 48 f. 1; DC., Prod. 1 (1824) 445; Schlecht., Linnaea 11 (1837) 359; Baker *f.*, J. Bot. 37 (1899) 344; Backer, Schoolfl. Java (1911) 120; Koord., Exk. Fl. Java 2 (1912) 583; Schery, Ann. Mo. Bot. Gard. 29 (1942) 209; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 17. — *Hibiscus malvaviscus* Linné, Sp. Pl. (1753) 694. — *Achania pilosa* Swartz, Prod. Veg. Ind. Occ. (1788) 102. — *M. pilosus* (Swartz) DC., Prod. 1 (1824) 445; Ceron, Cat. Pl. Herb. Manila (1892) 27; Merr., Fl. Manila (1912) 320; En. Philip. Fl. Pl. 3 (1923) 37. — *M. arboreus* var. *parviflorus* Baker *f.*, J. Bot. 37 (1899) 345; Backer, Fl. Bat. 1 (1907) 114. — *M. arboreus* var. *mexicanus* (*non* Schlecht.) Backer, l.c. 115.  
 Lectotype: *Hibiscus malvaviscus* L.: Herb. Clifford *s.n.* (BM).

*Distribution:* Tropical America from Mexico to Peru and Brazil; since long cultivated in greenhouses throughout the world; formerly often cultivated in Malesia but nowadays



more and more replaced by the next variety. Judging from a specimen (MA) collected by Née in the Philippines the variety had already been introduced there in the eighteenth century, no doubt by the Spaniards.

*Note:* Cavanilles based *M. arboreus* Cav. mainly on Linnaeus's *Hibiscus malvaviscus* L. Linnaeus refers in *Species Plantarum* primarily to an entry in *Hortus Cliffortianus*. Since there is in the Herbarium Clifford a fairly good specimen which matches the general concept of the species *sensu stricto*, that one is considered here the lectotype.

**b. var. penduliflorus** (DC.) Schery, *Ann. Mo. Bot. Gard.* 29 (1942) 223; Steiner, *Philip. Orn. Pl.* (1960) 80, 173, *cum fig.* — *M. penduliflorus* Moçño & Sessé *ex DC.*, *Prod.* 1 (1824) 445; Moçño & Sessé, *Fl. Mex.* (1874) t. 90. — *M. conzattii* Greenman, *Publ. Field Mus. Nat. Hist. (Bot.)* 2 (1912) 333.

*Types:* *M. penduliflorus* Moçño & Sessé *ex DC.*: *Fl. Mex.* t. 90 (holotype); *M. conzattii* Greenman: Mexico, San Pablo, *Conzatti 1981 (n.v.)*.

*Distribution:* Tropical America from Mexico to Ecuador and Venezuela. The variety is not mentioned in any publication on Malesian plants, except for the book of Mrs. M. L. Steiner (1960). Apparently it has been introduced rather late. At present it is frequently cultivated in gardens in the major towns of Indonesia, and has more or less replaced the first mentioned variety, obviously on account of its larger flowers.

## 7. PAVONIA

Cav., *Diss.* 2 (1786) app. 2; *Diss.* 3 (1787) 132, *nom. cons.*; B. & H., *Gen. Pl.* 1 (1862) 205; K. Sch., in E. & P., *Nat. Pfl. Fam.* 3, 6 (1890) 46; Ulbr., *Bot. Jahrb.* 57 (1920) 55; Kearney, *Am. Midl. Nat.* 46 (1951) 107. — *Lass Adans.*, *Fam. Pl.* 2 (1763) 400. — *Malache B. Vogel*, in *Trew, Pl. Select.* (1772) 50, t. 90. — *Prestonia* Scopoli, *Intr.* (1777) 281. — *Lebretonia* Schrank, *Pl. Rar. Hort. Monac.* (1819) t. 90.

*Lectotype:* *P. paniculata* Cav. (cf. Green, *Int. Rules Bot. Nomencl. ed.* 3, 1935, 145).

Annual or perennial herbs, undershrubs or shrubs. *Leaves* undivided or palmilobed to -parted, usually palminerved, rarely penninerved, rarely with extrafloral nectaries. *Flowers* mostly axillary, solitary, rarely in axillary or terminal clusters, sometimes in racemes or panicles through decrescence of leaves. *Pedicel* mostly articulate. *Epicalyx segments* 5–16, mostly free, sometimes connate at base. *Calyx* widely campanulate, urceolate or tubiform. *Corolla* rotate, small or medium-sized, mostly red or yellow, sometimes purple, pink or white. *Staminal column* as long as or shorter than the petals, rarely longer than the petals, antheriferous throughout or only in the upper part. *Carpels* 5, uni-ovulate; style arms 10; stigmas capitate, papillose. *Schizocarp* discoid to globular. *Mericarps* 5, usually more or less isodiametric, trigonous, dorsally convex, mostly carinate or winged, often prominent-reticulately veined, and muricate or tuberculate, rarely smooth, sometimes with 1–3 retrorsely hairy awns, indeshicent. *Seeds* 1 per mericarp, reniform.

*Distribution:* In absence of a monograph roughly estimated at c. 200 species; of these about two thirds are restricted to the tropical regions of the New World, one third to those of the Old World, mainly Africa; 4 or 5 species occur in Asia of which 2 are found in Malesia. In Australia only one species was recorded from Queensland, viz. *P. hastata* Cav. which is presumably an early introduction from S. America.

*Notes:* Many authors doubt whether there is sufficient evidence to keep the present genus separated from *Urena* L. That genus can be distinguished either by the mericaps bearing glochidia or by the leaves possessing nectaries on the nerves beneath. When the



Fig. 17. *Pavonia procumbens* (W. & A.) Walp. a. Habit,  $\times \frac{1}{2}$ , b. flower (schematic), nat. size, c. mericarp,  $\times 5$  (BO 158699, isotype of *Lebretonia cernua* Span.).

first criterion is accepted, as was done by Hochreutiner (Ann. Cons. Jard. Bot. Genève 5, 1901, 131), *Urena* would comprise only one polymorphic species, viz. *Urena lobata* L.; in case one uses the second criterion, as Gürke did (Bot. Jahrb. 16, 1892, 363), the genus would include also three other species, viz. *Urena repanda* Roxb. ex J. E. Sm.<sup>1)</sup>, *Urena rigida* Mast. from SE. Asia, and *Urena armitiana* F. v. M. from Australia. The latter three species are undoubtedly closely related to *Urena lobata* L. In addition to the presence of nectaries on the leaves, they are similar in habit, in the tendency of the short-pedicelled flowers to form axillary or terminal clusters, as well as in the form of the 5-parted epicalyx which is campanulate, urceolate or tubiform, all characters which, as far as I know, are rare in the rest of *Pavonia*. However, I have followed Hochreutiner, because the absence *cf.* presence of nectaries on the leaves cannot be accepted as the sole difference on the generic level, as this occurs both in other genera of *Malvaceae*, e.g. *Thespesia*, *Hibiscus*, and others. It can even vary occasionally within a single species. *Urena* remains here separated from *Pavonia* only by the presence of glochidia on the fruit, as far as I know a unique character in the family. Admittedly, a single character is, though practical, in essence insufficient for generic distinction.

A monographic study is badly needed but falls beyond the present treatment. I doubt whether it will lead to split *Pavonia* into more genera. Conversely the statements above rather indicate that it should be merged with *Urena*; that would make necessary the conservation of the generic name *Pavonia* also against *Urena*.

## KEY TO THE SPECIES

1. Mericarps with 3 retrorsely hairy awns. Flowers axillary, solitary. Pedicel fairly long, not jointed. Epicalyx segments 6—7, free, spreading, linear to spatulate . . . . . 2. ***P. spinifex***
1. Mericarps without awns.
  2. Mericarps slightly reticulately veined, not muricate. Flowers in head-like inflorescences. Pedicel extremely short, not jointed. Epicalyx segments united to a campanulate to urceolate, 5-partite structure . . . . . 3. ***P. rigida***
  2. Mericarps prominent-reticulately veined, muricate. Flowers axillary, solitary. Pedicel fairly long, jointed. Epicalyx segments 5, free or shortly connate, ovate . . . . . 1. ***P. procumbens***

**1. *Pavonia procumbens*** (W. & A.) Walp., Rep. Bot. Syst. 1 (1842) 301, *non* Casaretto, 1842; Boiss., Fl. Or. 1 (1867) 839. — *Lebretonia procumbens* [Wall., Cat. (1831) n. 2688, *nom. nud.*] W. & A., Prod. (1834) 47; Wight, Ic. 1 (1838) t. 4. — *Lebretonia flava* Wall., Cat. (1828) n. 1883, *nom. nud.* — *Lebretonia cernua* Span., [in Hook., Comp. Bot. Mag. 1 (1836) 344, *nom. nud.*] Linnaea 15 (1841) 168. — *P. cernua* (Span.) Walp., Rep. Bot. Syst. 2 (1843) 790; Miq., Fl. Ind. Bat. 1, 2 (1858) 150. — *Lebretonia glechomifolia* A. Rich., Tent. Fl. Abyss. 1 (1847) 54. — *P. glechomifolia* (A. Rich.) Garcke ex Schweinfurth, Beitr. Fl. Aethiop. 1 (1867) 54; Mast., Fl. Br. Ind. 1 (1875) 330; Trimen, Handb. Fl. Ceyl. 1 (1893) 149; Ulbr., Bot. Jahrb. 57 (1922) 119. — *P. coxii* Tadulingam & Jacob, J. Ind. Bot. Soc. 5 (1926) 11, fig. — *P. patens* (*non Sida patens* H. C. Andrews) Chiovenda, Ann. Bot. Roma 13 (1915) 409, *quoad specim.*; Exell & Meeuse, Fl. Zamb. 1 (1961) 507. — **Fig. 17.**

Types: *Lebretonia procumbens* W. & A.: India, Wallich 2688A (lectotype: K-W), Wight propr. 173 (paratypes: K, L, P); *Lebretonia cernua* Span.: Timor, Spanoghe *s.n.* (isotypes: BO 58888, 158699, K, L 908.139-48, 49); *Lebretonia glechomifolia* A. Rich.: Abyssinia, Choho, Dillon & Petit *s.n.* (isotype: P); *P. coxii* Tadulingam & Jacob: India, Coimbatore, Cox 59β (isotype: K).

<sup>1)</sup> *Urena repanda* Roxb. [Hort. Beng. (1814) 51, *nomen*] ex J. E. Sm., in Rees, Cyclop. 37, n. 6 (1819).

Undershrub. Stems, petioles and pedicels more or less covered with minute stellate hairs and short, patent, simple hairs, also with scattered, short gland-hairs. *Leaves* orbicular to ovate, at base cordate, at apex obtusely acuminate, often 3-lobed,  $2\frac{1}{2}$ —14 by  $1\frac{1}{2}$ —9 cm, coarsely crenate to serrate, at base 5—7-nerved, above sparsely covered with minute stellate and simple hairs, beneath densely set by minute stellate hairs, on the nerves also with simple ones, glabrescent; petiole  $\frac{1}{2}$ —8 cm. *Stipules* linear, 3—5 mm. *Flowers* axillary, solitary. Pedicel 3—6 cm, accrescent to c. 7 cm, jointed at  $\frac{1}{4}$ — $\frac{1}{3}$  from the apex, at the joint usually gemculate, above the joint more densely hairy than below it. *Epicalyx* rotate,  $1\frac{1}{2}$ — $2\frac{1}{2}$  cm  $\varnothing$ ; segments 5, free or shortly connate, ovate, at apex acute to acuminate, at base acuminate, 6—12 by 3—6 mm, on both sides sparsely stellate-hairy to glabrous, along the margin densely set with minute stellate hairs. *Calyx* campanulate, 6—8 mm high and 10—15 mm  $\varnothing$ , slightly accrescent, 5-parted; segments ovate, acute to acuminate, 5—7 by 3—4 mm; calyx outside densely covered by minute stellate and simple hairs, inside glabrous except for the margin. *Corolla* 3— $3\frac{1}{2}$  mm  $\varnothing$ , (in Malesia) red; petals obovate, slightly oblique, at apex rounded, c. 14 by 11 mm, at base ciliate. *Staminal column* short, c. 5 mm, sparsely stellate-hairy. Style to the branching c. 9 mm long. *Mericarps* nearly isodiametrical, 4—5 mm  $\varnothing$ , slightly carinate, very prominently reticulately ribbed, on the junctions of the ribs with stout, usually slightly curved, sharp prickles, ferruginous, sparsely minute stellate-hairy or glabrous. *Seeds* reniform, angular c. 3 mm  $\varnothing$ , glabrous, ferruginous.

*Distribution*: East Africa, Arabia, India, Birma, Ceylon, in Malesia only found in the Lesser Sunda Islands (Flores: Maumere; Timor: Ikanfoti; Alor: Lantoka).

*Ecology*: Evidently restricted to a pronounced seasonal climate, found up to 900 m.

*Notes*: *Sida patens* H. C. Andrews (Bot. Repos. 9, 1809, t. 571) has been considered by Chiovenda and later authors on the African flora the oldest name for the present species. In my opinion it is very doubtful whether the plate and the description really refer to a *Pavonia*. The statement 'Calyx simplex', the detail figure of the staminal column with the apical stamens, that of the pistil with 5 styles being separate from the very base, as well as the general habit of the plant pictured, point to a species belonging to the *Malveae*. As was suggested in the Kew Index, the plate may represent an *Abutilon*. British botanists told me that no type specimen can be traced.

Since I have not been able to find out whether *P. procumbens* (W. & A.) Walp. was earlier published than *P. procumbens* Casaretto (Nov. Stirp. Bras. Dec. 1842, 39; Walp., Rep. Bot. Syst. 5, 1845, 91), which is a synonym of *P. cancellata* Cav. from South America, I treat them as if they were published simultaneously.

In Malesia the flowers are recorded as red, but in Africa and India usually reported as yellow.

I am convinced that *P. coxii* Tadulingam & Jacob also represents a form of the present species. The type material, which I have seen at Kew, looks quite similar to the specimens from Malesia. The flowers are said to be yellow with a red centre.

**2. *Pavonia spinifex* (L.) Cav.**, Diss. 3 (1787) 133, t. 45 f. 2; Bot. Reg. 4 (1819) t. 339; Gürke, in Fl. Bras. 12, 3 (1892) 480, t. 85. — *Hibiscus spinifex* Linné, Syst. Nat. ed. 10, 2 (1759) 1149; Sp. Pl. ed. 2 (1763) 978. — *Malache spinifex* (L.) O.K., Rev. Gen. Pl. 1 (1891) 70.

*Distribution*: Tropical America, in Malesia occasionally cultivated as an ornamental in gardens.

**3. *Pavonia rigida* (Wall. ex Mast.) Hochr.**, Ann. Cons. Jard. Bot. Genève 5 (1901) 144. — *Urena rigida* Wall. [Cat. (1828) n. 1929, nom. nud.] ex Mast., in Fl. Br. Ind. 1

(1875) 330; Gürke, Bot. Jahrb. 16 (1892) 380; Gagn., in Fl. Gén. I.-C. 1 (1910) 414; Ridley, Fl. Mal. Pen. 1 (1922) 257; Craib, Fl. Siam. En. 1 (1925) 149. — *Malachra rigida* (Wall. ex Mast.) O.K., Rev. Gen. Pl. 1 (1891) 71. — *Decaschistia pulchra* Ridley, J. Str. Br. R. As. Soc. 59 (1911) 76.

Types: *Urena rigida* Wall. ex Mast.: Birma, Moulmain, Wallich 1929 (holotype: K-W); *Decaschistia pulchra* Ridley: S. Siam, Setul, Ridley 15236 (holotype: K).

Undershrub, up to c. 1 m. Stems and petioles asperulous by minute stellate hairs, above each axil with a line of minute stellate hairs, glabrescent, usually tinged purple. Leaves orbicular to ovate, at base cordate to rounded or acute, at apex obtuse, 2—4 by 1½—3½ cm, crenate to serrate, at base 3—7-nerved, beneath on the base of the midrib with an orbicular nectary, coriaceous, on both surfaces very rough by stiff, minute stellate hairs; petiole ½—1½ cm. *Stipules* linear, 3—4 mm. *Flowers* from the upper axils; through short internodes and decrescent leaves in head-like inflorescences. Pedicels 1—2 mm, minute stellate-hairy. *Epicalyx* long campanulate, widened to urceolate, 7—9 mm long and c. 6 mm  $\varnothing$ , slightly accrescent; 5-parted, segments long triangular, acute to acuminate, 4—7 by c. 2½ mm; epicalyx outside and inside near the margin stellate-tomentose. *Calyx* campanulate to tubular, closely enveloped by the equally long epicalyx, 5-parted; segments linear, acute to acuminate, 4—5 by c. 1 mm; calyx outside on the segments stellate-hairy. *Corolla* c. 4 cm  $\varnothing$ , crimson; petals obovate, rounded, at apex c. 2 cm  $\varnothing$ , on the covering margin minute stellate-hairy. *Staminal column* c. 1 cm, glabrous; style exceeding the staminal column; stigmas papillose. *Schizocarp* globular, c. 6 mm  $\varnothing$ ; mericarps reticulately veined, minute stellate-hairy. *Seed* reniform, c. 3 mm  $\varnothing$ , minute stellate-hairy, red-brown to black.

*Distribution*: E. Asia (Birma, Siam, Indo-China), in Malesia: S. Siam (Setul), the Malay Peninsula (Malacca), and SE. Borneo (Banjermasin; Martapura: Mt Kupang), in P. Penang also cultivated.

*Notes*: I have followed Hochreutiner in placing this species under *Pavonia*, although it shows a closer relationship with *Urena lobata* L. than with most *Pavonia* species (cf. p. 135).

It is also closely allied to *P. repanda* (J. E. Sm.) Spreng., (based on *Urena repanda* J. E. Sm.), from which it differs by the condensed, head-like inflorescences, the 5-parted calyx, and the asperous indument.

According to Gürke (1892, 54) and Hochreutiner (1901, 144) Wallich 1929 belongs partly to *Urena speciosa* Wall. [= *P. repanda* (J. E. Sm.) Spreng.]. I have not seen specimens of that species under this Wallich number at Kew, but possibly an error was made when the duplicates were distributed to other herbaria.

#### EXCLUDED SPECIES

*Pavonia zeylanica* Cav., Diss. 3 (1787) 134; Walp., in Meyen, Nov. Act. Ac. Nat. Cur. 19, Suppl. 1 (1843) 305; Fern.-Vill., Novis. App. (1880) 23.

Merrill (En. Philip. Fl. Pl. 3, 1923, 45) wrote: 'I suspect that Meyen's plant from Manila, on which Walpers's record was based, was erroneously identified'. I have not seen it. There is no specimen in the Martius Herbarium at Brussels (kind information by Prof. Robijns).

#### 8. URENA

Linné, Gen. Pl. ed. 5 (1754) 764; Sp. Pl. (1753) 692; B. & H., Gen. Pl. 1 (1862) 205; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 45; Gürke, Bot. Jahrb. 16 (1892) 368, p.p.; Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 131; Kearney, Am. Midl. Nat. 46 (1951) 106, p.p.

Lectotype: *U. lobata* L. (cf. Hitchcock & Green, Int. Rules Bot. Nomencl. ed. 3, 1935, 143).

Annual or perennial undershrubs. *Leaves* palmilobed to -parted, often twice divided, or undivided, palmnerved, with extrafloral nectaries on the nerves beneath. *Flowers* mostly solitary and axillary, or in axillary clusters. Pedicels without joint. *Epicalyx* campanulate to tubular, 5-parted. *Calyx* campanulate to tubular, usually with nectaries on the costae. *Corolla* rotate, small, usually pink. *Staminal column* ± as long as the petals, antheriferous for the upper half. Carpels 5, uni-ovulate; style above the middle divided into 10 arms; stigmas capitate, papillose. *Schizocarp* ± globular. *Mericarps* 5, more or less isodiametric, trigonous, dorsally convex and covered with glochidia (setae on top with 4—5 retrorse, short, sharp hooks), indehiscent.

*Distribution*: Monotypic, pantropic, possibly of Asiatic origin. See also under the species.

*Note*: See for the delimitation of the genus under *Pavonia* Cav.

**1. *Urena lobata*** Linné, Sp. Pl. (1753) 692, *sens. lat.*; Benth., Fl. Austr. 1 (1863) 206; Miq., Fl. Ind. Bat. 1, 2 (1858) 148; Mast., in Fl. Br. Ind. 1 (1875) 329; King, J. As. Soc. Beng. n.s. 60, ii (1891) 43; Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 134; Bailey, Queensl. Fl. 1 (1899) 121; Backer, Fl. Bat. 1 (1907) 113; Gagn., in Fl. Gén. I.-C. 1 (1910) 413; Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 242; Merr., Fl. Manila (1912) 319; Koord., Exk. Fl. Java 2 (1912) 583; Ridley, Fl. Mal. Pen. 1 (1922) 256; Merr., En. Philip. Fl. Pl. 3 (1923) 36; Hochr., Nova Guinea 14 (1924) 159; Backer & Sloot., Jav. Theeonkr. (1924) 171; Heyne, Nutt. Pl. (1927) 1027; Domin, Bibl. Bot. 22 (1928) 955; Backer, Onkruidfl. Jav. Suikerr. (1930) 442; Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 16; Steen., Fl. Schol. Indon. (1949) 265; Hend., Mal. Wild Flow. 1 (1949) 36, f. 25; Hochr., in Fl. Madag. fam. 129 (1955) 152.

See for synonyms and types under the varieties.

Annual, erect, rarely ascendent undershrub,  $\frac{1}{2}$ —2 m. Stems, petioles and pedicels more or less densely covered with minute stellate hairs, usually also with scattered, thin, simple hairs, glabrescent, often tinged purple. *Leaves* extremely variable as to shape and size; lowest ones usually orbicular, rather small, usually shallowly incised; middle ones larger, in general orbicular in outline, at base cordate, at apex rounded, obtuse or acute, angular, palmilobed, palmifid or palmiparted; upper leaves ovate to oblong to lanceolate, occasionally rhomboid, at base rounded, obtuse to acute, at apex mostly acute without deeper incisions, pennilobed, pennifid or penniparted; leaves serrate to crenate, occasionally entire, 1—12 by  $\frac{1}{2}$ —13 cm, at base 3—9-nerved, on midrib beneath (and sometimes on 2 adjacent foot-nerves) near base with a linear nectary, on both surfaces more or less densely clothed with minute stellate hairs (especially beneath), on nerves and veins beneath usually also with many thin, simple hairs, glabrescent; petiole  $\frac{1}{4}$ —12 cm. *Stipules* lanceolate to obovate, acute, 2—4 mm. *Flowers* axillary, mostly solitary, sometimes in clusters of 2—3 flowers, on account of the smallness of the upper leaves seemingly in spikes or racemes. Pedicel 1—2 mm, accrescent to c. 3 mm. *Epicalyx* 7—8 by 5—6 mm, closely enveloping the calyx and at base shortly adnate to it; segments linear to lanceolate or long triangular, 3—5 by 1—3 mm, outside with minute stellate hairs, often fimbriate by simple hairs, inside toward the tips sericeous by appressed, simple and stellate hairs. *Calyx* tubular to campanulate, 5—6 by  $1\frac{1}{2}$ —2 mm, 5-parted; segments ovate, acute to acuminate, 4—6 by  $1\frac{1}{2}$ —2 mm. *Calyx* with slightly prominent ribs and marginal nerves, on the costae with a nectary at c.  $\frac{1}{3}$  from the base or with a thickening only, outside more or less densely set with minute stellate hairs, inside at apex sericeous by

simple hairs. *Corolla* 2—3 cm  $\varnothing$ , rotate, pink with a purple centre; petals obovate, slightly oblique, at apex rounded, on the covering margin outside with minute stellate hairs or entirely glabrous. *Staminal column* 10—14 mm long, usually curved; anthers purple, pollen white; style arms *c.* 1 mm; stigmas dark purple. *Mericarps* with a short acumen, 4—5 mm high, radially *c.* 4 mm, tangentially *c.* 3 mm, dorsally and laterally stellate-hairy, and reticulately veined. *Seeds*  $\pm$  reniform,  $2\frac{1}{2}$ — $3\frac{1}{2}$  mm  $\varnothing$ , minutely hairy to glabrous, brown.

*Distribution*: Circumtropical, throughout Malesia. As the related *Pavonia* species, viz. *P. repanda* (J. E. Sm.) Spreng., and *P. rigida* (Wall. ex Mast.) Hochr., are restricted to SE. Asia, it is probable that *U. lobata* L. is of Asiatic origin. Although early recorded from Malesia, the impression from its occurrence in anthropogeneous country is that it has been introduced. It should be added that the pantropical distribution was already established in the 18th century. Whether it is post- or pre-Columbian cannot be ascertained, as in so many cases of pantropical weeds and cultigens.

*Ecology*: Common on road-sides, in waste places, fallow fields, plantations, secondary growths, teak-forests, etc., from sea-level up to *c.* 2000 m. The flowers open early in the morning, and wither about noon.

*Notes*: Linnaeus had three species of *Urena* in *Species Plantarum*, viz. *U. lobata*, *U. sinuata*, and *U. procumbens*, of which the last-mentioned one hitherto has not been identified (see under var. *sinuata*). Subsequent authors described numerous other species and many varieties. Gürke (1892) kept two Linnean species, *U. lobata*, with 9 varieties, and *U. sinuata*, with 2 varieties. Hochreutiner (1901) only distinguished *U. lobata*, with 14 varieties, later adding three more.

After having studied *U. lobata* both in the field and in the herbarium, I agree with Hochreutiner in admitting only one species. I have divided it into two subspecies, with a restricted number of varieties in Malesia. The differences between the subspecies lie essentially in the epicalyx (fig. 7e-f), but this coincides with difference in habit which cannot always be observed in herbarium specimens.

Most authors paid little attention to the epicalyx characters and characterized varieties on leaf-shape and indumentum, obviously not conscious that such characters vary considerably even on one plant: orbicular, small and subentire at the base, larger and deeper incised in the middle of the stem, and smaller and narrower to the apex. Thus, *U. lobata* var. *nova-guineensis* consists of apical parts with narrow leaves of var. *viminea* and *U. lobata* var. *sinuata* f. *heterophylla* is just the apical parts of var. *sinuata*.

The indumentum usually becomes thinner with age, that of shade-plants is mostly less dense if compared with specimens growing in sunny places.

I have accepted the two main groups as subspecies instead of as varieties partly on account of a tendency to altitudinal replacement (fig. 20, right). The subspecies are sharply distinct, and are not connected by intermediate specimens. In both subspecies I distinguish two varieties. A still finer distinction would involve growing experiments, crossings, and karyological research.

Unfortunately I have initially accepted *U. lobata* var. *genuina* Hochr. as representing *U. lobata* L. *sens. str.*, but I have later concluded that this variety is equivalent with *U. sinuata* L. *sens. lat.* Hence, in several herbaria my tickets are incorrect and should be verified with the identification list.

#### KEY TO THE SUBSPECIES

1. Epicalyx cupular in fruit, *c.* 8 mm  $\varnothing$ , stiff, appressed to the mericarps; segments long-triangular, acute\*  $4\frac{1}{2}$ —5 by  $2\frac{1}{2}$ —3 mm. Plant usually stouter than ssp. *sinuata*, ovate to lanceolate leaves in full grown plants more numerous, lower leaves (in Malesia) angular or shallowly lobed. . . . A. ssp. *lobata*

1. Epicalyx during fruiting spreading or reflexed, flexible; segments linear to lanceolate, acute, 3—4 by 1—1½ mm. Lower leaves angular or palmilobed or mostly deeper and often doubly incised.

B. ssp. *sinuata*

**A. ssp. lobata.** — Fig. 7e.

For description see the key.

Distribution: Throughout Malesia, especially above c. 400 m. Fig. 20 (right).

KEY TO THE VARIETIES

1. Green parts more or less densely tomentose . . . . . Aa. var. *lobata*  
 1. Green parts more or less densely pubescent, often slightly scabrous . . . . . Ab. var. *viminea*

**Aa. var. lobata.** — *U. lobata* Linné, Sp. Pl. (1753) 692; Cav., Diss. 6 (1788) 336, t. 185 f. 1; Hook., in Curtis, Bot. Mag. 58 (1831) t. 3043; Mor., Syst. Verz. (1846) 29; Vidal, Phan. Cuming. Philip. (1885) 97; Rev. Pl. Vasc. Filip. (1886) 63; Trimen, Handb. Fl. Ceyl. 1 (1893) 147; K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 437; Hall. f., Med. Rijksherb. 12 (1912) 13; Merr., En. Born. Pl. (1921) 374, p.p.; Steen., Arch. Hydrobiol., Suppl. 11 (1932) 309, p.p.; Kaneh. & Hatus., Bot. Mag. Tokyo 55 (1941) 390. — *U. monopetala* Lour., Fl. Coch. (1790) 418, e descr. — *U. tomentosa* Blume, Bijdr. 2 (1825) 66; Backer, Schoolf. Java (1911) 119; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 3. — *U. lobata* var. *tomentosa* (Bl.) Miq., Fl. Ind. Bat. 1, 2 (1858) 148, ? non Walp. 1843; O.K., Rev. Gen. Pl. 1 (1891) 74; Gürke, Bot. Jahrb. 16 (1892) 372, excl. synonym. p.p.; Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 139; op. cit. 15 (1911) 242; Koord., Fl. Tjibodas 2 (1923) 178; Baker f., J. Bot. 62, Suppl. (1924) 11; Ridley, Kew Bull. (1938) 221; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 16. — *U. lobata* f. *tomentosa* Miq., Pl. Jungh. (1854) 284. — ? *U. lobata* var. *tomentosa* Walp., in Meyen, Nov. Act. Ac. Nat. Cur. 19, Suppl. 1 (1843) 304. — *U. repanda* Blume, Bijdr. 2 (1825) 64, non Roxb. ex J. E. Sm., 1819. — *U. blumei* Hassk., Tijd. Nat. Gesch. Phys. 12 (1845) 78; Fl. Ind. Bat. 1, 2 (1858) 149; Val., Bull. Dép. Agr. Ind. Néerl. 10 (1907) 33. — *Pavonia rubiformis* Turcz., Bull. Soc. Imp. Nat. Mosc. 31, 1 (1858) 189. — *U. lobata* var. *rubiformis* (Turcz.) Gürke, Bot. Jahrb. 16 (1892) 373. — *U. callifera* Clarke, J. Linn. Soc. Bot. 25 (1889) 7, t. 3. — *U. lobata* f. *hirtula* Miq., Pl. Jungh. (1854) 284. — *U. lobata* var. *hirtula* (Miq.) Miq., Fl. Ind. Bat. 1, 2 (1858) 148. — *U. lobata* var. *per-tomentosa* O.K., Rev. Gen. Pl. 1 (1891) 74; Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 14; op. cit. 15 (1911) 243. — *U. lobata* var. *tomentosa* f. *umbrosa* Hochr., l.c. — *U. sinuata* (non L.) Baker f., J. Bot. 61, Suppl. (1923) 5. — *U. lobata* var. *scabriuscula* [non (DC.) Mast.] Merr., Philip. J. Sc. 1 (1906) Suppl. 92, p.p.

Types: *U. lobata* L.: ? Hortus Upsaliensis, Linn. Herb. n. 873.1 (lectotype: LINN); *U. tomentosa* Blume: Java, Romping and Kuripan, Blume 978 (lectotype: L); *U. repanda* Blume: Java, Bogor, Blume s.n. (holotype: L 905.353-8); *Pavonia rubiformis* Turcz.: Luzon, Calauang, Cuming 469 (isotypes: BM, G, K, L, MEL); *U. callifera* Clarke: Assam, Kohima, C. B. Clarke 41657 (holotype: K); *U. lobata* f. *hirtula* Miq.: Java, Mt Merbabu and Andong, Junghuhn s.n. (isotypes: L 905.353-61, 66, U 31051B); *U. lobata* var. *per-tomentosa* O.K.: Java, Dieng Mts, O. Kuntze 5652 (isotypes: K, NY); *U. lobata* var. *tomentosa* f. *umbrosa* Hochr.: Java, Pengalengan, Hochreutiner 1315 (holotype: G); *U. lobata* var. *tomentosa* Walp.: Luzon, Manila, Meyen s.n. (holotype: B †).

Notes: The protologue of *U. lobata* in Species Plantarum refers successively to entries in Linné's Hortus Cliffortianus, Hortus Upsaliensis, Flora Zeylanica, to Van Royen's Florae Leydensis Prodrum, and to plates of Dillenius and of Breynius. In the Herbarium



of Clifford I have not found any *Urena* specimen. The specimen in Hermann's herbarium on which the entry in *Flora Zeylanica* was based is a rather poor specimen, in my opinion not fit for typification, since its identity with some infraspecific form cannot be stated with certainty.

In the Linnean herbarium there is an excellent specimen under *n.* 873.1 bearing the specific epithet '*lobata*' in the handwriting of Linnaeus as well as the number 1, which doubtless refers to the number of the species in *Species Plantarum*. Although an indication 'HU' is lacking, the specimen might have been collected in the Upsala garden. I have selected this as the lectotype of *U. lobata* L. On the sheet is mounted one branch with leaves, flowers and fruits. The leaves are more or less orbicular, shallowly 3—5-lobate, the epicalyx is of the large type and its segments are appressed; the indument is moderately tomentose, about as in the type material of *U. tomentosa* Blume. In the herbarium Alströmer at Stockholm there are two corresponding sheets. One is originally from the herbarium of L. Montin, and bears the annotation 'Specimen ex horto Upsal.: communicavit Hortulanus Nietzel'. Apparently Nietzel, Linnaeus's gardener, presented the specimen to Linnaeus's pupil Montin. It bears a branch with large leaves, but without flowers. As country of origin China is given. The other specimen with small leaves, a flower and two fruits has the name '*Urena lobata*' in Linnaeus' handwriting. A locality is not noted. Both specimens are convarietal with the specimen at London and could be considered paratypes.

In the Rijksherbarium at Leyden the labels of the specimens of Van Royen's herbarium refer to the entry of the latter as well as to Linnaeus's species. They resemble the Linnean specimen very much, but differ by a slightly denser indumentum.

The plate of Dillenius shows a plant very similar to the Linnean specimen. On the plate of Breynius, however, the fruits are pictured with reflexed, short epicalyces. That plate should therefore be classified under *U. lobata* ssp. *sinuata* (L.) Borss.

I have not found any authentic specimen of Blume annotated 'Romping et Kuripan', the localities where according to his Bijdragen the type of *U. tomentosa* Blume should have been collected. Since most authentic specimens of Blume do not bear annotations as to the origin, I have not hesitated to select a lectotype from the specimens preserved with the name in Blume's handwriting.

It is possible that *U. repanda* Blume was a mere misinterpretation of *U. repanda* Roxb. ex J. E. Sm.; it may have been a homonym. The only authentic specimen which I have seen can be looked upon as a younger stage of the present variety; it may well be a shade form. I consider the specimen to be the holotype. *U. blumei* Hassk. is a later synonym based on the same type created because of the supposed homonymy of *U. repanda* Blume.

The type material of *Pavonia rubiformis* Turcz. as well as that of *U. lobata* var. *per-tomentosa* O.K. is characterized by an extremely dense, tomentose indumentum.

*U. callifera* Clarke was described as having 'hairy calli on the calyx segments', but these 'calli' appear to be the walls of the nectaries usually found on the calyx of *U. lobata* L.

The type material of *U. lobata* f. *hirtula* Miq. consists of apical parts of a form, probably identical with *U. repanda* Blume.

*U. repanda* var. *tomentosa* f. *umbrosa* Hochr. is in fact a mere shade form.

**Ab. var. *viminea*** (Cav.) Gürke, Bot. Jahrb. 16 (1892) 375; Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 137; op. cit. 15 (1911) 242; Nova Guinea 14 (1924) 160. — *U. viminea* Cav., Diss. 6 (1788) 335, t. 184 f. 1; DC., Prod. 1 (1824) 442. — ? *U. heterophylla* Schrad., Cat. Sem. Gött. (1835) *s.p.*, non J. E. Sm., 1819. — ? *U. phyllo-morpha* Steud.,

Nomencl. ed. 2, 2 (1841) 732; Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 143. — *U. lobata* var. *scabriuscula* [non (DC.) Mast.] A. Gray, Bot. Wilkes U.S. Expl. Exp. (1854) 169; Fern.-Vill., Novis. App. (1880) 23; Gürke, Bot. Jahrb. 16 (1892) 373, *quoad specim. p.p. maj.*; Merr., Philip. J. Sc. 1 (1906) Suppl. 92; op. cit. 3 (1908) Bot. 420; Fl. Manila (1912) 320; Un. Cal. Publ. Bot. 15 (1929) 188; Contr. Arn. Arb. 8 (1935) 101; Ridley, Kew Bull. (1938) 221. — *U. scabriuscula* (non DC.) W. & A., Prod. (1834) 46. — *U. lobata* var. *nova-guineensis* Hochr., Nova Guinea 14 (1924) 160. — *U. lobata* var. *genuina* Hochr., l.c. p.p. — *U. lobata* (non L.) DC., Prod. 1 (1824) 442, *quoad specim.*; Hook., in Curtis, Bot. Mag. 58 (1831) t. 3043; Roxb., Fl. Ind. ed. Carey 3 (1832) 182; Perk., Fragm. Fl. Philip. (1904) 109; Bartlett, Pap. Mich. Ac. Sc. 6 (1926) 30; Ridley, Kew Bull. (1926) 61, p.p. — *U. lappago* (non J. E. Sm.) Miq., Fl. Ind. Bat., Suppl. (1860) 163.

Types: *U. viminea* Cav.: Brazil, Commerson s.n. (holotype: P-JU 12331); *U. lobata* var. *nova-guineensis* Hochr.: New Guinea, Lorentz R., *Pulle 229* (isotypes: BO, L, U).

*Distribution*: Throughout Malesia, rare in Java, lacking in the Lesser Sunda Islands and the Moluccas.

*Notes*: Under *U. viminea* Cavanilles refers emphatically to a sheet in the herbarium De Jussieu. The corresponding sheet bears three specimens of which two bear a label with the name '*Urena viminea*' in the handwriting of Cavanilles. They match both the description and the plate of Cavanilles very well, and should be considered the holotype. To the third specimen a label is added on which is written 'trouvé dans L'Herb. du détroit de Magellanes'. It belongs to *U. lobata* ssp. *sinuata* var. *glauca* (Bl.) Borss. It may be a duplicate of a collection preserved at Madrid in the so-called herbarium of Cavanilles, which bears no label, and is accompanied only by the description and the figure of *U. viminea* Cav. cut out from the 'Dissertationes'. This specimen does not match the description and figure.

*U. heterophylla* Schrad., non Sm. (= *U. phyllomorpha* Steud.) was based on material from Java. The description is insufficient, but it may belong here.

The type of *U. lobata* var. *nova-guineensis* Hochr. consists of apical parts obviously collected from full-grown specimens of the present variety.

**B. ssp. *sinuata*** (L.) Borss., *stat. nov.* — *U. sinuata* Linné, Sp. Pl. (1753) 692. — **Fig. 7f.**

*For description see the key to the subspecies.*

*Distribution*: Throughout Malesia, especially in the lowlands below c. 400 m. Fig. 20 (right).

#### KEY TO THE VARIETIES

1. Leaves palmifid to palmiparted, with serrate or pennilobed to penniparted segments **Ba. var. *sinuata***  
 1. Leaves angular to palmilobed . . . . . **Bb. var. *glauca***

**Ba. var. *sinuata***. — *U. sinuata* Linné, Sp. Pl. (1753) 692; Cav., Diss. 6 (1788) 336, t. 185 f. 2; DC., Prod. 1 (1824) 442; Roxb., Fl. Ind. ed. Carey 3 (1832) 182; W. & A., Prod. (1834) 46; Mast., in Fl. Ind. 1 (1875) 329; Fern.-Vill., Novis. App. (1880) 23; F. v. M., Descr. Not. Pap. Pl. 6 (1885) 5; Gürke, Bot. Jahrb. 16 (1892) 377; Trimen, Handb. Fl. Ceyl. 1 (1893) 148; Merr., Philip. J. Sc. 1 (1906) Suppl. 92; Koord.-Schum., Syst. Verz. 3 (1914) 81. — *U. lobata* var. *sinuata* (L.) Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 141; op. cit. 15 (1911) 243; Ridley, J. Fed. Mal. St. Mus. 8, 4 (1917) 22. — *U. procumbens* L., Sp. Pl. (1753) 692. — *U. lappago* J. E. Sm., in Rees, Cyclop. 37, n. 6 (1819); DC., Prod. 1 (1824) 441. — *U. multifida* Cav., Diss. 6 (1788) 336, t. 184 f. 2; DC., Prod. 1 (1824) 441; Decne, Herb. Timor. (1835) 102; Span., Linnaea 15 (1841) 168; Blanco,

Fl. Filip. (1837) 540; ed. 2 (1845) 378; ed. 3, 2 (1879) 332, t. 243; Miq., Fl. Ind. Bat. 1, 2 (1858) 148; Britten, in Forbes, Natur. Wand., App. 6 (1885) 500. — *U. lobata* var. *multifida* (Cav.) Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 140. — *U. morifolia* DC., Prod. 1 (1824) 442. — *U. lobata* var. *sinuata* f. *morifolia* (DC.) Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 141. — *U. muricata* DC., Prod. 1 (1824) 442. — *U. lobata* var. *muricata* (DC.) Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 142. — *U. heterophylla* J. E. Sm., in Rees, Cyclop. 37, n. 2 (1819); DC., Prod. 1 (1824) 442; Blume, Bijdr. 2 (1825) 66; Mor., Syst. Verz. (1846) 29; Miq., Fl. Ind. Bat. 1, 2 (1858) 149; Koord., Med. Lands Plantent. 19 (1898) 360. — *U. sinuata* var. *ceylanica* Gürke, Bot. Jahrb. 16 (1892) 379. — *U. lobata* var. *ceylanica* (Gürke) Hochr., Ann. Cons. Jard. Bot. Genève 5 (1901) 142. — *U. lobata sensu* Backer, Schoolfl. Java (1911) 119, p.p.; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 3, p.p.; Merr., Sp. Blanc. (1917) 253; Steen., Arch. Hydrobiol., Suppl. 11 (1932) 309; Doct. van Leeuwen, Blumea 2 (1937) 260. — *Uren* Rheede, Hort. Malab. 10, p. 3, t. 2.

Types: *U. sinuata* L.: Ceylon, Herb. Hermann, Vol. IV, fol. 34, Linn. n. 257 (lectotype: BM); *U. procumbens* L.: China, Osbeck s.n. (isotypes: LINN, S); *U. multifida* Cav.: Mauritius (Ile de France), Commerson s.n. (holotype: MA; isotype: P-JU 12337); *U. lappago* J. E. Sm.: China, Osbeck s.n., Linn. herb. 873.4 (holotype: LINN); *U. morifolia* DC.: Friendship Is., s. coll. s.n. (holotype: G-DC); *U. muricata* DC.: Botanic Garden Calcutta, Leschenault s.n. (holotype: G-DC); *U. heterophylla* J. E. Sm.: Madras, Rottler s.n. (lectotype: LINN); *U. sinuata* var. *ceylanica* Gürke: Ceylon, Thwaites 1129 (isotypes: BM, K).

*Distribution*: Never found in New Guinea.

*Notes*: In the protologue of *U. sinuata* Linnaeus referred primarily to an entry in Flora Zeylanica, which was based on a specimen of Hermann selected in the present publication as the lectotype. In the Linnean herbarium there are no specimens with the name in the handwriting of Linnaeus. The figures of Plukenet and of Burman cited by him seem to me less suitable for typification.

J. E. Smith added to the description of *U. lappago* the following note: 'Our description is taken from specimens to which Linnaeus, long after he published his Sp. Plantarum, attached the name *procumbens*, fabricating from them a new specific character, which stands in the second volume of his Syst. Nat., and adopted by Willdenow, but which is altogether irreconcilable to the description of the original *procumbens*.'

The specimens mentioned by J. E. Smith are attached to the sheet n. 873.4 in the Linnean herbarium, and should in my opinion be considered the holotype of *U. lappago*, instead of the plate appertaining to *Lappago amboinica laciniata* Rumph., which is cited as a synonym.

It is true that the sheet in the Linnean herbarium, which bears the epithet '*procumbens*' in the handwriting of Linnaeus as well as the number '3' referring to the species number in Species Plantarum, does not match the protologue of *U. procumbens* L. It consists of some branches with flowers, fruits, and lobed leaves, whereas Linnaeus wrote in Species Plantarum 'foliis hastato-subcordatis indivisis serratis...' in his phrase-name, and 'folia... integra nec lobata...' in his description.

Gürke (1892) and Hochreutiner (1901) did not succeed in identifying *U. procumbens* L. either. Both supposed that it was not an *Urena*, and doubted even whether it belonged to the *Malvaceae*. It was based on material collected by P. Osbeck in China. Through the kindness of Dr. T. Norlindh I had the opportunity to study four corresponding specimens from the Riksmuseet at Stockholm. I have marked the specimens on my tickets added, viz. I, II, III, and IV. All specimens belong to *U. lobata* L. ssp. *sinuata*

and bear the name '*Urena procumbens*', though not in the handwriting of Linnaeus.

In the herbarium Alströmer (S) there is a specimen (I), which is marked 'Dahl a Linné P', but an annotation Osbeck or China is lacking. In a letter to Dr. van Steenis, Dr. Norlindh expressed his belief that this specimen, which apparently was presented by Linnaeus to his pupil A. Dahl, was the one Linnaeus had for *Species Plantarum*. I do not share Dr. Norlindh's opinion. The specimen consists of a stem with one flower and some trilobed leaves, again not matching the protologue.

The other three specimens are preserved in the general collection at Stockholm (S). Sheet II, marked 'Herb. Osbeckii' bears two stems with flowers, fruits and several leaves, partly trilobed, and partly unincised. Sheet III has the name 'Carl G. Osbeck', 'China' and an illegible locality; there are two twigs similar to those on sheet II. Finally there is sheet IV, with the collector 'Carl G. Osbeck' and the origin 'China' indicated. This sheet bears three twigs with flowers, fruits and leaves, which are unincised, trilobed, and — one — palmatifid.

I consider all sheets, also the one at London, to be isotypes, and assume that the holotype, which, no doubt, consisted of apical parts with unincised leaves, is lost. Since the leaves are lobed to parted, I have placed *U. procumbens* L. and *U. lappago* J. E. Sm. under the synonymy of var. *sinuata*.

On sheet IV also occurs the name '*Urena chinensis*', which according to Hochreutiner was published in Osbeck's *Dagbok Ostind. Resa* (1757) 225, English ed. (1771) 363, practically as a *nomen nudum* (cf. also Merrill, *Am. J. Bot.* 3, 1916, 587).

The segments of the leaves vary highly with respect to the degree of incision. They may be serrate, or pennilobed (as in the type of *U. multifida* Cav.), or even penniparted (as in the type of *U. muricata* DC.). The leaves of the type collection of *U. lobata* var. *zeylanica* Gürke are very similar to those of the type of *U. muricata* DC., but the indumentum is densely tomentose as in *U. lobata* var. *pertomentosa* O.K. *U. heterophylla* J. E. Sm. stands for full-grown plants of the present variety with the upper leaves much narrower than the lower ones.

**Bb. var. glauca** (Bl.) Borss., *comb. nov.* — *U. lappago* var. *glauca* Blume, *Bijdr.* 2 (1825) 65. — *U. lappago* (non J. E. Sm.) Blume, *Bijdr.* 2 (1825) 65; Miq., *Pl. Jungh.* (1854) 283; *Fl. Ind. Bat.* 1, 2 (1858) 283. — *U. scabriuscula* DC., *Prod.* 1 (1824) 441. — *U. lobata* var. *scabriuscula* (DC.) Mast., in *Fl. Br. Ind.* 1 (1875) 329; Gürke, *Bot. Jahrb.* 16 (1892) 373, *quoad specim. p.p. minor.*; Val., *Bull. Dép. Agr. Ind. Néerl.* 10 (1907) 33. — *U. lobata* f. *sinuosa* Miq., *Pl. Jungh.* (1854) 283. — *U. lobata* var. *sinuosa* (Miq.) Miq., *Fl. Ind. Bat.* 1, 2 (1858) 148. — *U. lobata* var. *genuina* Hochr., *Ann. Cons. Jard. Bot. Genève* 5 (1901) 136. — *U. lobata* (non L.) W. & A., *Prod.* (1834) 46; Miq., *Pl. Jungh.* (1854) 283, *quoad 'forma icone<sup>1</sup> laud. satis congrua'*; *Fl. Ind. Bat.*, *Suppl.* (1860) 163, 398; K. Sch., *Bot. Jahrb.* 9 (1887) 209; *Fl. Kaiser Wilhelmsl.* (1889) 55; *Warb., Bot. Jahrb.* 13 (1891) 373; *Koord., Med. Lands Plantent.* 19 (1898) 360; K. Sch. & Laut., *Fl. Deutsch. Schutzgeb. Südsee* (1901) 436, *quoad specim. p.p. major.*; Backer, *Schoolfl. Java* (1911) 119, *p.p.*; *Koord.-Schum., Syst. Verz.* 1, fam. 175 (1911) 3, *p.p.*; *op cit.* 3 (1914) 81; Gibbs, *J. Linn. Soc. Bot.* 42 (1914) 61; Merr., *Int. Rumph. Herb. Amb.* (1917) 357; Ridley, *J. Fed. Mal. St. Mus.* 8, 4 (1917) 22; Merr., *En. Born. Pl.* (1921) 374, *p.p.*; Doct. van Leeuwen, *Ann. Jard. Bot. Btzg* 32 (1922) 173; Ridley, *Kew Bull.* (1926) 61, *p.p.*; Bartlett, *Pap. Mich. Ac. Sc.* 6 (1926) 30; Doct. van Leeuwen, *Blumea* 2 (1937) 267; Backer, *Onkruidfl. Jav. Suikerr.*, *Atlas* (1940) t. 417. — *U. sinuata sensu* Linné, in *Stickman, Herb. Amb.* (1754)

<sup>1</sup>) Referring to t. 185 f. 1 in Cavanilles's *Dissertatio*.

26; Amoën. Acad. 4 (1759) 134. — *Lappago amboinica laciniata* Rumph., Herb. Amb. 6, p. 59, t. 25 f. 2.

Types: *U. lappago* var. *glauca* Blume: Java, Djakarta, Blume s.n. (holotype: L 905.353-99); *U. scabriuscula* DC.: Nepal, Wallich 1928F (lectotype G-DC; isotype: K-W); *U. lobata* f. *sinuosa* Miq.: Java, Magelang, Junghuhn s.n. (holotype: L 905.353-63).

Notes: The oldest name for the present form as a variety appears to be *U. lappago* var. *glauca* Blume. The epithet 'glauca' was given to the type on account of its leaves being glaucous underneath, a character not always present in the variety as conceived in the present publication.

According to Merrill (1917, 354, 357) the flowers pictured in Rumphius's figure of *Lappago amboinica laciniata* would be those of *Triumfetta bartramia* L. (*Tiliaceae*). Only loose stamens were drawn and not a staminal column, but in fact they are too small to be interpreted. The leaves and the fruits are undoubtedly of var. *glauca*. Judging from the description, and the leaf pictured under t. 25 f. 2A, *Lappago amboinica latifolia* of Rumphius might represent another variety of *U. lobata* L. A third form described by Rumphius under the heading *Lappago* might belong to *Triumfetta bartramia* L. as stated by Merrill, but in my opinion there can be no certainty. The name *Lappago amboinica sylvestris* mentioned by Merrill for this form, is not of Rumphius, but was given by Hasskarl in his 'Neuer Schlüssel etc.' (Abh. Nat. Ges. Halle 9, 1866, 305).

#### 9. MALACHRA

Linné, Syst. Nat. ed. 12, 2 (1767) 458 & Mant. 1 (1767) 13; B. & H., Gen. Pl. 1 (1862) 205; Gürke, Bot. Jahrb. 16 (1892) 345; Hochr., Ann. Cons. Jard. Bot. Genève 20 (1917) 144; Kearney, Am. Midl. Nat. 46 (1951) 106.

Lectotype: *M. capitata* (L.) L.

Annual or perennial herbs or undershrubs, often prickly or hirsute. *Leaves* undivided or palmilobed to -parted, without extrafloral nectaries. *Flowers* in head-like, condensed racemes, in the axils of rather large, mostly widely ovate or triangular, deeply cordate bracts. Pedicels extremely short, without joint. *Epicalyx* usually lacking, rarely (not in Malesia) present. *Calyx* cupular, small, often with aristate segments. *Corolla* small, red, yellow or white. *Staminal column* as long as or shorter than the petals, antheriferous throughout. Carpels 5, uni-ovulate; style above the middle divided into 10 arms; stigmas capitate, papillose. *Schizocarp* globular. Mericarps  $\pm$  isodiametric to ovoid, trigonous, with convex dorsal side, slightly prominently, reticulately veined, indehiscent, after falling leaving a slender columella.

*Distribution*: About 10 species, native in tropical America; 2 or 3 species have been introduced as weeds in the Old World, Malesia included.

*Note*: A new revision of the genus as a whole is very much needed, since Gürke's monograph of 1892 is out of date. His species concept was a rather narrow one.

#### KEY TO THE SPECIES

1. Outer bracts conduplicate. Leaves undivided or palmilobed to -parted; segments never spatulate.
2. Green parts with scattered, stiff simple hairs and stiff 2-armed stellate hairs, for the rest densely covered with minute many-armed, stellate hairs. Stipules 1—1½ cm long. Calyx segments obtuse, not aristate. Corolla bright yellow . . . . . 1. *M. capitata*
2. Green parts densely covered with stiff simple hairs only, usually without minute stellate hairs. Stipules 2—3 cm. long. Calyx segments acuminate, aristate. Corolla white . . . . . 2. *M. fasciata*
1. Outer bracts flat. Leaves palmiparted, with spatulate segments . . . . . 3. *M. heptaphylla*

**1. *Malachra capitata* (L.) Linné, Syst. Nat. ed. 12, 2 (1767) 458; Cav., Diss. 2 (1786) 98, t. 33 f. 2; DC., Prod. 1 (1824) 440; Mém. Soc. Hist. Nat. Genève 5 (1831) t. 5; A. Gray, Gen. Am. Ill. 2 (1849) t. 129; Mast., in Fl. Br. Ind. 1 (1875) 329; Fern.-Vill., Novis. App. (1880) 23; Gürke, Bot. Jahrb. 16 (1892) 348; Merr., Publ. Gov. Lab. Philip. 27 (1905) 23; Gagn., in Fl. Gén. I.-C. 1 (1910) 411; Backer, Schoolfl. Java (1911) 119; Merr., Fl. Manila (1912) 319; Sp. Blanc. (1918) 253; En. Philip. Fl. Pl. 3 (1923) 36; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 15; Hochr., in Fl. Madag. fam. 129 (1955) 152, t. 36 f. 1—2. — *Sida capitata* Linné, Sp. Pl. (1753) 685. — *M. alceifolia* Jacq., Coll. Bot. 2 (1789) 350; Ic. Pl. Rar. 3 (1792) t. 549; Gürke, Bot. Jahrb. 16 (1892) 348. — *Napaea latifolia* Blanco, Fl. Filip. ed. 2 (1845) 387; ed. 3, 2 (1879) 346, t. 295.**

Types: *Sida capitata* L.: Hortus Upsaliensis, *Herb. Linn n. 867.1* (lectotype: LINN); *M. alceifolia* Jacq.: Jacquin, Ic. Pl. Rar. 3, t. 549 (holotype); *Napaea latifolia* Blanco: Luzon, Manila, Merrill, *Sp. Blanc. 351* (neo-isotypes: A, BM, K, L, P, US).

Annual or perennial, erect undershrub,  $\frac{1}{2}$ —2 m. Stems, petioles and floral axes cinereously velutinous by minute, stellate hairs, also more or less densely set with *c.* 2 mm long, stiff, prickly stellate and simple hairs. *Leaves* orbicular to ovate, angular or slightly lobed with rounded or obtuse lobes, at base cordate, at apex obtuse or rounded, 2—9 cm  $\varnothing$ , crenate to serrate, at base 5-nerved, on both surfaces cinereously velutinous by minute stellate hairs, glabrescent; petiole  $1\frac{1}{2}$ —9 cm. *Stipules* filiform, 1— $1\frac{1}{2}$  cm long, hispid. *Heads* 3—7 per axil; inflorescencial axis  $\frac{1}{2}$ — $1\frac{1}{2}$  cm, with 2—5 flowers; bracts 3—4 per head, broadly ovate to orbicular, at base cordate to rounded, at apex acute with a slightly recurved tip, folded along the midrib,  $\frac{1}{2}$ —2 cm  $\varnothing$ , entire, minutely stellate-hairy, with stiff hairs on the veins, often tinged red, usually with white patches on the intervenium, accompanied by filiform stipules. *Calyx* cupular, *c.*  $3\frac{1}{2}$  mm high, 5-parted; segments oblong, acuminate, 3 by  $1\frac{1}{2}$  mm, 3-nerved, glabrous, but the tips with some long stiff hairs, white with red nerves. *Corolla* 1— $1\frac{1}{2}$  cm  $\varnothing$ , yellow; petals obovate, at base stellate-ciliate. *Staminal column* *c.* 3 mm, at base stellate-hairy. *Schizocarp* obpyriform, 5—6 mm  $\varnothing$ . Mericarps obovoid, at base acute, at apex rounded, trigonous, *c.* 3 by 2 mm, veined, glabrous. *Seeds* same shape as the mericarps, *c.*  $2\frac{1}{2}$  mm long, densely covered with minute stellate hairs.

*Distribution*: Introduced as a weed; in Malesia: West Java (Bogor), Timor, and the Philippines (Luzon, Panay).

*Ecology*: Waste places, grassfields subject to annual burning (Timor).

*Notes*: In my opinion *M. alceifolia* Jacq. is not specifically distinct from *M. capitata* (L.) L. The only difference is actually in the indumentum, which in *M. alceifolia* Jacq. not only consists of minute stellate hairs as in *M. capitata* (L.) L., but also of stiff, prickly simple hairs and stellate hairs. All other differences as given by Gürke and other authors in keys and descriptions do not hold as I observed on extensive material. The Malesian specimens belong to var. *rotundifolia* (Schranck) Gürke<sup>1)</sup>, which differs by the said prickly hairs, and by more or less orbicular, usually angular or slightly lobed leaves.

*Sida capitata* L. was primarily based on 'Sida capitulis pedunculatis triphyllis septemfloris' of Linnaeus, which was published in 1743 (Acta Soc. Reg. Sc. Ups., Annum 1740, 137, t. 2). The detailed description and the plate in the latter publication were made after a plant grown in the Upsala Botanic Garden. In the Linnean herbarium, there is only one sheet, viz. n. 867.1. This bears the specific epithet in the handwriting of Linnaeus, and is marked 'HU' (Hortus Upsaliensis). Since the specimen fits both Linnaeus' description and his plate very well, I accept this as the lectotype.

Merrill, *Sp. Blanc. 351* seems to me suitable for a neotype of *Napaea latifolia* Blanco.

<sup>1)</sup> *M. alceifolia* var. *rotundifolia* (Schranck) Gürke, Bot. Jahrb. 16 (1892) 348. — *M. rotundifolia* Schranck, Pl. Rar. Hort. Mon. 2 (1820) t. 56.

**2. *Malachra fasciata*** Jacq. Coll. 2 (1789) 552; Ic. Pl. Rar. 3 (1792) t. 548, em. Gürke, Bot. Jahrb. 16 (1892) 353; Backer, Ann. Jard. Bot. Btzg Suppl. 3 (1910) 407; Schooffl. Java (1911) 119; Koord., Exk. Fl. Java 2 (1912) 583; Merr., Fl. Manila (1912) 319; En. Philip. Fl. Pl. 3 (1923) 36.

*See for synonyms and types under the varieties.*

Annual, erect undershrub,  $\frac{1}{2}$ — $2\frac{1}{2}$  m. Stems, petioles and axes covered by stiff, prickly simple hairs c.  $3\frac{1}{2}$  mm long, without minute stellate hairs; stems with a single line of short, minute simple hairs below the petiolar bases. *Leaves* orbicular to ovate, at base rounded, truncate or shallowly cordate, 3—15 by 2—14 cm, 3—5-lobed or deeply 3—5—7-parted with distally pointing segments, central segment always longest, sinuses acute; coarsely serrate to crenate, at base 5-nerved, on both surfaces with scattered, appressed, stiff, simple hairs; petiole 2—12 cm. *Stipules* filiform, 2—3 cm long, ciliate with stiff hairs. *Heads* 2—5 per axil; axis  $2\frac{1}{2}$ —15 mm, with 6—9 flowers; bracts 3—4 per head, triangular, at apex whether or not reflexed, acute to acuminate, at base rounded to shallowly cordate, folded along the midrib, 1— $2\frac{1}{2}$  by  $\frac{1}{2}$ —2 cm, remotely serrate, with stiff hairs on the veins, often with white patches in the intervenium, accompanied by long filiform stipules. *Calyx* cupular, c. 4 mm long, 5-fid; segments ovate, acute, c.  $2\frac{1}{2}$  by  $1\frac{1}{2}$  mm, 3-nerved; calyx on the margin with stiff hairs, white with red nerves. *Corolla* 1— $1\frac{1}{2}$  cm  $\varnothing$ , white, finally red; petals obovate, at apex rounded, glabrous. *Staminal column* c. 3 mm, glabrous. *Schizocarp* obpyriform, 3—4 mm  $\varnothing$ . *Mericarps* obovoid, at base acute, at apex rounded, trigonous,  $2\frac{1}{2}$ —3 by  $1\frac{1}{2}$ —2 mm, prominently veined, glabrous. *Seeds* similar in shape with the mericarps, c.  $2\frac{1}{2}$  mm long, glabrous except for the stellate-hairy hilum, black.

*Distribution*: In Malesia an introduced weed common in the Philippines, rare in West Java and Madura I., Timor, and New Guinea.

Var. *lineariloba* (Turcz.) Gürke seems to be known only from Malesia.

*Ecology*: Waste places, road-sides, etc., in the lowlands, presumably under seasonally dry conditions.

*Notes*: *M. fasciata* Jacq. is closely allied to the preceding species but well distinct from it in Malesia.

Hochreutiner (1917, 148) pointed out that *M. fasciata* Jacq. *sens. str.* is hard to distinguish from certain non-Malesian forms of *M. alceifolia* Jacq.

#### KEY TO THE VARIETIES

1. Leaves 3—5-lobed; segments ovate to deltoid to oblong,  $1\frac{1}{2}$ —2 cm wide . . . . **a. var. *fasciata***  
 1. Leaves deeply 3—7-parted; segments linear to long-lanceolate,  $\frac{1}{2}$ — $1\frac{1}{2}$  cm wide . **b. var. *lineariloba***

**a. var. *fasciata***. — *M. fasciata* Jacq., Coll Bot. 2 (1789) 552; Ic. Pl. Rar. 3 (1792) t. 548; Bot. Reg. 6 (1820) t. 467; DC., Prod. 1 (1824) 440; Gürke, in Fl. Bras. 12, 3 (1892) t. 81.

Type: Ic. Pl. Rar. 3, t. 548 (holotype of *M. fasciata* Jacq.), unless there is authentic material at Vienna.

*Distribution*: West Java (Djakarta), Philippines (Luzon, Manila vicinity; Panay), Lesser Sunda Islands (Timor), S. New Guinea (Merauke).

**b. var. *lineariloba*** (Turcz.) Gürke, Bot. Jahrb. 16 (1892) 355; Merr., Philip. J. Sc. 1 (1906) Suppl. 92; Hochr., Ann. Cons. Jard. Bot. Genève 20 (1917) 149; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 14. — *M. lineariloba* Turcz., Bull. Soc. Imp.

Nat. Mosc. 31, 1 (1858) 206; Vidal, Phan. Cuming. Philip. (1885) 97; Rev. Pl. Vasc. Filip. (1886) 63. — *Malva horrida* Span., Linnaea 15 (1841) 168; in Hook., Comp. Bot. Mag. 1 (1836) 344, *nom. nud.* — *M. horrida* (Span.) Miq., Pl. Ind. Bat. 1, 2 (1858) 149. — *Napaea scabra* (non L.) Blanco, Fl. Filip. (1837) 553; ed. 2 (1845) 386; ed. 3, 2 (1879) 346. — *M. bracteata* (non Cav.) Fern.-Vill., Novis. App. (1880) 23. — *M. fasciata* (Jacq.) Merr., Sp. Blanc. (1918) 253.

Types: *M. lineariloba* Turcz.: Luzon, Ilocos Sur Prov., Cuming 111 (isotypes: BM, G, K, L, P); *Malva horrida* Span.: Timor, Spanoghe s.n. (isotypes: BO 158693, K, L 908.136-555, 556, 561).

Distribution: East Java (Madura I.), Lesser Sunda Islands (Timor), Philippines (Luzon, Mindoro, Panay, Mindanao).

3. *Malachra heptaphylla* Fischer ex Hornem., Hort. Hafn., Suppl. (1819) 578; Gürke, Bot. Jahrb. 16 (1892) 29; Hochr., Ann. Cons. Jard. Bot. Genève 20 (1917) 149. — *M. diversifolia* Hassk., Flora II, 25 (1842) Beibl. 38 ('*Malacha*'). — *Pavonia diversifolia* (Hassk.) Hassk., Tijds. Nat. Gesch. Phys. 10 (1843) 134; Cat. Hort. Bog. (1844) 196; Mor., Syst. Verz. (1846) 29.

Distribution: Brazil; formerly cultivated in the Botanic Garden of Bogor.

Note: I believe that Gürke has rightly referred *M. diversifolia* Hassk. to *M. heptaphylla* Fischer ex Hornem. Hasskarl's description is rather vague and fits that of any species of the genus. However, Zollinger 1845, collected in the Botanic Garden of Bogor, and distributed with Hasskarl's name, undoubtedly belongs to *M. heptaphylla* Fischer ex Hornem. as described and mentioned by Gürke (1892, 31). It is proposed here as a neotype for Hasskarl's name.

### III. Tribe MALVEAE

A. Gray, Gen. Fl. Am. Bor. 2 (1849) 46; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 35; in Fl. Bras. 12, 3 (1891) 262.

Holotype: *Malva* L.

#### 10. MODIOLA

Moench, Meth. Pl. (1794) 619.

Distribution: Three species in tropical and subtropical America of which one locally naturalized in the Old World.

1. *Modiola caroliniana* (L.) G. Don, Gen. Syst. 1 (1831) 465; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 8; Backer & Bakh. f., Fl. Java 1 (1963) 424. — *Malva caroliniana* Linné, Sp. Pl. (1753) 688.

Distribution: North America, elsewhere cultivated and occasionally running wild; in Malesia found in East Java (Mt Tengger).

#### 11. ANODA

Cav., Diss. 1 (1785) 38; Hochr., Ann. Cons. Jard. Bot. Genève 20 (1916) 29.

Distribution: About 14 species in subtropical and tropical America of which 2 or 3 have been introduced in the Old World.

#### KEY TO THE SPECIES

1. Mericarps at apex with a rather long, patent beak, hispid . . . . . 1. *A. cristata*  
 1. Mericarps without such a beak, tomentose . . . . . 2. *A. hastata*



1. *Anoda cristata* (L.) Schlecht., *Linnaea* 11 (1837) 210; Hochr., *Ann. Cons. Jard. Bot. Genève* 20 (1916) 44; Backer & Bakh. *f.*, *Fl. Java* 1 (1963) 428. — *Sida cristata* Linné, *Sp. Pl.* (1753) 685. — *A. lavateroides* Medicus, *Malv.* (1787) 19; Backer, *Bekn. Fl. Java* (em. ed.) 4C (1943) fam. 109, p. 15.

*Distribution*: Subtropical and tropical America, especially Mexico, elsewhere cultivated of naturalized; in Java rarely cultivated as an ornamental (Backer, 1943, 15) and once found as an escape near Bogor.

2. *Anoda hastata* Cav., *Diss.* 1 (1785) 38, t. 11 f. 2. — *Sida hastata* (Cav.) Sims, in *Curtis Bot. Mag.* 37 (1813) t. 1541. — *Sida acerifolia* Zucc., in Roemer, *Coll. Bot.* (1809) 148, *non Medic.* 1787. — *A. acerifolia* (Zucc., *non Medic.*) DC., *Prod.* 1 (1824) 459; Hochr., *Ann. Cons. Jard. Bot. Genève* 20 (1916) 50.

*Distribution*: Tropical America, locally naturalized in the Old World.

*Note*: Hochreutiner (1916, 51) mentioned *Zollinger 3081* (found by me in G, P) under the species with the locality 'prob. cult.: Java'. Presumably the Zollinger number was collected in the Botanic Gardens at Bogor.

## 12. MALVA

Linné, *Sp. Pl.* (1753) 687; *Gen. Pl. ed.* 5 (1754) 308.

*Lectotype*: *M. sylvestris* L. (cf. Hitchcock & Green, *Int. Rules Bot. Nomencl. ed.* 3, 1935, 141).

Annual, biennial or perennial herbs or undershrubs. *Leaves* undivided or palmilobed to -parted, palminerved, without extrafloral nectaries. *Flowers* axillary, solitary or in axillary clusters, rarely in racemes, small or medium-sized. *Epicalyx segments* 3, free, small. *Calyx* cupular to rotate. *Corolla* rotate to slightly infundibular, mostly red, pink, violet, purple or white, rarely blue. *Staminal column* shorter than the petals. *Carpels* and styles 9—15; carpels uni-ovulate; styles free, acute; stigmas decurrent on the adaxial side of the styles. *Schizocarp* discoid with a depressed centre. *Mericarps* usually reniform, flattened, awnless, usually dorsally and laterally prominently veined, sometimes muricate, indehiscent.

*Distribution*: About 30 species, as generally accepted all native in the temperate and subtropical parts of the Old World; many species naturalized in the New World, a few occasionally introduced as aliens in the tropical mountains, some cultivated as ornamentals in gardens.

*Note*: The species occurring in Malesia belong to sect. *Malva* (= sect. *Fasciculatae* DC.).

### KEY TO THE SPECIES

1. Epicalyx segments linear, 3—4 mm long. Corolla small, petals 6—7 mm long, little longer than the calyx. Schizocarp c. 5 mm  $\emptyset$  . . . . . 1. *M. parviflora*  
 1. Epicalyx segments oblong to ovate, 4—7 mm long. Corolla medium-sized; petals 20—25 mm long, 2—4 times as long as the calyx. Schizocarp c. 8 mm  $\emptyset$  . . . . . 2. *M. sylvestris*

1. *Malva parviflora* Linné, in Höjer, *Demonstr. Pl. Hort. Ups.* (1753) 18; *Amoen. Acad.* 3 (1756) 416; *Sp. Pl. ed.* 2 (1763) 969; DC., *Prod.* 1 (1824) 433; Mast., in *Fl. Br. Ind.* 1 (1875) 321; Baker *f.*, *J. Bot.* 28 (1890) 341; Bailey, *Queensl. Fl.* 1 (1899) 109; Backer, *Bekn. Fl. Java* (em. ed.) 4C (1943) fam. 109, p. 10; Backer & Bakh. *f.*, *Fl. Java* 1 (1963) 425. — *M. sylvestris* (non L.) Koord.-Schum., *Syst. Verz.* 1, fam. 175 (1911) 1; Koord., *Exk. Fl. Java* 2 (1912) 581.

Var. *microcarpa* (Pers.) Loscos, *Trat. Pl. Aragon* 2 (1877) 203. — *M. microcarpa* Pers., *Syn.* 2 (1807) 251; Desf., *Tabl. Ec. Paris* ed. 1 (1804) 144, *nom. nud.*

Type: *Herb. Persoon s.n.* (holotype: L 908.137-24).

Annual, prostrate or ascending herb, branched at base,  $\frac{1}{4}$ — $\frac{3}{4}$  m long. Stems with scattered, patent, simple and stellate hairs, glabrescent. *Leaves* orbicular to reniform, at base broadly cordate,  $1\frac{1}{2}$ —8 cm  $\varnothing$ , often 3—7-lobed, with rounded to obtuse lobes, crenate to serrate, at base 5—7-nerved, on both surfaces with scattered stellate hairs; petiole 1—27 cm, on the upper side with a line of simple and stellate hairs. *Stipules* lanceolate to triangular, acuminate, 2—4 mm long. *Flowers* 2—6 in axillary clusters. Pedicel very short, 3—6 mm, accrescent to c. 20 mm, densely stellate-hairy. *Epicalyx segments* caducous, narrowly linear, 3—4 mm, ciliate by simple hairs. *Calyx* cupular, 5-lobed,  $\pm$  inflated, c. 5 mm  $\varnothing$ , after flowering rotate, enlarged up to c. 8 mm  $\varnothing$ ; segments broadly ovate, acute, c.  $1\frac{1}{2}$  mm  $\varnothing$ , accrescent to c. 3 mm  $\varnothing$ ; calyx outside with scattered, minute stellate hairs and ciliate by simple hairs, glabrescent, inside glabrous. *Petals* obovate, 6—7 mm long, glabrous, white with pink tips. *Staminal column* c. 3 mm long, glabrous. *Schizocarp* discoid, c. 2 mm high, 5 mm  $\varnothing$ , at apex indented. Mericarps c. 10, reniform from aside, trigonous with sharp angles, c. 2 mm  $\varnothing$  all directions, dorsally prominently, reticulately veined, laterally prominently, radially veined, glabrous, indehiscent. *Seeds*  $1\frac{1}{2}$  mm  $\varnothing$ , glabrous, brown-black.

*Distribution*: Native in the Mediterranean area, now reported from the subtropics generally, in Malesia collected only in East Java (Ngadisari, on Mt Tengger), at c. 1900 m.

*Notes*: I have not ventured to deal with the typification of this polymorphous species, which is hard to delimit against allied species. I have compared the Javanese material with extensive European material and with descriptions in Floras.

Var. *microcarpa* (Pers.) Loscos can apparently be distinguished from the type variety by smaller mericarps and by calyces which become less enlarged during fruiting.

**2. *Malva sylvestris* Linné, Sp. Pl. (1753) 689; DC., Prod. 1 (1824) 432; Baker f., J. Bot. 28 (1890) 339; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 10; Backer & Bakh. f., Fl. Java 1 (1963) 425.**

*Distribution*: Temperate and subtropical Eurasia, introduced elsewhere; often cultivated as an ornamental, in Malesia occasionally as such in the mountains, near Lembang.

#### EXCLUDED SPECIES

*Malva moschata* Blanco, *Fl. Filip.* (1837) 551, *non* Linné, 1753; ed. 2 (1845) 385; ed. 3, 2 (1879) 334. Blanco's plant is according to Merrill, *Sp. Blanc.* (1918) 194, conspecific with *Pelargonium radula* (Cav.) L'Hérit. (*Geraniaceae*).

#### 13. ALTHAEA

Linné, *Gen. Pl.* ed. 5 (1754) 307; Sp. Pl. (1753) 686; Adans. *Fam. Pl.* 2 (1763) 400. — *Alcea* Linné, *Gen. Pl.* ed. 5 (1754) 307; Sp. Pl. (1753) 687; Zohary, *Bull. Res. Council Israel* 11 (1963) 210—216.

Lectotype: *A. officinalis* L. (cf. Hitchcock & Green, *Int. Rules Bot. Nomencl.* ed. 3, 1935, 139).

*Distribution*: About 20 species in the temperate and subtropical regions of Europe and Asia; 2 of them locally naturalized in North America or escaped from cultivation. *A. rosea* (L.) Cav. is cultivated as an ornamental throughout the world.

1. *Althaea rosea* (L.) Cav., Diss. 2 (1786) 91, t. 28 f. 1; DC., Prod. 1 (1824) 437; Blanco, Fl. Filip. ed. 2 (1845) 386; ed. 3, 2 (1879) 345; Mast., in Fl. Br. Ind. 1 (1875) 319; Baker f., J. Bot. 28 (1890) 207; Merr., Publ. Gov. Lab. Philip. 27 (1905) 23; Sp. Blanc. (1918) 252; En. Philip. Fl. Pl. 3 (1923) 44; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 9; Backer & Bakh. f., Fl. Java 1 (1963) 425. — *Alcea rosea* Linné, Sp. Pl. (1753) 687; Zohary, Israel J. Bot. 12 (1963) 12. — *A. coromandeliana* Cav., Diss. 2 (1786) 93; DC., Prod. 1 (1824) 437. — *A. sinensis* Cav., Diss. 2 (1786) 92, t. 29 f. 3; DC., Prod. 1 (1824) 437; Blanco, Fl. Filip. (1837) 552.

*Distribution*: Native in Asia Minor, cultivated as an ornamental throughout the world, often running wild. In Malesia only cultivated, especially in Java and possibly in the Philippines (Luzon), mainly in the mountains.

*Notes*: Although I have studied type material, I have not attempted to typify this polymorphous species.

Merrill (1923, 44) apparently has not noticed the species in the Philippines; he mentioned Blanco as having known it in cultivation in Luzon.

#### 14. MALVASTRUM

A. Gray, Mem. Am. Acad. Sc. II, 4 (Pl. Fendl.) (1849) 22, *nom. cons.*; B. & H., Gen. Pl. 1 (1862) 201, *p.p.*; Baker f., J. Bot. 29 (1891) 164, *p.p.*; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1895) 41, *p.p.*; Kearney, Am. Midl. Nat. 46 (1951) 119, *p.p.*

Lectotype: *M. spicatum* (L.) A. Gray (see below).

Annuals or undershrubs. *Leaves* undivided, rarely shallowly lobed, penninerved, without extrafloral nectaries. *Flowers* axillary, solitary or in axillary clusters, or in terminal and axillary spikes, small, sessile or on a short, jointless pedicel. *Epicalyx segments* 3, small, slightly adnate to the calyx. *Calyx* widely campanulate. *Corolla* rotate, yellow. *Staminal column* shorter than the petals. Carpels and styles 10—15; carpels uni-ovulate; styles connate, towards the base; stigmas capitate. *Schizocarp* discoid. Mericarps flattened, reniform, whether or not awned, laterally radially veined, indehiscent, after falling leaving a short columella.

*Distribution*: Three species native in tropical and subtropical America, 2 of them naturalized as weeds in most tropical countries.

*Notes*: The genus is here adopted in a narrow sense; a wider concept might be desirable after a thorough revision of the allied genus *Sphaeralcea*.

Kearney (Leaf. West. Bot. 5, 1947, 23—24; op. cit. 7, 1955, 238—241) and myself (Taxon 9, 1960, 212—213) have pointed out that the selection of the first-mentioned species in A. Gray's list, viz. *M. coccineum* (Nutt.) A. Gray, as the lectotype, by Green (Int. Rules Bot. Nomencl. ed. 3, 1935, 145) would be most undesirable, as this species is now accommodated in *Sphaeralcea* St. Hil.; it would leave two widely distributed species without a generic name. Consequently Kearney and I (ll.cc.) proposed *M. coromandelianum* (L.) Garcke as a more suitable lectotype. As, however, a lectotype should be chosen among the authentic concept — and *M. coromandelianum* was not among Gray's species — I here definitely propose *M. spicatum* (L.) A. Gray as the lectotype of the genus. I advise this to be followed in the Code.

The name *Malvastrum* was used already by De Candolle (Prod. 1, 1824, 430) as a sectional name in *Malva*. Fortunately Gray did not base the genus *Malvastrum* on that section although his genus contained several species of it. *Malva* sect. *Malvastrum* DC. contains a heterogeneous lot, amongst others *Malva sylvestris* L., the lectotype of *Malva*.

## KEY TO THE SPECIES

1. Stems, petioles, pedicels, and nerves beneath finely striate with appressed, 4 (rarely less or more)-armed stellate hairs, of which 2 arms point upwards and 2 downwards. Flowers axillary and solitary, or in axillary clusters. No bract-like leaves . . . . . **1. *M. coromandelianum***
1. Stems, petioles, and nerves on the lower surface of the leaves more or less densely tomentose (slightly rough in sicco) by minute, appressed stellate hairs with 5—10 arms pointing in all directions. Flowers in dense spikes, subtended by bracts . . . . . **2. *M. americanum***

**1. *Malvastrum coromandelianum* (L.) Garcke**, Bonplandia 5 (1857) 295; K. Sch., in Fl. Bras. 12, 3 (1891) 268, t. 53; K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 437; Nachtr. (1905) 316; Merr., Philip. J. Sc. 1 (1906) Suppl. 91; op. cit. 3 (1908) Bot. 77, 419; Backer, Schoolfl. Java (1911) 113; Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 240; Merr., Philip. J. Sc. 7 (1912) Bot. 240; Fl. Manila (1912) 316; Int. Rumph. Herb. Amb. (1917) 357; Sp. Blanc. (1918) 252; En. Philip. Fl. Pl. 3 (1923) 33; Domin, Bibl. Bot. 22 (1928) 938; Backer, Onkruidfl. Jav. Suikerr. (1930) 438, atlas t. 413; Merr., J. Arn. Arb. 19 (1938) 354; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 11; Kearney, Leafl. West. Bot. 7 (1955) 240; Hochr., in Fl. Madag. fam. 129 (1955) 134, t. 32 f. 1—2; Hu, Fl. China, fam. 153 (1955) 11, t. 4; Meeuse, Fl. Zamb. 1 (1961) 503; Backer & Bakh. f., Fl. Java 1 (1963) 426. — *Malva coromandeliana* Linné, Sp. Pl. (1753) 687; Cav., Diss. 2 (1786) 80, t. 22 f. 2; Blanco, Fl. Filip. (1837) 551; Garcke, Jahr. Naturw. Ver. Halle 5 (1852) 151. — *Malva tricuspidata* R. Br., in Ait. f., Hort. Kew. ed. 2, 4 (1812) 210; DC., Prod. 1 (1824) 430. — *M. tricuspidatum* (R. Br.) A. Gray, Pl. Wright, 1 (1852) 16; Bot. Wilkes U. S. Expl. Exp. (1854) 148; Benth., Fl. Austr. 1 (1863) 187; Mast., in Fl. Br. Ind. 1 (1875) 321; Fern.-Vill., Novis. App. (1880) 22; Vidal, Phan. Cuming. Philip. (1885) 97; Rev. Pl. Vasc. Filip. (1886) 62; Baker f., J. Bot. 29 (1891) 170; Trimen, Handb. Fl. Ceyl. 1 (1893) 140; Bailey, Queensl. Fl. 1 (1899) 109; Baker f., in Andrews, Mon. Christmas I. (1900) 172; Ridley, J. Str. Br. R. Soc. 45 (1906) 174; Backer, Fl. Bat. 1 (1907) 93; Ann. Jard. Bot. Btzg Suppl. 3 (1910) 407; Koord., Exk. Fl. Java 2 (1912) 581; Ewart & Davies, Fl. North. Terr. (1917) 183; C. T. White, Proc. R. Soc. Queensl. 34 (1922) 44. — *M. carpinifolium* [non (L. f.) A. Gray] A. Gray, Mem. Am. Acad. Sc. II, 4 (1849) 22, *quoad specim.*; cf. A. Gray, Pl. Wright. 1 (1852) 16. — *Malva americana* (non L.) Cav., Diss. 2 (1786) 80, t. 22 f. 2; Thw., En. Pl. Zeyl. (1864) 441. — *Malveopsis americana* [non (L.) O.K.,] O.K., Rev. Gen. Pl. 1 (1891) 72, *pro specim.* — *Sida carpinoides* DC., Prod. 1 (1824) 461; Miq., Fl. Ind. Bat. 1, 2 (1858) 141; Suppl. (1860) 162; op. cit. (1861) 398. — *Sida mucronulata* DC., Prod. 1 (1824) 461; Miq., Fl. Ind. Bat. 1, 2 (1858) 141. — *Malva ruderalis* Blume, Bijdr. 2 (1825) 64, non Salisb. 1796; Span., Linnæa 15 (1841) 168; Miq., Pl. Jungh. (1854) 284. — *M. ruderale* (Bl.) Miq., Fl. Ind. Bat. 1, 2 (1858) 138. — *M. ruderale* Hance ex Walp., Ann. Bot. Syst. 3 (1852) 830. — *Malva luzonica* Blanco, Fl. Filip. ed. 2 (1845) 385; ed. 3, 2 (1879) 343, t. 251.

Types: *Malva coromandeliana* L.: Hortus Upsaliensis, *Herb. Linn. n. 870.3* (lectotype: LINN); *Sida mucronulata* DC.: Java, *s. coll. s.n.* (holotype: G-DC); *Sida carpinoides* DC.: *patr. ign., s. coll. s.n.* (holotype: G-DC); *Malva ruderalis* Blume: Java, Djakarta, ? *Blume s.n.* (lectotype: L 908.137-216; isotype: P); *Malva luzonica* Blanco: Luzon, Manila, *Merrill Sp. Blanc. 451* (iso-neotypes: BO, L, NY, P, US).

Annual, erect herb or undershrub, up to c. 1 m. *Leaves* ovate to oblong, rarely lanceolate or orbicular, at base acute, obtuse, rounded or truncate, at apex obtuse to acute, 2—6 by  $\frac{3}{4}$ —4 cm, coarsely serrate to dentate, at base 5-nerved, above with scattered, appressed, simple hairs, beneath with appressed simple, and in particular (on the nerves) 4-armed stellate hairs; petiole  $\frac{1}{2}$ —4 cm. *Stipules* linear to lanceolate, acuminate, serrate to entire,

3—7 mm. *Flowers* axillary and solitary, at a later stage often accompanied by a bud developing a short branch with small leaves and sometimes flowers, thus flowers finally often in axillary clusters of 2—4. *Pedicels* 2—5 mm, accrescent to c. 8 mm. *Epicalyx segments* linear to lanceolate, acute, shorter than the calyx, 5—7 by  $\frac{1}{2}$ — $\frac{3}{4}$  mm, with 4-armed stellate hairs. *Calyx* widely campanulate, 7—9 mm high, 10—15 mm  $\varnothing$ , slightly accrescent, 5-fid, segments deltoid to ovate, acuminate, 3—5 by  $\frac{1}{2}$ —5 mm; calyx outside covered with 4-armed stellate hairs, inside glabrous or nearly so. *Corolla* stellate, c. 1  $\frac{1}{2}$  cm  $\varnothing$ , yellow; petals obliquely obovate, at apex rounded or emarginate, at base ciliate. *Staminal column* 2—3 mm, conical, without tubular part, glabrous. *Mericarps* 10—14, c. 2 mm high, radially 2  $\frac{1}{2}$  mm, strongly curved, dorsally with sharp edges, at apex with an awn  $\frac{1}{2}$ —1  $\frac{1}{4}$  mm long, dorsally at the middle with 2 awns c.  $\frac{1}{2}$  mm long pointing outward, dorsally above the middle with erecto-patent simple hairs, below the middle with minute stellate hairs to glabrous, laterally with radial, prominent veins. *Seeds* 1 per mericarp, reniform, c. 1  $\frac{1}{2}$  mm  $\varnothing$ , glabrous.

*Distribution*: Pantropical. Throughout Malesia, not yet collected on the Sumatran mainland (though on the adjacent islands P. Weh and Banka), in Borneo, and West New Guinea; common in Java and adjacent islands, and in the Philippines; was frequently collected in the Lesser Sunda Islands, Celebes, the Moluccas, and East New Guinea.

*Ecology*: Heliophilous species in waste places, road-sides, fallow fields, coconut plantations, secondary vegetations, cattle-grounds, etc., with preference for at least a feeble dry season, from sea-level up to c. 1250 m.

The flowers open at about noon.

*Notes*: Linnaeus based *Malva coromandeliana* primarily on an entry in Hortus Cliffortianus, which is also mentioned in Hortus Upsaliensis. In the Herbarium Clifford I have found only one poor twig of the species, mounted together with a similar one of *M. americanum* (L.) Torr. on a sheet without any label. This sheet is therefore unsuitable to be designated as a lectotype. In the Linnean herbarium, however, there is a sheet with a good specimen (n. 870.3) bearing not only the name of the species in the handwriting of Linnaeus, but also the indications '2', referring to the species number in Species Plantarum, and 'HU' (Hortus Upsaliensis). This specimen, fitting the phrase name as well as the description in Hortus Upsaliensis very well, is here designated as the lectotype.

Linnaeus also cited a figure of Plukenet, which, however, was drawn after specimens, which according to Trimen (1893, 141) belong to *Sida acuta* Burm. f.

*Malva tricuspidata* R. Br. is a superfluous name for the species, based on the same protologue, since R. Brown mentioned *Malva coromandeliana* 'Willd.' as a synonym. I have not seen any specimen studied by R. Brown for the second edition of the Hortus Kewensis, but the phrase name does not admit any doubt as to the identity of his plant.

*M. carpiniifolium* A. Gray is merely a misidentification, because Gray (Pl. Wright. 1852, 16) recognized his own error and corrected it.

The description and figure of Cavanilles under the name of *Malva americana* L. undoubtedly represent a misinterpretation of Linnaeus's species, as was already recognized by De Candolle (1824, 430) and belong to the present species. I have not seen any authentic specimen from the localities mentioned by Cavanilles.

*M. ruderale* Hance ex Walp. was taken from a manuscript of Hance on Chinese plants. *Malva ruderalis* Blume is neither mentioned by Hance and Walpers; according to the latter Hance collected the species both in Hongkong and near Djakarta.

*Sigalurium album* Rumph. (Herb. Amb. 6, lib. 10, 45), which Hasskarl supposed to

belong to the present species, probably represents, judging from the description, a form of *Sida acuta* Burm. f.

*M. coromandelianum* (L.) Garcke shows an appreciable degree of variability, especially in the shape of its leaves, but as this varies even on single plants, this cannot serve for distinguishing infraspecific taxa.

The species has often been confused with *Sida acuta* Burm. f. but it can easily be distinguished by the peculiar, strigose indument of the stems and presence of an epicalyx.

**2. *Malvastrum americanum* (L.) Torr., Rep. U.S. Mex. Bound. Surv. 2 (1859) 38; Backer & Bakh. f., Fl. Java 1 (1963) 426. — *Malva americana* Linné, Sp. Pl. (1753) 687; DC., Prod. 1 (1824) 430. — *Sphaeralcea americana* (L.) Metz, Contr. Biol. Lab. Cath. Univ. Am. 16 (1934) 142. — *Malva spicata* Linné, Syst. Nat. ed. 10, 2 (May or June 1759) 389; Amoen. Acad. 5 (1760) 401; Sp. Pl. ed. 2 (1763) 964; Cav., Diss. 2 (1786) 80, t. 20 f. 4; DC., Prod. 1 (1824) 430. — *M. spicatum* (L.) A. Gray, Mem. Am. Acad. Sc. II, 4 (Pl. Fendl.) (1849) 22; Garcke, Bonplandia 5 (1857) 295; Benth., Fl. Austr. 1 (1863), 187; Mast., in Fl. Br. Ind. 1 (1875) 321; Fern.-Vill., Novis. App. (1880) 22; K. Sch., in Fl. Bras. 12, 3 (1891) 271, t. 52 f. 2; Baker f., J. Bot. 29 (1891) 170; Bailey, Queensl. Fl. 1 (1899) 109; Backer, Fl. Bat. 1 (1907) 94; Schoolf. Java (1911) 113; Koord., Exk. Fl. Java 2 (1912) 581; Ewart & Davies, Fl. North. Terr. (1917) 183; Merr., En. Philip Fl. Pl. 3 (1923) 33; Domin, Bibl. Bot. 22 (1928) 939; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 11. — *Malveopsis spicata* (L.) O.K., Rev. Gen. Pl. 1 (1891) 72. — ? *Malva waltherifolia* Link, En. Hort. Berol. 2 (1822) 209, e descr.; DC., Prod. 1 (1824) 431. — *Malva timoriensis* DC., Prod. 1 (1824) 430; Blume, Bijdr. 2 (1825) 64; Decne, Herb. Timor. (1835) 102; Span., Linnaea 15 (1841) 168; Miq., Fl. Ind. Bat. 1, 2 (1858) 137. — *Malva blumeana* Steud., Nomencl. ed. 2, 2 (1840) 94. — *Malva brachystachya* F. v. M., Linnaea 25 (1852) 378.**

Types: *Malva americana* L.: Hortus Leydensis, *A. van Royen s.n.* (lectotype: L 908.139-311); *Malva spicata* L.: Sloane, Cat. Pl. Jam. t. 138 f. 1 (holotype); *Malva timoriensis* DC.: Timor, ? Riedlé *s.n.* (holotype: G-DC; isotypes: K, L. 908.137-308); *Malva brachystachya* F. v. M.: Australia, Flinders Range, *F. Mueller s.n.* (syntype: BM, K, MEL).

Erect, annual herb or undershrub,  $\frac{1}{2}$ –2 m. Leaves ovate to oblong, at base acute to obtuse, or truncate to shallowly cordate, at apex acute, occasionally 3-lobed,  $2\frac{1}{2}$ –7 by 1–5 cm, serrate to crenate, at base 5–7-nerved, tomentose by stellate hairs (above 4–6-armed, beneath 7–10-armed); petiole  $\frac{1}{2}$ – $3\frac{1}{2}$  cm. Stipules filiform, 4–5 mm. Spikes terminal or axillary, condensed, from the axils of bracts or, occasionally partly of superior leaves, sessile, up to c. 6 cm long. Bracts ovate, 4–6 by  $1\frac{1}{2}$ – $2\frac{1}{4}$  mm, bifid to biparted, with acute to acuminate segments, outside densely covered by simple and minute stellate hairs, inside glabrous, finally caducous. Epicalyx segments linear to lanceolate, acuminate, 8–10 by  $1\frac{1}{2}$ – $2\frac{1}{2}$  mm, outside with simple and minute stellate hairs, inside glabrous. Calyx c. 5–7 mm  $\varnothing$  and 5–6 mm high, slightly accrescent, 5-fid to -parted; segments triangular, acuminate, c. 4 by 3 mm; calyx outside densely covered with long, appressed simple hairs with thickened base, inside with minute stellate hairs near the margin. Corolla 13–17 mm  $\varnothing$ , yellow; petals obliquely obovate, at apex emarginate, at base ciliate by stellate hairs. Staminal column 2–3 mm, base conical, apex tubular, stellate-hairy. Mericarps 10–15, strongly curved, c.  $1\frac{3}{4}$ –2 mm  $\varnothing$ , at apex obtuse, awnless, dorsally with sharp edges, dorsally above the middle with erecto-patent, simple hairs and minute stellate hairs, laterally with radial, prominent veins. Seed reniform, c.  $1\frac{1}{4}$  mm  $\varnothing$ , brown-grey, glabrous.

*Distribution*: In the semi-arid areas of the tropics and subtropics; in Malesia only

found in the Lesser Sunda Islands (Sumba, Komodo, and Timor). Backer took this species up in his Floras of Java, because of Blume's early record 'in cultis Bataviae'. At Leyden there is a specimen (L 908.137-260) from Djakarta annotated by Blume 'ex seminis in Horto'; obviously Blume raised it from seeds, which he obtained from elsewhere, possibly from Timor.

*Notes:* *Malva americana* L. has, since Cavanilles's misinterpretation (see p. xx), often been considered synonymous to *M. coromandelianum* (L.) Garcke. It appears, however, that Torrey was right in his conclusion regarding the proper identity of the name. Linnaeus based *Malva americana* L. on an entry of A. van Royen (Fl. Leyd. Prod. 1740, 357<sup>1</sup>). He also mentioned a plate of Breynius (Exot. Pl. Cent. 1678, 124, t. 57), already cited by Van Royen. The plate is clear and represents without doubt what was up till now usually known under the name of *M. spicatum* (L.) A. Gray. When describing *Malva spicata* L., Linnaeus evidently did not realize, that he already had dealt with the same species before. Presumably he had no specimen of *Malva americana* L. at hand when drawing the MS for the first edition of Species Plantarum; there is, at any rate, no specimen under that name in the Linnean herbarium. In the Rijksherbarium is preserved a good specimen of A. van Royen accompanied by a label in the handwriting of the latter, referring to his own entry in Florae Leydensis Prodomus, as well as to Linnaeus's *Malva americana* L. Although it cannot be proved that Van Royen studied this particular specimen before he wrote his book, it is here designated as the lectotype.

*Malva spicata* L. was based solely on a plate of Sloane, which is thus the holotype. In Elmgren's dissertation on Patrick Browne's plants from Jamaica, which appeared in November of the same year, a more detailed description, possibly made after the specimen n. 870.1 of the Linnean herbarium, occurs.

The type of *Malva waltherifolia* Link, which was said to come from Java, has been destroyed. According to the description it probably belonged to the present species.

*Malva blumeana* Steud. was a new name for *Malva timorensis* Blume. Steudel supposed that Blume's plant was different from that of De Candolle.

The variability among the Malesian specimens is small and does not give rise to special remarks. American specimens show a much greater variability, especially with respect to leaf-shape and density of indumentum.

#### 15. WISSADULA

Medicus, Malv. (1787) 24; B. & H., Gen. Pl. 1 (1862) 204; Baker f., J. Bot. 31 (1893) 69; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1895) 38; R. E. Fries, K. Svensk Vet. Ak. Handl. n.s. 43, 4 (1908) 1; Kearney, Am. Midl. Nat. 46 (1951) 114.

Holotype: *W. zeylanica* Medicus.

Annual or perennial herbs or undershrubs. *Leaves* undivided, palminerved, mostly entire, without extrafloral nectaries. *Flowers* usually in loose or condensed, terminal panicles, rarely partly axillary and solitary. Pedicels jointed. *Epicalyx* none. *Calyx* cupular. *Corolla* small, rotate, yellow, rarely white. *Staminal column* extremely short. Carpels and styles 5, each carpel with 3 ovules. *Schizocarp* globular to obconical. Mericarps not or only slightly flattened, usually with a transverse constriction, thus seemingly biloculari, upper part rarely atrophied (not in Malesia). *Seeds* 3, of which 2 in the upper part in collateral position, and 1 in the lower part, sometimes 2 or 1 as a result of abortion, about globular to reniform.

*Distribution:* About 40 species, native in tropical America, as is the closely allied genus

<sup>1</sup>) Linnaeus erroneously referred to 359 as the page number.

*Pseudabutilon* R. E. Fries. Of these *W. periplocifolia* (L.) Thw. *sens. str.* has obtained a nearly pantropical distribution as a weed; *W. contracta* (Link) R. E. Fries has been found locally in Asia and perhaps in Africa, possibly as an escape from cultivation; *W. am- plissima* (L.) R. E. Fries has become naturalized in tropical Africa.

Notes: I agree with Hochreutiner (Ann. Cons. Jard. Bot. Genève 20, 1917, 107—112) that by habit, inflorescence, and characters of the mericarps *Wissadula* Medicus is a natural group, which should be kept separate from the genus *Abutilon* Mill., although the two genera are closely related.

The only flaw in this clear cut distinction is *W. contracta* (Link) R. E. Fries, of which the constriction in the mericarps is faint or sometimes even wanting. However, the position of the seeds in its mericarps is just as in most *Wissadula* species and also both habit and inflorescence are that of *Wissadula*.

Of the genus *Abutilon* Mill., *A. persicum* (Burm. f.) Merr. comes very near to *Wissadula* by having a paniculate inflorescence and pentamerous schizocarps, but the mericarps do not show the slightest trace of a constriction and contain 4—6 seeds.

Interesting are the fruits occurring in the species belonging to sect. *Wissada* (Griseb.) K. Sch.; here the upper part of the mericarps atrophies during the development so that the ultimate stage is about that in the genus *Sida* L.

The species occurring in Malesia belong to sect. *Wissadula* (= sect. *Euwissadula* K. Sch.).

#### KEY TO THE SPECIES

1. Leaves ovate to long triangular or lanceolate, gradually acuminate to acute. Mericarps with a distinct transverse constriction . . . . . 1. *W. periplocifolia*
1. Leaves orbicular to widely ovate, mostly abruptly acuminate. Mericarps with a faint transverse constriction or without it . . . . . 2. *W. contracta*

**1. *Wissadula periplocifolia*** (L.) Presl ex Thw., En. Pl. Zeyl. (1858) 27; Garcke, Z. Naturw. Halle 63 (1890) 113, 122; K. Sch., in Fl. Bras. 12, 3 (1891) 441, t. 77; R. E. Fries, K. Svensk Vet. Ak. Handl. n.s. 43, 4 (1908) 32, t. 1 f. 3—4, t. 6 f. 6—9; Backer, Schoolfl. Java (1911) 116; Hochr., Ann. Cons. Jard. Bot. Genève 20 (1917) 109; Merr., Philip. J. Sc. 14 (1919) 245; Craib, Fl. Siam. En. 1 (1925) 151; Bartlett, Pap. Mich. Ac. Sc. 6 (1926) 31; Merr., Lingn. Sc. J. 9 (1930) 40; Backer, Onkruidfl. Jav. Suikerr. (1930) 437, atlas t. 412; Malm, in Fedde, Rep. 34 (1934) 298; Hend., J. Mal. Br. R. As. Soc. 17 (1939) 37; Ridley, Kew Bull. (1938) 221; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 8; Hend., Mal. Wild Flow. 1 (1949) 39, f. 29; Hu, Fl. China, fam. 153 (1955) 27, t. 6; Backer & Bakh. f., Fl. Java 1 (1963) 424. — *Sida periplocifolia* Linné, Sp. Pl. (1753) 684; Cav., Diss. 1 (1785) 26, t. 5 f. 2; DC., Prod. 1 (1824) 467; Blume, Bijdr. 2 (1825) 77; Roxb., Fl. Ind. ed. Carey 3 (1832) 172. — *Abutilon periplocifolium* (L.) Sweet, Hort. Brit. (1826) 53; G. Don, Gen. Syst. 1 (1831) 500; W. & A., Prod. (1834) 55. — *W. zeylanica* Medicus, Malv. (1787) 25; Mor., Syst. Verz. (1846) 28; Miq., Fl. Ind. Bat. 1, 2 (1858) 147; Baker f., J. Bot. 31 (1893) 70, *excl. var.*; Trimen, Handb. Fl. Ceyl. 1 (1893) 146; Backer, Fl. Bat. 1 (1907) 102; Gagn., in Fl. Gén. I.-C. 1 (1910) 410, f. 40; Koord., Exk. Fl. Java 2 (1912) 580; Ridley, Fl. Mal. Pen. 1 (1922) 255. — *Sida periplocifolia* var. *zeylanica* (Medicus) DC., Prod. 1 (1824) 467. — *Abutilon periplocifolium* var. *zeylanicum* (Medicus) G. Don, Gen. Syst. 1 (1831) 500; O.K., Rev. Gen. Pl. 1 (1891) 65. — *W. rostrata* var. *zeylanica* (Medicus) Mast., in Fl. Br. Ind. 1 (1875) 325. — *W. zeylanica* var. *truncata* Miq., Fl. Ind. Bat. 1, 2 (1858) 147. — *W. periplocifolia* var. *genuina* Hochr., Ann. Cons. Jard. Bot. Genève 6 (1902) 28, *p.p.* — *Abutilon hastatum* Ridley, Trans. Linn. Soc. Bot. II, 3 (1893) 279.



Types: *Sida periplocifolia* L.: Ceylon, Herb. Hermann Vol. III, fol. 11, *Linn. n.* 251 (lectotype: BM); *W. zeylanica* Medicus: Dillenius, Hort. Elth., t. 3 f. 3 (holotype); *W. zeylanica* var. *truncata* Miq.: Java, Bondowoso (Besuki), *Zollinger s.n.* (holotype: P); *Abutilon hastatum* Ridley: Malaya, Kuala Berar, *Ridley s.n.* (holotype: SINGJ).

Annual or perennial, stout undershrub,  $\frac{1}{2}$ –2 m. Stems, petioles, axes and pedicels relatively thin, velutinous to tomentose by minute and larger, ferrugineous stellate hairs, also with short simple hairs. *Leaves* long-triangular, ovate or lanceolate, at base shallowly cordate to truncate, at apex long-acuminate to acute, mucronate, 3–15 by  $\frac{1}{2}$ –7 cm, entire, at base 5–7-nerved, above sparsely stellate-hairy to glabrous, beneath velutinous to tomentose by ferrugineous stellate hairs; petiole  $\frac{1}{2}$ –6 $\frac{1}{2}$  cm. *Stipules* filiform, 2–5 mm. *Lower flowers* axillary, solitary, mostly accompanied by a bud finally sprouting into a side-branch; upper flowers by the smallness or abortion of the upper leaves in large, lax, terminal panicles 20–80 cm long, with thin axes. *Pedicel* 1–4 $\frac{1}{2}$  cm, thin, accrescent to c. 8 cm, near the apex with a joint. *Calyx* widely campanulate, 3–4 mm  $\varnothing$ , slightly accrescent, 5-fid; segments ovate to triangular, acute, c. 2 by 1 $\frac{1}{2}$  mm; calyx outside densely set with short, simple hairs, also with scattered stellate hairs, inside glabrous or nearly so. *Corolla* 9–13 mm  $\varnothing$ ; petals obovate, at apex rounded or emarginate, at base ciliate, pale yellow with dark yellow veins, rarely white. *Staminal column* very short, without tubular part, glabrous. *Styles* short, 2–3 mm, shortly connate, stigmas capitate. *Schizocarp* obconic, 7–10 mm  $\varnothing$ . *Mericarps* with a short mucro (c.  $\frac{1}{2}$  mm), dorsally rounded, with scattered, short, simple hairs. Upper two *seeds* finally falling out of the mericarp, tetrahedral to globular, c. 2 $\frac{1}{2}$  mm  $\varnothing$ , sparsely covered with stellate and short simple hairs; lower seed persistent within the mericarp, obconic to globoid, at apex truncate, densely set with fairly long simple hairs, especially on the hilum, c. 2 $\frac{1}{2}$  mm  $\varnothing$ .

*Distribution*: Pantropical weed, in Malesia collected in West to East Java, the Lesser Sunda Islands, S. Borneo (Banjermasin), SW. Celebes, and locally in NE. and W. Sumatra and the Malay Peninsula (Pahang). It has been known from Ceylon since the 17th century. Plukenet (*Alm. Bot.* 1696, 17) already mentioned two vernacular names for it in Ceylon, viz. 'nilavonanghu' and 'wissadulu' (hence the generic name). R. E. Fries (1908, 36) explained its early occurrence in Ceylon by assuming that it was used there as a fibre producer, for which purpose it is still used. It may have been brought to Ceylon intentionally, e.g. by Portuguese traders.

*Ecology*: A heliophilous plant from waste places, road-sides, teak-forests, secondary vegetations, fallow fields, etc., in the low lands up to an altitude of c. 600 m.

*Notes*: A lectotype for *Sida periplocifolia* L. was chosen by R. E. Fries (1908, 37), viz. the specimen in Hermann's herbarium, which is probably the only one which Linnaeus studied before he published the species in *Species Plantarum*. The phrase name in *Species Plantarum* is taken from *Flora Zeylanica*, so that it can be assumed that Linnaeus based his species primarily on the specimen of Hermann, though the species epithet was derived from the phrase name of Dillenius, which is also cited in the protologue, viz. 'Abutilon periplocae acutioris folio, fructu stellato' (Dillenius, Hort. Elth. 4, 1732, t. 3 f. 3, which is the type of *W. zeylanica* Medicus). The two sheets in the Linnean herbarium (*n.* 866.18, 19) with the name of *Sida periplocifolia* do not fit the protologue and belong to other species, as was already pointed out by R. E. Fries.

The publishing author of *W. periplocifolia* was not Presl, as cited by most writers, but Thwaites; Presl (*Reliq. Haenk.* 2, 1836, 117) recognized *Sida periplocifolia* L. to belong to *Wissadula*, but he added between brackets *W. zeylanica* Medicus, which was then the only available name for the species under the genus *Wissadula*.

R. E. Fries has described some varieties and forms, which do not differ much from the type; these are all restricted to America. The specimens from Malesia belong to the type variety which, at least according to R. E. Fries, does not occur in America; they show only a small degree of variability. *W. zeylanica* var. *truncata* Miq. has in my opinion no taxonomical importance; leaves with a cordate or with a truncate base can be found on a single specimen.

**2. *Wissadula contracta*** (Link) R. E. Fries, K. Svensk Vet. Ak. Handl. n.s. 43, 4 (1908) 60; Backer, Schoolfl. Java (1911) 116; Bull. Jard. Bot. Btzg II, 12 (1913) 33; Hochr., Ann. Cons. Jard. Bot. Genève 20 (1917) 108; Heyne, Nutt. Pl. (1927) 1025; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 8; Backer & Bakh. f., Fl. Java 1 (1963) 424. — *Sida contracta* Link, En. Hort. Berol. 2 (1822) 204; DC., Prod. 1 (1824) 473; G. Don, Gen. Syst. 1 (1831) 499. — *Abutilon contractum* (Link) Sweet, Hort. Brit. ed. 2 (1830) 64. — *Sida luciana* DC., Prod. 1 (1824) 468. — *Abutilon lucianum* (DC.) Sweet, Hort. Brit. ed. 1 (1826) 53; ed. 2 (1830) 64; G. Don, Gen. Syst. 1 (1831) 500. — *W. luciana* (DC.) Benth. ex Triana & Planchon, Ann. Sc. Nat. IV, 17, Bot. (1862) 188. — *W. periplocifolia* var. *luciana* (DC.) Hochr., Ann. Cons. Jard. Bot. Genève 6 (1902) 29. — *Sida leschenaultiana* DC., Prod. 1 (1824) 468. — *Abutilon leschenaultianum* (DC.) Sweet, Hort. Brit. ed. 1 (1826) 53; ed. 2 (1830) 64; G. Don, Gen. Syst. 1 (1831) 500; ? Hassk., Tijds. Nat. Gesch. Phys. 12 (1845) 104; Thw., En. Fl. Zeyl. (1864) 401; O.K., Rev. Gen. Pl. 1 (1891) 65. — *W. leschenaultiana* (DC.) Mast., in Fl. Br. Ind. 1 (1875) 325; Trimen, Handb. Fl. Ceyl. 1 (1893) 147. — *W. rostrata* (non Planchon) Baker f., J. Bot. 31 (1893) 69, *quoad* *synon.*, p.p. — *W. hernandioides* [non (L'Hérit.) Garcke] Garcke, Z. Naturw. Halle 63 (1890) 122, *quoad* *synon.*, p.p.

Types: *Sida contracta* Link: Madagascar (B †); *Sida luciana* DC.: St. Lucia, A. Anderson s.n. (holotype: G-DC); *Sida leschenaultiana* DC.: Botanic Garden Calcutta, *Leschenault s.n.* (holotype: G-DC; isotype: ? P).

Erect undershrub,  $\frac{1}{2}$ –3 m. Stems, petioles and pedicels cinereous-velutinous by minute stellate hairs, glabrescent. *Leaves* orbicular or broadly ovate to oblong, at base cordate, at apex mostly abruptly acuminate, 4–18 by 2–12 cm, entire, at base 7–9-nerved, above glabrous or nearly so, beneath velutinous by minute, white stellate hairs, also with scattered larger, ferruginous, stellate hairs especially on the nerves; petiole  $\frac{1}{2}$ –12 cm. *Stipules* linear to lanceolate, 6–9 mm. *Flowers* in terminal, rather condensed panicles 20–30 cm long; bracts only represented by their stipules. *Pedicel*  $\frac{1}{4}$ – $\frac{1}{2}$  cm, accrescent to c.  $1\frac{1}{2}$  cm, near the apex with a joint. *Calyx* widely campanulate, 3–4 mm  $\varnothing$ , slightly accrescent, 5-lobed to -parted; segments triangular, acute, 1– $1\frac{1}{2}$  by c. 2 mm; calyx outside tomentose by minute stellate hairs, inside glabrous. *Corolla* 8–10 mm  $\varnothing$ , white; petals obovate, emarginate, at base ciliate. *Staminal column* c.  $\frac{1}{2}$  cm, sparsely hairy. *Schizocarp* in outline more or less globular, 7–10 mm  $\varnothing$ . *Mericarps* ovoid, at apex acuminate, 7–8 mm long, dorsally minute stellate hairy, with two sharp awns, 1– $1\frac{1}{2}$  mm long. *Seeds* 3, globular to reniform, 2– $2\frac{1}{2}$  mm  $\varnothing$ , warty, stellate-hairy, glabrescent.

*Distribution*: Tropical America, elsewhere cultivated in botanical, and occasionally in private gardens, or naturalized, probably as an escape from cultivation; in Malesia only in West Java, occasionally cultivated as a fibre-producer and run wild, not thoroughly naturalized.

*Ecology*: In waste grounds near villages and houses.

*Notes*: The type description of *Sida contracta* Link is rather poor, and does not give any information with regard to the characters of the fruit. R. E. Fries, however, examined the type, and could identify it with *Sida luciana* DC. and *Sida leschenaultiana* DC.

(corresponding names under the genera *Wissadula* and *Abutilon*). The Malesian specimens fit the detailed description by Fries and specimens mentioned by him.

The type came from Madagascar. It is therefore remarkable that Hochreutiner did not mention *W. contracta* in the 'Flore de Madagascar' (1955), but only *W. amplissima* (L.) R. E. Fries on account of one specimen found in the island, viz. *s. loc. Chapelier s.n.* (P), the type of *W. chapelieri* (Baill.) Baker *f.*

R. E. Fries mentioned 2 specimens of *W. contracta* (Link) R. E. Fries from the adjacent island of Mauritius as well as one specimen from Réunion.

I have been able to examine the type specimens of *Sida luciana* DC. and *Sida leschenaultiana* DC. which Fries did not see. These belong indeed to the present species and do not differ essentially from each other as can already be concluded from the descriptions.

*W. contracta* can always be recognized by the mericarps having hardly developed constrictions or lacking these completely. The position of the seeds within the mericarps is the same as in *W. periplocifolia* (L.) Presl *ex* Thw. The degree of variation in Malesia is small.

#### 16. ABUTILON

Mill., Gard. Dict. ed. 4, 1 (1754); Adans., Fam. Pl. 2 (1763) 398; B. & H., Gen. Pl. 1 (1862) 204; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 37; Baker *f.*, J. Bot. 31 (1893) 71; Kearney, Am. Midl. Nat. 46 (1951) 116. — *Herissantia* Medicus, Phil. Bot. 1 (1789) 90, *nomen*. — *Bogenhardia* Rchb. *f.*, Nom. Gen. Pl. pt. 2 (1841) 48, 136 *sub* *Bastardia* sect. *Gayoides* Endl., *nom. val.*, pt. 1, p. 20; Kearney, Leaf. West. Bot. 7 (1955) 120. — *Pseudobastardia* Hassler, Bull. Soc. Bot. Genève II, 1 (1909) 211.

Lectotype: *A. theophrasti* Medicus.

Annual herbs, perennial undershrubs, or shrubs, rarely small trees (not in Malesia). *Leaves* divided or undivided, mostly cordate at base, palminerved, without extrafloral nectaries. *Flowers* axillary, solitary, by decrescence of upper leaves sometimes in loose panicles. Pedicels usually with a joint in the upper half. *Epicalyx* absent. *Calyx* usually campanulate. *Corolla* rotate, campanulate, or rarely tubiform (not in Malesia), orange, pink or white, (in Malesia) usually yellow. *Staminal column* usually much shorter than the petals. Carpels and style branches 5—40; cells of the ovary with 2—9 ovules, by abortion occasionally uni-ovulate. *Schizocarp* globular to cylindrical, campanulate, rarely discoid. Mericarps 5—40, dehiscent, follicular, mostly rather flat and reniform from aside, at apex rounded, acuminate, or sometimes biaristate, after separating often remaining pendulous on a basal carpophore, being the partly disjointed costa, after falling leaving a truncate, slender columella. *Seeds* 2—9 per cell, reniform, lying fairly loosely within the mericarp, finally falling out of it.

*Distribution*: About 150 species in the tropics and the subtropics. In all continents native species are encountered; a few, largely presumably Asiatic species have gained a pantropical weed distribution in post-Columbian time by human agency, e.g. *A. indicum* (L.) Sweet *sensu stricto*, *A. hirtum* (Lamk) Sweet, *A. theophrasti* Medicus and *A. crispum* (L.) Medicus.

The fact that many species are restricted to the Old World does not sustain the opinion sometimes expressed that the genus originated in America, unless this would be a secondary centre of speciation. Of the species occurring in Malesia, with a circumtropical distribution, the group to which *A. indicum* (L.) Sweet, *A. hirtum* (Lamk) Sweet and *A. theophrasti* Medicus belong, are presumably of Old World origin. This may be deduced from the experience that *A. pannosum* (Forst. *f.*) Schlecht., also a species of this group,

as well as *A. indicum* (L.) Sweet ssp. *guineense* (Schumach.) Borss. and ssp. *albescens* (Miq.) Borss. have not yet been encountered in America. *A. theophrasti* Medicus is generally reported as to be of Mediterranean origin. *A. crispum* (L.) Medicus, now almost pan-tropical, is on the other hand doubtless of American origin, since the closely related species *A. imberbe* (DC.) G. Don is restricted to America. Of the remaining Malesian species *A. auritum* (Wall. ex Link) Sweet is in origin restricted to Malesia, North Australia, and Melanesia, and has been found only occasionally in America. *A. persicum* (Burm. f.) Merr. has never been found outside tropical Asia. *A. striatum* Dicks. ex Lindl. has been introduced in Malesia from America as an ornamental. *A. listeri* Baker f. has only been found on Christmas I. (South of Java).

*Ecology:* The Malesian wild species are all heliophilous herbs or undershrubs, always occurring in open places in the lowlands. All appear to prefer drier habitats. The flowers usually open in the afternoon or evening.

*Notes:* For the delimitation of *Abutilon* against the related genus *Wissadula* I refer to the notes under that genus. Unlike many writers I do not consider *A. crispum* (L.) Medicus to deviate enough to accommodate it in a separate genus.

The Malesian species all belong to sect. *Abutilon* (= sect. *Cephalabutilon* K. Sch.). Within that section there is a striking diversity with respect to the geographical origin of the species (see above). I have not been able to find a satisfactory subdivision for the Malesian species; this would entail a thorough study of the section as a whole. Presumably Old World species *A. indicum* (L.) Sweet, *A. hirtum* (Lamk.) Sweet, *A. pannosum* (Forst. f.) Schlecht., and *A. theophrasti* Medicus form a separate group, the description of which could run as follows: Herbs or undershrubs with a velutinous or tomentose indumentum; corolla rotate; yellow; mericarps 8—30, rather flat, at maturity separating completely, but often remaining pendulous by carpophores being the partly disjointed costae.

The other section, sect. *Corynabutilon* K. Sch., is not represented in Malesia and is purely American.

#### KEY TO THE SPECIES

1. Slender herb with flaccid, ascendent stems. Petals 6—10 mm long, usually shorter than or as long as the calyx, pale yellow to white. Styles and mericarps 10—15; lateral walls of the mericarps membranous, silvery and more or less transparent . . . . . 1. *A. crispum*
1. Erect undershrubs. Petals usually longer than 10 mm, exceeding the calyx, mostly yellow, sometimes red or orange, rarely white. Lateral walls of the mericarps coriaceous or chartaceous, dull and opaque, usually black.
  2. Styles and mericarps 5—12.
    3. Styles and mericarps 5. Stipules linear to subulate. Flowers partly in panicles. Mericarps acute. . . . . 3. *A. persicum*
  3. Styles and mericarps 8—12.
    4. Shrub with palmilobed to palmiparted leaves. Petals  $2\frac{1}{2}$ — $4\frac{1}{2}$  cm long, erect, mostly red to orange. . . . . 2. *A. striatum*
    4. Undershrubs; leaves undivided or rarely tricuspidate. Petals less than 2 cm long, spreading, yellow.
      5. Stipules broadly ovate to triangular, at base slightly auriculate. Flowers in loose, terminal racemes or panicles. Mericarps tardily separating, at apex shortly acuminate. 4. *A. auritum*
      5. Stipules linear to subulate. Flowers solitary, axillary or in axillary clusters.
        6. Stems densely covered with patent, long and simple hairs, also with minute stellate hairs. Mericarps tardily separating, at apex shortly acuminate. 5. *A. grandifolium*
        6. Stems more or less densely covered with minute stellate hairs, occasionally with scattered, short simple hairs. Mericarps soon separating.
          7. Mericarps exceeding the calyx segments, at apex with an erecto-patent, stiff, sharp beak . . . . . 6. *A. theophrasti*
          7. Mericarps not exceeding the calyx segments, at apex shortly acuminate. 7. *A. listeri*

## 2. Styles and mericarps 15—25.

8. Undershrub up to c. 2½ m. Stems, petioles and pedicels densely covered with patent, long, shiny simple hairs, minute stellate hairs, and viscid by short gland-hairs. Corolla orange-yellow, usually with a purple centre. Styles and mericarps 20—25 . . . . . 8. *A. hirtum*
8. Undershrub, usually not higher than c. 1 m. Stems, petioles and pedicels densely covered with stellate hairs, without gland-hairs, rarely with some slender, simple hairs. Corolla yellow to pale orange, without purple centre. Styles and mericarps 15—22 . . . . . 9. *A. indicum*

**I. *Abutilon crispum* (L.) Medicus, Malv. (1787) 29; Sweet, Hort. Brit. ed. 1 (1826) 53; G. Don, Gen. Syst. 1 (1831) 502; W. & A., Prod. (1834) 56; Wight, Ic. 1 (1838) t. 68; Benth., Fl. Austr. 1 (1863) 206; Thw., En. Pl. Zeyl. (1864) 401; Mast., in Fl. Br. Ind. 1 (1875) 327; K. Sch., in Fl. Bias. 12, 3 (1891) 382, t. 70, excl. syn. *Sida sessiliflora* Hook. et *Bastardia nemoralis* St. Hil.; Baker f., J. Bot. 31 (1893) 213, excl. syn. *A. albescens* Miq.; Trimen, Handb. Fl. Ceyl. 1 (1893) 146; Backer, Fl. Bat. 1 (1907) 104; Schoolfl. Java (1911) 117; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 1; Koord., Exk. Fl. Java 2 (1912) 580; Ewart & Davies, Fl. North. Terr. (1917) 182; Heyne, Nutt. Pl. (1927) 1024; Backer, Onkruidfl. Jav. Suikerr. (1930) 43, atlas t. 409; Doct. van Leeuwen, Blumea 2 (1937) 269; Merr. & Chun, Sunyatsenia 2 (1935) 280; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 5; Gagn., in Fl. Gén. I.-C. Suppl. 1 (1945) 365; Backer & Bakh. f., Fl. Java 1 (1963) 423. — *Sida crispa* Linné, Sp. Pl. (1753) 685; Cav., Diss. 1 (1785) 30, t. 7 f. 1; op. cit. 5 (1788) 275, t. 135 f. 2; DC., Prod. 1 (1824) 469; Roxb., Fl. Ind. ed. Carey 3 (1832) 177. — *Herissantia crispa* (L.) Medicus, Phil. Bot. 1 (1789) 90. — *Pseudobastardia crispa* (L.) Hassler, Bull. Soc. Bot. Genève II, 1 (1909) 211; Hu, Fl. China, fam. 153 (1955) 27, t. 7. — *Bogenhardia crispa* (L.) Kearney, Leaf. West. Bot. 7 (1954) 120. — *Sida cistiflora* Blume, Bijdr. 2 (1825) 77, non L'Hérit., 1789; Span., Linnaea 15 (1841) 171. — *A. cistiflorum* (Bl.) G. Don, Gen. Syst. 1 (1831) 503. — *Sida sonneratiana* (non Cav.) Spreng., Syst. 4, Suppl. (1828) 259. — *A. neurocarpum* Miq., Pl. Jungh. (1854) 285; Fl. Ind. Bat. 1, 2 (1858) 144; Baker f., J. Bot. 31 (1893) 269; Backer, Schoolfl. Java (1911) 116.**

Types: *Sida crispa* L.: Dillenius, Hort. Elth. t. 5 f. 5 (lectotype); *Sida cistiflora* Blume: Botanic Garden, Bogor, *Blume s.n.* (isotypes: L 908.133-1099, P); *A. neurocarpum* Miq.: Java, Mt Gamping, *Junghuhn s.n.* (isotypes: L 908.135-128, U 31041B).

Ascendent or decumbent, slender herb, 1—1½ m, usually with more or less dorsiventral, flaccid branches. Stems, petioles and pedicels ± densely set with minute stellate and patent, simple hairs, occasionally tomentose. *Leaves* ovate, at base cordate, at apex acuminate, 4½—10 by 3—7½ cm, crenate to serrate, 7—9-nerved, on both surfaces more or less densely stellate-hairy, often tomentose, especially beneath, on the nerves also with simple hairs; petiole ½—7 cm. *Stipules* different in poise, one erect, the other reflexed, both filiform, 3—8 mm. *Flowers* axillary, solitary, mostly accompanied by an accessory bud usually producing a side-branch with small leaves and flowers. Pedicel longer than the petiole, 1½—2½ cm, accrescent to c. 4 cm at ¼—½ from the apex with a joint, geniculate. *Calyx* stellate to widely campanulate, 7—8 mm ø, 5-parted, slightly accrescent, segments ovate to long triangular, 4—5 by 2—2½ mm, acute to acuminate, after flowering reflexed; calyx 5-nerved, on both sides densely set with minute stellate hairs, also with long, simple hairs. *Corolla* ± as long as the calyx or shorter, 10—12 mm ø, white to pale yellow; petals broadly obovate, 6—10 mm, glabrous but for the ciliate base. *Staminal column* 2—3 mm, with a very short, tubular part, glabrous. *Schizocarp* usually nodding, globular, indented at apex, c. 15 mm ø. Mericarps 10—15, somewhat inflated, elliptic, rounded at base and at apex, 12—15 mm long, 8—9 mm radially, dorsally with coarse simple hairs and minute stellate hairs; lateral walls membranaceous, silvery and ±

transparent. *Seeds* (1-)2(-3) per mericarp, reniform,  $1\frac{1}{2}$ —2 mm  $\varnothing$ , covered with curved, appressed, simple hairs.

*Distribution*: Native in America, now a pantropical weed, in Malesia found near Djakarta and Cheribon and further in East Java (also Madura and Kangean Is.), the Lesser Sunda Islands (Nusa Penida near SW. Bali; Lombok, Sumba, Timor, Kisar), in SW. Celebes (near Makassar and Bonerate I. of the Kaloatoa Is.).

*Ecology*: Heliophilous plant, restricted to periodically very dry regions, in waste places, along road-sides, in secondary growths in teak-forest, etc., from the lowland up to c. 700 m.

*Notes*: The only specimen in the Linnean herbarium (n. 866.30) is rather poor and consists of a stem with leaves and flowers in bud. The specimen was identified '*Sida crispa*', apparently not by Linnaeus, but, according to Savage's Catalogue, by Solander. Therefore I have preferred to choose as the lectotype the good plate of Dillenius, in Hort. Elth., which is cited by Linnaeus.

I see no good reason which would justify to accommodate *A. crispum* in a separate genus. According to observations by Hassler (1909, 208) in living specimens in South America, the carpels would not separate from one another, so that the fruit would be a capsule instead of a schizocarp. In Malesia the fruit of living specimens always splits up into mericarps at maturity. It is obvious that Hassler went too far in stating that the figure of the mericarp on the plate by Schumann (in Fl. Bras.) 'n'est que la reproduction d'une opération botanico-chirurgicale, effectuée sur une capsule de *Ps. crispa*. nob.'

*A. neurocarpum* was described by Miquel to have 5 carpels but I found 11 in his type material.

*Sida sessiliflora* Hook. (in Curtis, Bot. Mag. 55, 1828, t. 2857) was quoted as a synonym to *A. crispum* (L.) Medicus by Schumann (1891, 382), but judging from the plate it is probably a genuine *Sida* species.

The variability of the species within Malesia is small and restricted to the density of the indumentum.

**2. *Abutilon striatum* Dickson ex Lindl., Bot. Reg., Misc. Not. (1839) 39; Dickson, in Maund, The Botanist 3 (1839) t. 144; Hassk., Retzia (1858) 92; Baker f., J. Bot. 31 (1893) 335; Hochr., Bull. Inst. Bot. Btzg 22 (1905) 123, 124; Backer, Fl. Bat. 1 (1907) 108; N. E. Brown, Gard. Chron. III, 48 (1910) 428; Backer, Schoolfl. Java (1911) 118; Buysman, Flora 106 (1913) 96; J. J. Smith, Teysmannia 32 (1922) 265; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 6; Bailey, Cyclop. Hort. 1 (1935) 178; Kearney, Leaf. West. Bot. 7 (1955) 244, 251; Backer & Bakh. f., Fl. Java 1 (1963) 423. — *Sida striata* (Dickson ex Lindl.) Dietr., Synops. 4 (1847) 852. — *A. thompsonii* Hort.; André, Rev. Hort. 57 (1855) 324, c. tab. col.; N. E. Brown, Gard. Chron. III, 48 (1910) 428; Bailey, Cyclop. Hort. 1 (1935) 178. — *A. pseudostriatum* Hochr., Bull. Inst. Bot. Btzg 22 (1905) 124; Ann. Jard. Bot. Btzg Suppl. 3, 2 (1910) 818; Backer, Schoolfl. Java (1911) 118; J. J. Smith, Teysmannia 32 (1922) 265; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 6; Backer & Bakh. f., Fl. Java 1 (1963) 423. — *Abutilon* sp. Backer, Fl. Bat. 1 (1907) 109; Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 240.**

*Types*: *A. striatum* Dickson ex Lindl.: Maund, The Botanist 3, t. 144 (holotype); *A. pseudostriatum* Hochr.: Botanic Garden, Bogor, *Hochreutiner (Exsicc. Bog.)* 42 (isotypes: BO, K, L, NY, P).

Erect shrub, 1—2 m. Young twigs rather thin, as the petioles and pedicels  $\pm$  densely covered with stellate hairs, rarely glabrous. *Leaves* orbicular to broadly ovate in outline, at base cordate, 2—13 by 1—10 cm, at base 5—7-nerved, 3—5-lobed to -parted, rarely

undivided; segments triangular, ovate or oblong, acute or acuminate, coarsely crenate to serrate; central segment usually longest; leaves above with scattered simple and stellate hairs, beneath  $\pm$  densely stellate-hairy; petiole  $\frac{1}{2}$ —6 cm. *Stipules* linear, 3—8 mm. *Flowers* axillary, solitary, mostly nodding, often accompanied by a bud producing a sprout after flowering. Pedicel 3—11 cm, slightly accrescent, thin, with a joint near the apex, above the joint thicker and more densely hairy. *Calyx* campanulate, at base slightly inflated, 15—25 mm high, 5-fid to -parted; segments long triangular, acute or slightly acuminate, 5—10 by 5—8 mm; calyx with 5 faintly prominent costae, outside stellate-tomentose, inside on the segments stellate-tomentose and at base densely papillose. *Corolla* campanulate with the tips of the petals curved inwards; petals obliquely obovate, at apex rounded to truncate,  $2\frac{1}{2}$ —4 by 2—3 cm, outside with scattered simple hairs, inside glabrous, orange, ochraceous or pink, with carmine or purple veins, rarely yellow or white. *Staminal column* as long as or longer than the petals, consisting of a short, conical, basal part and a long, tubular, apical part, glabrous, pollen yellow. *Schizocarp* globular,  $1\frac{1}{2}$ —2 cm  $\varnothing$ . Mericarps 8—11, soon separating, reniform, at apex rounded, c. 15 mm long, radially c. 6 mm, dorsally stellate-hairy. *Seeds* (sec. lit.) 7—9 per mericarp.

*Distribution*: Native in Central America, cultivated as an ornamental throughout the world, frequently so in Malesia, locally run wild in the mountains of Priangan Res., West Java.

*Ecology*: Fruits are rarely found in Malesia. According to Van der Pijl (Ann. Jard. Bot. Btzg 48, 1937, 23) this disability might be attributed to a disharmony between the flowers and the Malesian flower-birds, but he made no experiments to prove this.

*Notes*: *A. striatum* Dickson ex Lindl. was validly published by Lindley in 1839, the name and description being taken from a MS on the species by Dickson, which was printed in Maund's 'The Botanist' in the same year, but after the publication of Lindley. I consider the plate accompanying the description of Dickson as the type, until an authentic specimen is traced.

The cultivated material in gardens shows an appreciable variation, especially with respect to the flower colour. A garden form with yellow-variegated leaves is known under the name *A. thompsonii* Hort.

*A. pseudostriatum* Hochr., which differs mainly by smaller, pale yellow or white flowers, and hardly or not lobed leaves, is another form cultivated in the Botanic Gardens of Bogor; its origin is unknown. Judging from the descriptions it might be the same as *A. pictum* (Gill. ex Hook. & Arn.) Walp. (from Brazil and Uruguay), which is mentioned by Baker f. (1893) in the synonymy of *A. striatum* Dickson ex Lindl.

3. *Abutilon persicum* (Burm. f.) Merr., Philip. J. Sc. 19 (1921) 364; Alston, Handb. Fl. Ceyl. 6 (1931) 28; Backer & Bakh. f., Fl. Java 1 (1963) 423. — *Sida persica* Burm. f., Fl. Ind. (1768) 148, t. 47 f. 1; Cav., Diss. 1 (1785) 35, t. 4 f. 1; DC., Prod. 1 (1824) 473. — *Sida timoriensis* DC., Prod. 1 (1824) 468. — *A. timoriense* (DC.) G. Don, Gen. Syst. 1 (1831) 500; Baker f., J. Bot. 31 (1893) 76. — *Sida sundaica* Blume, Bijdr. 2 (1825) 78. — *Sida sundensis* Spreng., Syst. 4, Suppl. (1828) 259. — *A. sundaicum* (Bl.) G. Don, Gen. Syst. 1 (1831) 500; Hassk., Nat. Tijds. Ned. Ind. 10 (1856) 130; Miq., Fl. Ind. Bat. 1, 2 (1858) 144; Hochr., Bull. Inst. Bot. Btzg 22 (1905) 125; Backer, Schoolfl. Java (1911) 117; Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 4. — *Sida polyandra* Roxb., [Hort. Beng. (1814) 50, nom. nud.; Wall., Cat. (1828) n. 1851] Fl. Ind. ed. Carey 3 (1832) 173. — *A. polyandrum* (Roxb.) W. & A. ex Wight, Cat. (1833) 12; Prod. (1834) 55, non G. Don, 1831; Miq., Pl. Jungh. (1854) 284; Fl. Ind. Bat. 1, 2 (1858) 144; Thw., En. Pl. Zeyl. (1858) 27; Mast., in Fl. Br. Ind. 1 (1875) 325; Baker f., J. Bot. 31 (1893) 270; Trimen,

Handb. Fl. Ceyl. 1 (1893) 144; Backer, Schoolfl. Java (1911) 117; Craib, Fl. Siam. En. 1 (1925) 153; Gagn., in Fl. Gén. I.-C. Suppl. 1 (1945) 366.

Types: *Sida persica* Burm. f.: Burman f., Fl. Ind. t. 47 (holotype); *Sida timoriensis* DC.: Timor, ? Riedlé s.n. (holotype: G-DC; isotype: P); *Sida sunandaica* Blume: Java, Mt Parang, Blume s.n. (isotypes: L 908.140-237, 244, 369, 139-1208, P); *Sida polyandra* Roxb.: Botanic Garden Calcutta, Roxburgh s.n. (lectotype: BR-Herb. Martius).

Stout, usually somewhat viscid undershrub, 1½—3 m. Stems, petioles and pedicels velutinous or tomentose by minute stellate hairs, also with scattered, patent, slender, simple hairs, and usually with gland-hairs. Inferior leaves orbicular, superior ones ovate to lanceolate; blade at base cordate, at apex gradually obtusely long-acuminate, 3—22 by ½—17 cm, coarsely crenate to serrate, 5—9-nerved; nerves with their transversal connections forming a cobweb-like pattern; leaves on either surface but particularly beneath tomentose by stellate hairs, also with scattered, simple hairs, especially on the nerves, glabrescent above; petiole ½—9 cm. Stipules linear to subulate, c. 2 mm. Flowers axillary, solitary, by decrescence of leaves partly in terminal racemes or panicles. Pedicel shorter than the petiole, 2½—3 cm, accrescent to c. 5 cm, ½—1 cm below the apex with a joint. Calyx stellate, 6—8 cm high and 13—14 mm Ø, slightly accrescent, 5-parted; segments ovate to lanceolate, acute or acuminate, 5—7 by c. 3 mm; calyx with 5 slightly prominent costae, outside stellate-tomentose, also with scattered simple hairs, inside velutinous by short simple hairs. Corolla 3—4 cm Ø, yellow; petals obovate, at apex rounded, outside short hairy on the covering margin. Staminal column c. 4 mm, a basal part conical, glabrous, tubular apical part short, stellate-hairy. Schizocarp in outline more or less campanulate, 12—15 mm high and 14—17 mm Ø. Mericarps 5, separating late, oblong, c. 13 mm high, radially 3 mm, with a firm erecto-patent mucro, almost completely dehiscent along the ventral suture and along the back almost halfway, dorsally densely covered by stellate hairs and simple hairs. Seeds 4—6 in each mericarp, reniform, c. 2½ mm Ø, black-brown, glabrous or white-punctate by minute stellate hairs.

*Distribution*: S. and E. Asia; in Malesia very rare: in some places in Java (Mts Parang, Tampomas, and Sumedang in Priangan; Margasari in Central Java; Mt Baluran in E. Java; only the last two in this century) and in Timor (one old collection).

*Ecology*: Obviously restricted to lowland and hill areas subject to a severe dry season; also in teak-forest (cf. p. 16).

*Notes*: Although Burman's description and the plate are not very clear, I believe Merrill correctly interpreted *Sida persica* Burm. f. I failed to find type material in Geneva and therefore consider the plate as the provisional type.

*A. polyandrum* G. Don (Gen. Syst. 1, 1831, 500) was based on *Sida polyantha* Schlecht. ex Link (En. Hort. Berol. 2, 1822, 204, not 264), which according to R. E. Fries (K. Vet. Ak. Handl. n.s. 43, 4, 1908, 48) is a synonym to *Wissadula amplissima* (L.) R. E. Fries.

*Sida sundensis* Spreng. is a superfluous name for *Sida sunandaica* Blume.

*A. roseum* Hand.-Mazz. [Symb. Sin. 7 (1933) 607, f. 21; Hu, Fl. China, fam. 153 (1955) 30, t. 17 f. 1; holotype: Yunnan, Handel-Mazzetti 8522 (W)] is closely allied to *A. persicum* (Burm. f.) Merr.; it differs in that the corolla is pink instead of yellow, that there are 7 carpels, and that the pedicels have no joints. Fruits are still unknown.

*A. persicum* is in Malesia only variable regarding the density of the indumentum. It can easily be confused with *A. auritum* (Wall. ex Link) Sweet, but differs readily by having 5 mericarps, by linear to lanceolate stipules, and by the cobweb-like venation.

**4. *Abutilon auritum*** (Wall. ex Link) Sweet, Hort. Brit. ed. 1 (1826) 53; G. Don, Gen. Syst. 1 (1831) 500; Miq., Fl. Ind. Bat. 1, 2 (1858) 147; Benth., Fl. Austr. 1 (1863)



203; Mast., in Fl. Br. Ind. 1 (1875) 328; F. v. M., Descr. Not. Pap. Pl. 4 (1876) 55; Rolfe, J. Bot. 23 (1885) 210; Vidal, Rev. Pl. Vasc. Filip. (1886) 63; K. Sch., in Fl. Bras. 12, 3 (1891) 377; Baker f., J. Bot. 31 (1893) 76; Bailey, Queensl. Fl. 1 (1899) 118; Baker f., in Andrews, Mon. Christmas I. (1900) 172; Ridley, J. Str. Br. R. As. Soc. 45 (1906) 174; Backer, Schoolfl. Java (1911) 117; Hall. f., Med. Rijksherb. 12 (1912) 13; Backer, Bull. Jard. Bot. Btzg II, 12 (1913) 6; C. T. White, Proc. R. Soc. Queensl. 34 (1922) 43; Merr., En. Philip. Fl. Pl. 3 (1923) 32; C. T. White, J. Arn. Arb. 10 (1929) 238; Guillaumin, Fl. Nouv.-Caléd. (1948) 209; Kearney, Leaf. West. Bot. 7 (1955) 247, 252. — *Sida aurita* Wall. ex Link, En. Hort. Berol. 2 (1822) 206; DC., Prod. 1 (1824) 468; Sims, in Curtis, Bot. Mag. 51 (1824) t. 2495; Schrank, Syll. Ratisb. 2 (1827) 73; Wall., Cat. (1828) n. 1860; Mor., Syst. Verz. (1846) 28; Dietr., Synops. 4 (1847) 851 ('*Sida auriculata*'). — *Sida atropurpurea* Blume, [Cat. (1823) 89, *nom. nud.*] Bijdr. 2 (1825) 77; Moris, Mem. Ac. Turin 36 (1833) 8. — *A. atropurpureum* (Bl.) G. Don, Gen. Syst. 1 (1831) 502; Hassk., Tijd. Nat. Gesch. Phys. 12 (1845) 103; ? Zoll., Nat. & Geneesk. Arch. 2 (1845) 593; Miq., Pl. Jungh. (1854) 286; Fl. Ind. Bat. 1, 2 (1858) 146; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 5; Meijer Drees, Comm. For. Res. Inst. 33 (1951) 75; Backer & Bakh. f., Fl. Java 1 (1963) 423. — *A. stipulare* Presl, Reliq. Haenk. 2 (1830) 14; Miq., Fl. Ind. Bat. 1, 2 (1858) 147; Fern.-Vill., Novis. App. (1880) 23. — *Sida stipularis* (Presl) Dietr., Synops. 4 (1847) 855. — *A. guichenotianum* Decne, Ann. Mus. Paris 3 (1834) 434; Herb. Timor. (1835) 106; Miq., Fl. Ind. Bat. 1, 2 (1858) 146. — *Sida guichenotiana* (Decne) Steud., Nomencl. ed. 2, 2 (1841) 577.

Types: *Sida aurita* Wall. ex Link: Botanical Garden, Calcutta, origin Java, *Wallich* 1860 (neotype: K-W); *Sida atropurpurea* Blume: Java, *Blume s.n.* (isotypes: L 903.257-274, P); *A. stipulare* Presl: Luzon, *Haenke s.n.* (holotype: PR, *n.v.*); *A. guichenotianum* Decne: Timor, *Guichenot s.n.* (holotype: P).

Erect, stout undershrub, 1–3 m. Stems, petioles, and pedicels velutinous or tomentose by minute stellate hairs, also with scattered simple hairs; pedicels above the joint densely covered with simple hairs. *Leaves* orbicular to broadly ovate, at base cordate, at apex acuminate, 2–20 by 1½–20 cm, evenly dentate, 5–9-nerved, above with scattered, appressed, short, simple hairs and minute stellate hairs, glabrescent, beneath velutinous or tomentose by minute stellate hairs and especially on the nerves with simple hairs; petiole 10–20 cm. *Stipules* large, orbicular or broadly ovate to triangular, at base cordate or auricled, at apex acuminate, with reflexed flanks, 10–15 by 8–10 mm, with minute stellate hairs. *Flowers* by decrescence of leaves (often only represented by their stipules) in loose, terminal racemes or panicles. Pedicels 1–2 cm, accrescent to c. 3½ cm, with a joint near the apex. *Calyx* campanulate, 5–7 mm high, ± accrescent, 5-parted; segments ovate, acute to acuminate, 3–5 by c. 3 mm; calyx outside velutinous or tomentose by minute stellate hairs and simple hairs, inside on the segments with appressed, simple hairs and scattered, minute stellate hairs. *Corolla* 20–25 mm ø; petals broadly ovate, shortly acuminate, outside on the covering margin with scattered, minute stellate hairs, yellow to light orange with purple veins. *Staminal column* c. 8 mm long, basal part conical, stellate-hairy, apical part tubular, glabrous. *Schizocarp* exceeding the calyx, more or less campanulate with flat or indented apex, 10–12 mm long and 12–17 mm ø. *Mericarps* 8–12, tardily separating, oblong, at apex and dorsally more or less alate, at apex shortly acuminate, on the outer wings densely covered with patent, simple hairs and stellate hairs, separating late. *Seeds* reniform, 2–2½ mm ø, brown-black, punctate by minute stellate hairs.

*Distribution*: Queensland and New Caledonia; in Malesia: Christmas I. (S. of Java), East Java, Madura, Lesser Sunda Islands (Lombok, Sumbawa, Flores, Timor), Celebes

(Buton I., Gorontalo), Philippines (Luzon) and East New Guinea. Specimens from Bali have not been encountered, though Zollinger (1845, 593) mentioned the species for that island. Elsewhere in the tropics rare, and probably only adventitious. Fig. 1.

*Ecology:* Heliophilous plant, obviously preferring seasonal conditions, in waste places, teak-forests, secondary growths, monsoon forests, road-sides, etc., from sea-level up to c. 900 m (cf. p. 14).

*Notes:* The holotype of the species name in Berlin has been destroyed. Since Link attributes his species to Wallich, it is likely that he had a specimen of *Wallich 1860* at hand. Therefore, it seems appropriate to designate as a neotype the Wallich specimen at Kew, which agrees with the original description. I have not seen a type specimen of *A. stipulare* Presl, but the description hardly leaves any doubt as to its identity.

*A. paniculatum* Hand.-Mazz. [Symb. Sin. 7 (1933) 606; Hu, Fl. China, fam. 153 (1955) 34, t. 17 f. 8; holotype: SE. Sikang, *Handel-Mazzetti 2756* (W); paratype: Yunnan, *Forrest 16833* (W)] differs by lanceolate stipules and by mericarps (only known from immature fruits) which are rounded at apex.

With respect to the density of the indumentum two forms can be recognized, viz. a velutinous, cinereous form which is the commonest one in Malesia, and a tomentose, *in sicco* usually ferruginous form.

**5. *Abutilon grandifolium*** (Willd.) Sweet, Hort. Brit. ed. 1 (1826) 53; Brenan, Kew Bull. (1954) 90. — *Sida grandifolia* Willd., En. Hort. Berol. 2 (1809) 724; Ker-Gawl., Bot. Reg. 5 (1819) t. 360. — *Sida mollis* Ortega, Dec. Matrit. (1800) 65, non Rich., 1792; Hook., in Curtis, Bot. Mag. 54 (1827) t. 2759. — *A. molle* (Ortega) Sweet, Hort. Brit. ed. 2 (1830) 65. — *A. tortuosum* Guillemin & Perrottet, Fl. Seneg. 1 (1831) 68; Backer, Schoolf. Java (1911) 118. — *A. kanaiense* Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 238. — *A. mollissimum* (Cav.) Sweet var. *sandwicense* Hochr., l.c. 239; Degener, Fl. Haw. fam. 221 (1938) c. tab. — *A. mollissimum* [non (Cav.) Sweet] Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 6; Backer & Bakh. f., Fl. Java 1 (1963) 423.

*Distribution:* Tropical America and Africa, elsewhere in the tropics cultivated as an ornamental or as a fibre-producer. According to Backer (1943) and Backer & Bakhuizen van den Brink f. (1963) the species is cultivated in Java in gardens, but I have seen only specimens collected in the Botanic Gardens at Bogor and Tjibodas, and further at Baguio in the mountain province of Luzon, also from cultivation.

*Notes:* With respect to the nomenclature and synonymy of the species Brenan (1954) has been followed. I have examined an authentic specimen of *Sida mollissima* Cav. at Madrid. This bears a label with the annotation 'Sida mollissima Mantissa No 67' in a handwriting resembling that of Cavanilles, and the number '67' refers to the species number in Cavanilles's Dissertations. The specimen, which is in accordance with the description, possesses a velutinous indumentum, but lacks the patent, simple hairs, which is a constant character of the present species; the general habitus is also different.

In addition authentic material of *Sida mollis* Ortega was found at Madrid, which undoubtedly falls under the present species.

The types of the names of Hochreutiner also belong here, as could be verified at Geneva.

**6. *Abutilon theophrasti*** Medicus, Malv. (1787) 28; Baker f., J. Bot. 31 (1893) 214; Kearney, Leaf. West. Bot. 7 (1955) 247, 252; Hu, Fl. China, fam. 153 (1955) 31, t. 8 f. 1—4. — *Sida abutilon* Linné, Sp. Pl. (1753) 685. — *A. abutilon* (L.) Huth, Helios 11 (1893) 132; Rusby, Mem. Torr. Bot. Club 5 (1894) 222. — *A. avicennae* Gaertn., Fruct.

2 (1791) 251, t. 135 f. 1; Rchb. f., Ic. Fl. Germ. Helv. 5 (1841) 17, t. 166 f. 4832; Benth., Fl. Austr. 1 (1863) 203. — *Sida avicennae* (Gaertn.) Dietr., Synops. 4 (1847) 854. — *A. behrianum* F. v. M., Trans. Phil. Inst. Vict. 1 (1855) 13.

Types: *Sida abutilon* L. and *A. theophrasti* Medic.: Hortus Cliffortianus (lectotype: BM-Herb.-Cliff.); *A. avicennae* Gaertn.: Gaertn. Fruct. 2, t. 135 f. 1 (holotype); *A. behrianum* F. v. M.: Murray R., Australia, *F. Mueller s.n.* (syntype: K).

Stout, annual undershrub, up to c. 1 m. Stems, petioles, and pedicels velutinous by minute stellate hairs, occasionally also with scattered, slender, simple hairs. *Leaves* large, orbicular, at base deeply cordate, often with overlapping lobes, at apex abruptly, long, narrowly acuminate,  $1\frac{1}{2}$ –18 cm  $\varnothing$ , often slightly 3-lobed, irregularly crenate to dentate or almost entire, 7–11-nerved, above velutinous by minute stellate hairs, glabrescent, beneath velutinous to tomentose by minute and larger stellate hairs, on the nerves also with slender, simple hairs; petiole  $\frac{1}{2}$ –30 cm. *Stipules* linear to filiform, acute, c. 8 mm. *Flowers* solitary, axillary, but later by the development of an accessory bud in short, few-flowered racemes. Pedicel much shorter than the petiole, 2–5 $\frac{1}{2}$  cm, accrescent to c. 7 cm, jointed at c.  $\frac{1}{2}$  cm below apex, usually geniculate. *Calyx* campanulate, c. 13 mm  $\varnothing$ , slightly accrescent, 5-fid; segments ovate, acuminate, c. 8 by 4 mm, after flowering spreading to reflexed; calyx obsolete nerved, outside velutinous to tomentose by minute stellate hairs, inside sparsely stellate-hairy. *Corolla* c. 2 cm  $\varnothing$ , yellow; petals widely obovate to orbicular, at apex rounded, glabrous. *Staminal column* short, 2–3 mm, without tubular part, glabrous. *Mericarps* 10–16, exceeding the calyx, long persistent, finally separating, reniform, c. 11 by 6 mm, at apex with 2 erecto-patent, stout, sharp, 1–5 mm long beaks, dorsally and on the beaks coarsely stellate hairy. *Seeds* 1–2 per mericarp, reniform, c. 3 mm  $\varnothing$ , with minute stellate hairs, especially at the hilum, black-brown.

*Distribution*: Subtropics of the world, probably native in the Mediterranean area, adventitious in temperate and subtropical countries. In Malesia rare: N. Sumatra (Taken-gon), Java (2 unlocalized French collections), Lesser Sunda Islands (Sumbawa), Celebes (SW. Peninsula: Tempe Lake).

*Ecology*: The Malesian localities are situated in areas subject to a distinct dry season, except N. Sumatra, which has only a feeble dry season. The latter is also the only place in the mountains, c. 1200 m.

*Notes*: Linnaeus gave as phrase name for *Sida abutilon* L. 'Sida foliis subrotundocordatis acuminatis crenatis'. He had used this already for it in Hortus Cliffortianus, without the adjective 'crenatis', that Van Royen added in his work to distinguish the species from the one named *Sida amplissima* L. [= *Wissadula amplissima* (L.) R. E. Fries] by Linnaeus in Species Plantarum. The specimen in Clifford's herbarium is designated here as the lectotype; it bears flowers and fruits.

*A. theophrasti* Medicus was based on Linnaeus's name.

Of *A. avicennae* Gaertn. there is at Leyden still a seed sample which presumably belonged to the holotype. The seeds may belong to *A. theophrasti* but cannot be distinguished macroscopically from those of many other *Malvaceae*, and thusfar the microscopical structure of the seedcoat is insufficiently known to be of use for precise identification. The figure of Gaertner with the fruit has for this reason been indicated as the type.

The species is fairly variable, but I have refrained from an infraspecific subdivision because so few sheets are available from Malesia.

**7. *Abutilon listeri* Baker f.**, J. Bot. 31 (1893) 269; in Andrews, Mon. Christmas I. (1900) 173; Ridley, J. Str. Br. R. As. Soc. 45 (1906) 175. — **Fig. 18.**

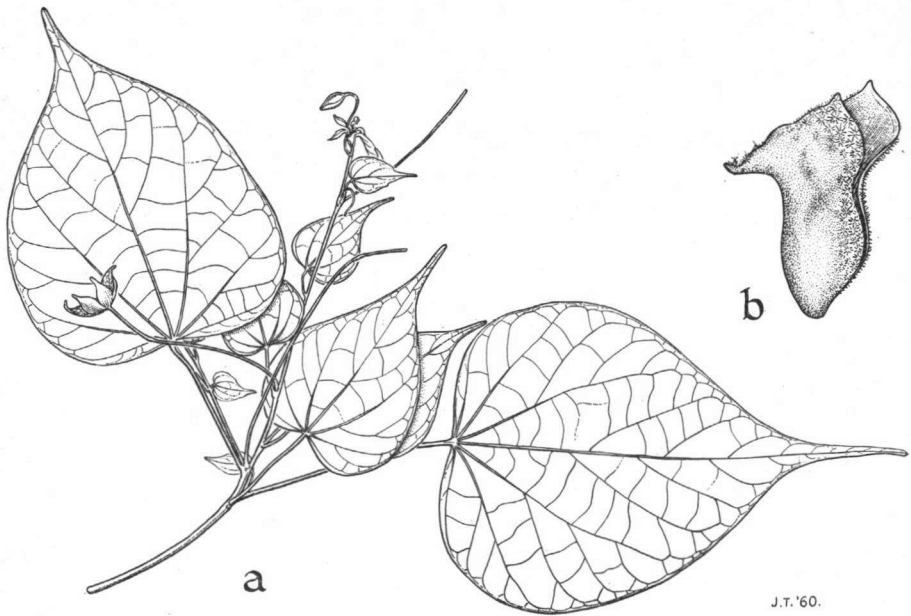


Fig. 18. *Abutilon listeri* Baker f. Habit,  $\times \frac{1}{2}$ , b. open mericarp,  $\times 5$  (Andrews 8, type).

Type: Christmas I., *Lister s.n.* (isotypes: K).

Undershrub. Stems, petioles and pedicels faintly cinereous by minute stellate hairs, also with scattered short simple hairs, glabrescent. *Leaves* orbicular to widely ovate, at base cordate, at apex long acuminate, 2—16 by  $1\frac{1}{2}$ —15 cm, entire or remotely crenate to serrate, at base 5—9-nerved, on both surfaces with scattered, minute stellate hairs, soon glabrescent; petiole  $1\frac{1}{2}$ —12 cm. *Stipules* setaceous, 2 mm. *Flowers* axillary, solitary. Pedicels longer than the petiole,  $2\frac{1}{2}$ — $4\frac{1}{2}$  cm, jointed at  $\frac{1}{4}$  from apex, accrescent to c. 8 cm. *Calyx* in bud acuminate, slightly 5-winged, in anthesis campanulate, finally stellately spreading,  $1\frac{1}{2}$ —2 cm  $\varnothing$ , slightly accrescent, 5-fid; segments ovate, acuminate, 6—7 by  $4\frac{1}{2}$  mm; calyx outside densely covered with minute, stellate hairs, also with scattered, simple hairs, inside sericeous by appressed simple hairs, also with scattered, coarse, stellate hairs. *Corolla* c. 4 mm  $\varnothing$ ; petals obovate, glabrous. *Staminal column* c. 5 mm long, glabrous; styles 10. *Schizocarp* proportionally small, not exceeding the calyx, oblate, c. 10 mm  $\varnothing$ . *Mericarps* c. 10, oblong, at apex shortly acuminate, c. 7 mm long, radially 3—4 mm, dorsally with minute and coarse stellate hairs. *Seeds* 2 per mericarp, flattened reniform, c.  $1\frac{1}{2}$  mm, glabrous, smooth, brown.

*Distribution*: Known only from Christmas I., Indian Ocean (South of Java).

*Note*: *A. listeri* Baker f. resembles *A. indicum* (L.) Sweet very much, but can be distinguished by the 10 small mericarps not exceeding the calyx.

**8. *Abutilon hirtum*** (Lamk) Sweet, Hort. Brit. ed. 1 (1826) 53; G. Don, Gen. Syst. 1 (1831) 503; W. & A., Prod. (1834) 56; Miq., Pl. Jungh. (1854) 284; Fl. Ind. Bat. 1, 2 (1885) 145; K. Sch., in Fl. Bras. 12, 3 (1891) 384; Hochr., Ann. Cons. Jard. Bot. Genève 6 (1902) 17; Backer, Fl. Bat. 1 (1907) 105; Merr., Philip. J. Sc. 5 (1910) Bot. 197; Backer, Schoolfl. Java (1911) 118; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911)

1; Koord., Exk. Fl. Java 2 (1912) 580; Merr., Int. Rumph. Herb. Amb. (1917) 355; En. Philip. Fl. Pl. 3 (1923) 32; Heyne, Nutt. Pl. (1927) 1024; Backer, Onkruidfl. Jav. Suikerr. (1930) 435, atlas t. 410; Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 7; Kearney, Leaf. West. Bot. 7 (1955) 248, 252; Meeuse, Fl. Zamb. 1 (1961) 487, t. 93 f. 1—2; Backer & Bakh. f., Fl. Java 1 (1963) 424. — *Sida hirta* Lamk, Encycl. 1 (1783) 7; Cav., Diss. 1 (1785) 33, t. 7 f. 5; op. cit. 5 (1788) 276, t. 129 f. 1; DC., Prod. 1 (1824) 470; Blume, Bijdr. 2 (1825) 78. — *A. graveolens* var. *hirtum* (Lamk) Mast., in Fl. Br. Ind. 1 (1875) 327; Baker f., J. Bot. 31 (1893) 213; Ridley, Kew Bull. (1938) 221. — *A. indicum* var. *hirtum* (Lamk) Griseb., Fl. Br. W. Ind. Is. (1859) 78. — *Sida pilosa* L'Hérit., Stirp. Nov. (1789) 130, ex descr., non Mill. 1768, nec Cav., 1785. — *Sida viscosa* Lour., Fl. Coch. (1790) 413, non L. 1759. — *Sida graveolens* Roxb. [Hort. Beng. (1814) 50, nom. nud.] ex Hornem., Hort. Hafn., Suppl. (1819) 77, DC., Prod. 1 (1824) 473; Wall., Cat. (1828) n. 1856, 1858G; Roxb., Fl. Ind. ed. Carey 3 (1832) 179. — *A. graveolens* (Roxb. ex Hornem.) W. & A. ex Wight, Cat. (1833) 13; W. & A., Prod. (1834) 56; in Hook., Comp. Bot. Mag. 1 (1835) 20, t. 2; Thw., En. Pl. Zeyl. (1858) 27; Benth., Fl. Austr. 1 (1863) 204; Mast., in Fl. Br. Ind. 1 (1875) 327; Baker, Fl. Maurit. (1877) 21; Fern.-Vill., Novis. App. (1880) 23; Baker f., J. Bot. 31 (1893) 213; Trimen, Handb. Fl. Ceyl. 1 (1893) 145; Bailey, Queensl. Fl. 1 (1899) 119; Gagn., in Fl. Gén. I.-C. 1 (1910) 408; Craib, Fl. Siam. En. 1 (1925) 152; Domin, Bibl. Bot. 22 (1928) 951. — ? *Sida asiatica* (non L.) Roxb., Fl. Ind. ed. Carey 3 (1832) 179. — *Sida populifolia* (non Lamk) Mor., Syst. Verz. (1846) 29, p.p. — *A. indicum* [non (L.) Sweet] Britten, in Forbes, Nat. Wand. App. 6 (1885) 500, p.p. — *A. hirsutum* Rumph., Herb. Amb. 4, p. 30, t. 10; Hassk., Tijd. Nat. Gesch. Phys. 12 (1845) 103. — *Sida abutilon* (non L., 1753) var.  $\beta$  sensu Linné, in Stickman, Herb. Amb. (1754) 15; Amoen. Acad. 4 (1759) 125.

Types: *Sida hirta* Lamk: India, *Sonnerat s.n.* (holotype: P-LA); *Sida graveolens* Roxb. ex Hornem.: India or., *Roxburgh s.n.* (holotype: C; ? isotypes: BR, K, K-W 1856D).

Stout, annual undershrub,  $\frac{1}{2}$ —2 $\frac{1}{2}$  m, usually somewhat viscid, with a disagreeable smell. Stems, petioles and pedicels densely set with minute stellate hairs, long patent simple hairs, and short gland-hairs. *Leaves* orbicular to broadly ovate, at base cordate, at apex acute or slightly acuminate, often somewhat 3-lobed, 1 $\frac{1}{2}$ —9 by 1—8 cm, coarsely or minutely crenate to dentate, or almost entire, at base 5—9-nerved, on both surfaces densely covered with minute stellate hairs especially beneath, and with simple hairs and gland-hairs especially on the nerves; petiole 1 $\frac{1}{2}$ —16 cm. *Stipules* linear to lanceolate, often falcate, acute, 5—10 mm. *Flowers* axillary, solitary, usually accompanied by a bud, after flowering producing a side-branch. Pedicel mostly shorter than the petiole, 1 $\frac{1}{2}$ —3 $\frac{1}{2}$  cm, accrescent to c. 4 $\frac{1}{2}$  cm, jointed at  $\frac{1}{8}$ — $\frac{1}{2}$  below the apex. *Calyx* campanulate, 7—9 mm high, 15—20 mm  $\emptyset$ , somewhat inflated, slightly accrescent, 5-fid to 5-parted; segments ovate, acuminate, 5—7 by 3—4 mm; calyx outside densely covered with minute stellate hairs, simple hairs, and gland-hairs, inside on the segments sericeous. *Corolla* 25—35 mm  $\emptyset$ , petals broadly obovate, at apex rounded, often emarginate, spreading, finally reflexed, at base ciliate, on the covering margin outside stellate pilose, orange-yellow, at base mostly with a dark purple patch. *Staminal column* 7—9 mm, yellow or dark purple, the basal part conical and stellate-hairy, the apical part tubular, glabrous. *Ovary* c. 3 mm  $\emptyset$ , stellate-hairy. Styles connate half-way up. *Schizocarp* globular, indented at apex, 17—19 mm  $\emptyset$ . Mericarps 20—25, faintly prominent in the mericarp, separating early, ovate, at apex usually shortly acuminate, or (not in Malesia) rounded or truncate, 10—12 mm high, radially 7—9 mm, dorsally stellate-tomentose. *Seeds* 3 per mericarp, reniform, c. 2 $\frac{1}{2}$  mm  $\emptyset$ , punctate by minute stellate hairs, at the hilum longer stellate-hairy.

*Distribution:* Semi-arid, tropical regions of the Old World, introduced in tropical America. In Malesia locally throughout the area, except for Sumatra, the Moluccas, and New Guinea, presumably introduced and adventitious.

*Ecology:* In Malesia in waste places, road-sides, etc., in the lowlands from the coast up to c. 110 m. In Java, the Lesser Sunda Islands (Bali, Timor) and in Celebes (Palu) the localities are distinctly confined to areas subject to a distinct dry season, but in N. Borneo, Sarawak, and Mindanao (Zamboanga) found as a weed under everwet conditions. According to Backer (1930, 436) the flowers open at three o'clock in the afternoon and fade after sunset.

*Notes:* *Sida hirta* Lamk was principally based on a specimen collected by Sonnerat in India and preserved in Lamarck's herbarium at Paris. The protologue also contains a reference to *A. hirsutum* of Rumphius, which, judging from Rumphius's plate and description, is correct (cf. Merrill, 1917, 355). The type material of *Sida graveolens* Roxb. ex Hornem. (at Copenhagen) differs from that of *Sida hirta* Lamk by rounded or truncate mericarps instead of shortly acuminate ones; a difference also to be noticed in the respective descriptions. Rounded or truncate mericarps never occur in Malesian specimens.

Judging from the description, *Sida pilosa* L'Hérit. is conspecific with the present species.

Merrill (Trans. Am. Phil. Soc. n.s. 24, 2, 1935, 259) referred *Sida viscosa* Lour. non L. to *Sida mysorensis* W. & A., but considering the description it can only be a synonym of *A. hirtum*.

*A. hirtum* (Lamk) Sweet is often confused with forms of *A. indicum* (L.) Sweet. From these it can be distinguished by a much stouter appearance, a larger corolla with usually a dark purple centre, and by the indumentum, consisting of minute stellate hairs, many long simple hairs, and also by being  $\pm$  viscid by many short gland-hairs. The mericarps are very flat, and dorsally less prominent than in *A. indicum* (L.) Sweet. The leaves are at apex acute or shortly acuminate as in *A. indicum* ssp. *guineense* (Schumach.) Borss., but lack the slight roughness of the indumentum on the upper surface occurring in the last named subspecies. The leaves of *A. hirtum* (Lamk) Sweet are often more or less 3-lobed.

It is occasionally confused with *A. pannosum* (Forst. f.) Schlecht. [syn. *A. muticum* (Delile ex DC.) Sweet], from the Near East, which differs by the greater number of carpels and mericarps, viz. c. 30, and a dense, tomentose indumentum.

**9. *Abutilon indicum* (L.) Sweet, Hort. Brit. ed. 1 (1826) 54; emend. Hochr., Ann. Cons. Jard. Bot. Genève 6 (1902) 19; Backer, Fl. Bat. 1 (1907) 107; Koord., Exk. Fl. Java 2 (1912) 580; Merr., En. Philip. Fl. Pl. 3 (1923) 32; Heyne, Nutt. Pl. (1927) 1025; Backer, Onkruidfl. Jav. Suikerr. (1930) 436; Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 7; Steen., Fl. Schol. Indon. (1949) 271; Backer & Bakh. f., Fl. Java 1 (1963) 424.**

*See for synonyms and types under the subspecies and varieties.*

Stout, erect, annual to perennial undershrub,  $\frac{1}{2}$ —2(—3) m. *Leaves* ovate or orbicular, at base cordate, 7—9-nerved. *Stipules* linear, acute,  $2\frac{1}{2}$ —5 mm. *Flowers* axillary, solitary. *Pedicels* usually longer than the petiole, near the apex with a joint, accrescent and geniculate. *Corolla*  $2\frac{1}{2}$ —3 cm  $\varnothing$  [rarely much larger, up to 5 cm; in *Brass* 27622, belonging to ssp. *albescens* var. *australiense* Hochr.], yellow to orange, never with a purple centre; petals broadly obovate, at apex rounded, truncate, or emarginate, at base ciliate. *Staminal column* c. 8 mm, the basal part conical and stellate-hairy, the short, apical part tubular and glabrous. *Schizocarp* globular, at apex flat or slightly indented,  $1\frac{1}{2}$ —2 cm  $\varnothing$ . *Mericarps* 15—22, flattened-reniform, with the upper part ventrally with an acute

mucro, laterally glabrous, smooth, blackish, dorsally and ventrally dehiscent, dorsally more or less densely hairy. *Seeds* 2 or 3 per mericarp, reniform, 2—3 mm  $\varnothing$ , punctate by minute warts, whether or not with minute stellate hairs.

*Distribution*: *A. indicum* ssp. *indicum* is widely distributed throughout the tropics and subtropics of both hemispheres. Some races are restricted to the Old World; ssp. *albescens* even occurs only in Malesia, rarely in North Australia and the Pacific Islands. From the distribution of these it may be concluded that *A. indicum* is possibly of Indo-Australian origin.

*Ecology*: Heliophilous plant, under both everwet and seasonal climatic conditions, found in waste places, along road-sides, on dikes between fish-ponds near the sea, along the beach, in coconut plantations, as a weed in native gardens, in teak- and monsoon-forest, and in secondary growths, always at low altitude, usually near the sea.

*Note*: I have followed the wider concept of the species, as applied by Hochreutiner (1902), Merrill, Backer, Koorders, Van Steenis and other authors. In my opinion, however, the differences between the main forms are too large to consider them mere varieties. In this connection, and also on account of the differences in their distribution, I have treated them as subspecies.

## KEY TO THE SUBSPECIES

1. Calyx much shorter than the schizocarp; segments 3—4 mm long and wide, finally spreading. Mericarps at apex shortly acuminate, with erecto-patent acumen. Leaves obtuse to acute, rarely acuminate, above stellate-velutinous or glabrous . . . . . **A. ssp. indicum**
1. Calyx about as long as the schizocarp; segments 5—10 by 5—6 mm, usually appressed. Mericarps at apex rounded, obtuse or long acute, with an erect acumen.
  2. Leaves long acuminate, above stellate-velutinous. Mericarps at apex mostly rounded or obtuse, sometimes long acute, dorsally stellate-tomentose . . . . . **B. ssp. albescens**
  2. Leaves obtuse to acute, rarely shortly acuminate, *in sicco* above somewhat rough by stellate hairs (coarser than in ssp. *indicum* and *albescens*), also slightly rugose. Mericarps long acute, dorsally woolly by long-branched stellate hairs . . . . . **C. ssp. guineense**

**A. ssp. indicum.** — *A. indicum* (L.) Sweet, Hort. Brit. (1826) 54; G. Don, Gen. Syst. 1 (1831) 504; W. & A., Prod. (1834) 56; Wight, Ic. 1 (1838) t. 12; A. Gray, Bot. Wilkes U. S. Expl. Exp. (1854) 167; Miq., Pl. Jungh. (1854) 285; Fl. Ind. Bat. 1, 2 (1858) 146; Suppl. (1860) 163; op. cit. (1861) 398; Thw., En. Pl. Zeyl. (1858) 27; Benth., Fl. Austr. 1 (1863) 202, *quoad descr., non quoad synon.*; Mast., in Fl. Br. Ind. 1 (1875) 326; Britten, in Forbes, Nat. Wand. App. 6 (1885) 500, *p.p.*; Vidal, Phan. Cuming. Philip. (1885) 97; King, J. As. Soc. Beng. n.s. 60, ii (1891) 42; K. Sch., in Fl. Bras. 12, 3 (1891) 385; ? Warb., Bot. Jahrb. 13 (1891) 373; Baker f., J. Bot. 31 (1893) 213; Trimen, Handb. Fl. Ceyl. 1 (1893) 145; Ridley, Trans. Linn. Soc. Bot. II, 3 (1893) 279; K. Sch., Notizbl. Berl.-Dahl. 2 (1898) 133; Bailey, Queensl. Fl. 1 (1899) 118, *quoad descr., non quoad synon.*; ? K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 436; Merr., Philip. J. Sc. 1 (1906) Suppl. 90; op. cit. 3 (1908) Bot. 77; Gagn., in Fl. Gén. I.-C. 1 (1910) 409, f. 40; Backer, Schoolfl. Java (1911) 118, *p.p.*; Merr., Int. Rumph. Herb. Amb. (1917) 355; Sp. Blanc. (1918) 251; En. Born. Pl. (1921) 374; Ridley, Fl. Mal. Pen. 1 (1922) 256; Merr., Lingn. Sc. J. 5 (1928) 124; Backer, Onkruidfl. Jav. Suikerr. (1930) 436, atlas t. 436; Hend., Mal. Wild. Flow. 1 (1949) 37, f. 26; Hochr., in Fl. Madag. fam. 129 (1955) 140, t. 34 f. 3, 4; Kearney, Leaf. West. Bot. 7 (1955) 249; Hu, Fl. China, fam. 153 (1955) 32, t. 8 f. 9, t. 17 f. 10; Biswas, J. As. Soc. Sc. 22 (1956) 62, *c. fig.* — *Sida indica* Linné, in Torner, Cent. Pl. 2 (1756) 26; Amoen. Acad. 4 (1759) 324; Sp. Pl. ed. 2 (1863) 964; Cav., Diss. 1 (1785) 33, t. 7 f. 10; Houttuyn, Nat. Hist. 2, 10 (1779) 44, t. 61 f. 2; DC.,

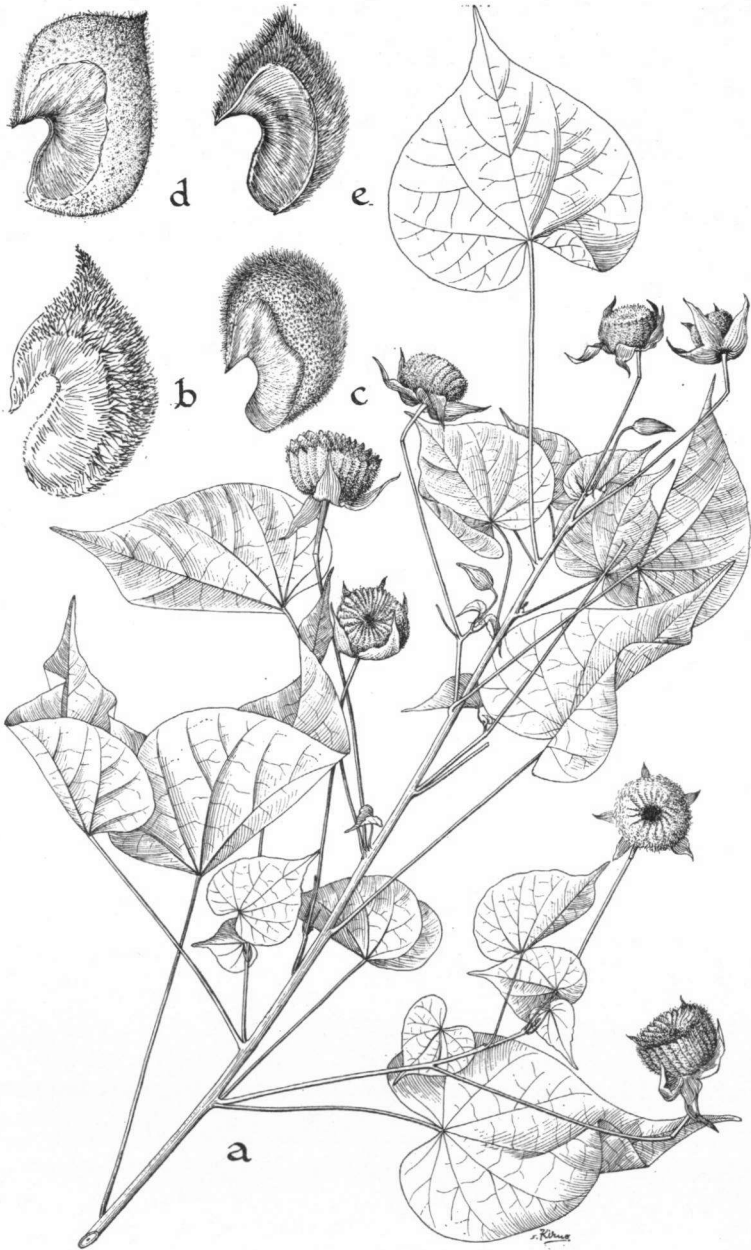


Fig. 19. *Abutilon indicum* (L.) Sweet ssp. *albescens* (Miq.) Bors. var. *australiense* Hochr. a. Habit,  $\times \frac{1}{2}$ , b. mericarp. — Ditto, var. *albescens*, c. mericarp. — *A. indicum* ssp. *indicum*, d. mericarp. — *A. indicum* ssp. *guineense* (Schumach.) Bors. e. mericarp. All mericarps  $\times 2\frac{1}{2}$  (a-b. Forbes 3330, c. Backer 28484, d. Hallier BO 56314, e. Docters van Leeuwen BO 56450).



Prod. 1 (1824) 471; Roxb., Fl. Ind. ed. Carey 3 (1832) 179; Blanco, Fl. Filip. (1837) 547; ed. 2 (1845) 383; ed. 3, 2 (1879) 339, t. 337; Mor., Syst. Verz. (1846) 28. — *Sida populifolia* Lamk, Encycl. 1 (1783) 7; Cav., Diss. 1 (1785) 32, t. 7 f. 9; op. cit. 5 (1788) t. 128 f. 2; Roxb., Fl. Ind. ed. Carey 3 (1832) 179. — *A. populifolium* (Lamk) Sweet, Hort. Brit. ed. 1 (1826) 53; G. Don, Gen. Syst. 1 (1831) 503. — *A. indicum* var. *populifolium* (Lamk) W. & A. ex Mast., in Fl. Br. Ind. 1 (1875) 326; Baker f., J. Bot. 31 (1893) 214; Hu, Fl. China, fam. 153 (1955) 33. — *A. asiaticum* [non (L.) Sweet] W. & A., Prod. (1834) 56, excl. syn. — *Sida philippinensis* Gandoger, Bull. Soc. Bot. Fr. 71 (1924) 631. — *A. timoriense* [non (DC.) G. Don] Decne, Herb. Timor. (1835) 106; Span., Linnaea 15 (1841) 171, p.p. — *A. indicum* var. *typicum* Backer, Fl. Bat. 1 (1907) 108. — *A. indicum* var. *microphyllum* Hochr., Ann. Cons. Jard. Bot. Genève 6 (1902) 20; Backer, Fl. Bat. 1 (1907) 108. — *Sida beloere* L'Hérit., Stirp. Nov. 1 (1789) 130. — *Beloeren* Rheede, Hort. Malab. 6, p. 77, t. 45. — *A. laeve* Rumph., Herb. Amb. 4, p. 31, t. 11. — *Sida abutilon* L. var. *a sensu* Linné, in Stickman, Herb. Amb. (1754) 15; Amoén. Acad. 4 (1759) 125. — **Fig. 19 d.**

Types: *Sida indica* L.: Hortus Upsaliensis, *Linn. Herb. n. 866.29* (lectotype: LINN); *Sida populifolia* Lamk: 'l'Inde', *Sonnerat s.n.* (holotype: P-LA); *A. indicum* var. *microphyllum* Hochr.: Java, Tjiringin, *Zollinger 1319* (lectotype: G; isotypes: BM, FI, P); *Sida beloere* L'Hérit.: Rheede, Hort. Malab. 6, t. 45 (holotype); *Sida philippinensis* Gandoger: *Cuming 748* (isotypes: A, BM, FI, G, K, L, MEL, P).

Stems, petioles, leaves and pedicels cinereously velutinous by minute stellate hairs, mostly also with scattered, larger stellate hairs, rarely with scattered, slender simple hairs. *Leaves* at apex obtuse or acute, rarely acuminate,  $1\frac{1}{2}$ —7 by 1—6½ cm, minutely to coarsely crenate to dentate or undulate. *Pedicels* c. 3½ cm, accrescent to 5 cm. *Calyx* widely campanulate, in fruit stellately spreading, 4—5 mm high, 8—10 mm ø, slightly accrescent, 5-fid to 5-parted; segments broadly ovate to triangular, at apex mucronate, 3—4 by 3—4 mm, outside and inside velutinous by minute stellate hairs, inside also with slender, simple hairs, indistinctly nerved. *Mericarps* much longer than the calyx, 12 by 7 mm, at apex shortly acuminate, the acumen erecto-patent, dorsally sparsely covered with stellate hairs. *Seeds* glabrous or sparsely and minutely stellate-hairy.

*Distribution*: Tropics and subtropics of both hemispheres, in Malesia common in the Philippines, locally in Sumatra, the Malay Peninsula, North Borneo, the Natuna Islands, Celebes, the Lesser Sunda Islands, the Moluccas, and New Britain, rare in Java (Djakarta, Bogor, Surabaya, Madura I.).

*Notes*: For the fairly detailed phrase and description of *Sida indica*, Linnaeus (or his pupil Torner) had doubtlessly a good specimen at hand. This could have been *n. 866.29* of the Linnean herbarium, which fits the original phrase and description very well; this I accept as the lectotype.

Within Malesia this subspecies is not very variable and does not call for the distinction of varieties. Var. *populifolium* (Lamk) W. & A. ex Mast. differs only by stems tinged purplish; var. *microphyllum* Hochr. is even of less value and appears to me a mere modification.

Ssp. *indicum* has often been confused with other forms, but can always be distinguished by the relatively small calyx being much shorter than the schizocarp.

**B. ssp. albescens** (Miq.) Borss., *stat. nov.* — *A. albescens* Miq., Pl. Jungh. (1854) 285.

Stems, petioles and pedicels cinereously velutinous by minute stellate hairs, mostly also with scattered, larger stellate hairs, and scattered, slender, simple hairs. *Leaves* at apex gradually to suddenly, narrowly and long, obtusely acuminate, 2—16 by 2—12 cm,

minutely crenate to dentate or coarsely serrate to undulate, on both surfaces, but especially beneath cinereously velutinous by minute stellate hairs, mostly also with scattered, larger stellate hairs and slender, simple hairs. Pedicels  $2\frac{1}{2}$ —4 cm, accrescent to c. 12 cm. Calyx  $\pm$  campanulate, c. 12 mm  $\varnothing$ , mostly accrescent, 5-fid to -parted; segments ovate to triangular, acute to acuminate, 6—10 by 5—6 mm, the tube slightly inflated; calyx indistinctly nerved, outside velutinous by minute stellate hairs, inside densely tomentose. *Mericarps* at apex rounded to obtuse or long acute, dorsally tomentose by stellate hairs. *Seeds* velutinous by extremely minute stellate hairs.

## KEY TO THE VARIETIES

1. *Mericarps* at apex rounded or obtuse . . . . . **Ba. var. albescens**  
 1. *Mericarps* at apex long-acute . . . . . **Bb. var. australiense**

**Ba. var. albescens.** — *A. albescens* Miq., Pl. Jungh. (1854) 285; Fl. Ind. Bat. 1, 2 (1858) 145. — *Sida populifolia* (non Lamk) Blume, Bijdr. 2 (1825) 79; Mor., Syst. Verz. (1846) 28. — *A. muticum* [non (Delile ex DC.) Sweet] Backer, Schoolfl. Java (1911) 188; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 1. — ? *Sida rotundifolia* Perrottet, Mém. Soc. Linn. Paris 3 (1824) 145, non Lamk, 1783. — ? *A. litoreum* Rumph., Herb. Amb. 4, lib. 6, p. 33; Hassk., Neue Schlüss. (1866) 73; Merr., Int. Rumph. Herb. Amb. (1917) 356. — **Fig. 19c.**

Type: *A. albescens* Miq.: Java, Palimanan, *Junghuhn s.n.* (lectotype: L 908.135-624; isotype: U).

*Distribution:* Within Malesia: Java (viz. mainly in Central and East Java, in West Java near the north coast, also on the Thousand Is. and Kangean), all Lesser Sunda Islands, the SE. Moluccas (Babar, Key, Tanimbar), and locally in the Philippines (Luzon, Mindanao), Celebes (also Salajar and Tukangbesi), and East New Guinea; in Sumatra only found at Medan and vicinity. From outside Malesia I have seen specimens from New Caledonia and from Christmas I. (Pacific) and Wake I.

*Notes:* Miquel referred to two specimens, viz. a specimen collected by Junghuhn at Palimanan, and a specimen collected by Van Gesker at Tjibogo. Both specimens are at Leyden and mounted on one sheet together with the original labels; the first mentioned one, being in the best condition, is considered here the lectotype. There is a duplicate of that specimen at Utrecht.

There is some doubt regarding the identity of *Sida rotundifolia* Perrottet from Java. I have not seen any authentic material, but according to the vernacular name stated, viz. 'yoplakan' (= *tjemplakan*) it could be only an *Abutilon* species. According to the poor description: 'Ses feuilles sont rondes, velue et argentées', it possibly belongs to the present variety.

Judging from the description, Hasskarl was possibly right in referring *A. litoreum* of Rumphius to *A. albescens* Miq., but there will never be any certainty.

Baker f. (J. Bot. 31, 1893, 213) erroneously identified Miquel's species with *A. crispum*.

Backer (1911, 118) referred the present variety erroneously to *A. muticum* (Delile ex DC.) Sweet. This species, of which the correct name is *A. pannosum* (Forst. f.) Schlecht., very much resembles the present variety and can easily be distinguished from it by the greater number of mericarps, viz. c. 30, by the widely campanulate, not inflated calyx, by the larger corolla having a purple centre, and by the densely tomentose indumentum. It occurs from the arid regions of northern Africa, Southwest Asia, and Australia, and does not occur in Malesia.

*A. indicum* ssp. *albescens* may be confused with *A. hirtum*, but the latter can be recognized by the indumentum consisting of coarser stellate hairs, stiff, patent simple hairs, and gland-hairs, the number of mericarps being 20—25.

**Bb. var. australiense** Hochr., Ann. Cons. Jard. Bot. Genève 6 (1902) 20; Nova Guinea 14 (1924) 159. — *A. indicum sensu* Span., Linnaea 15 (1841) 171; ? F. v. M., Descr. Not. Pap. Pl. 4 (1875) 55; Specht, Rec. Am.-Austr. Sc. Exp. Arnhem Land 3 (1958) 258. — *A. graveolens* [non (Roxb. ex Hornem.) W. & A. ex Wight] Britten, in Forbes, Nat. Wand., App. 6 (1885) 500. — **Fig. 19a-b.**

Type: Timor, *Forbes 3330* (lectotype: G; isotypes BM, K, L).

*Distribution:* Within Malesia: locally in the Lesser Sunda Islands (Lombok, Sumba, Flores, Timor, Alor), N. Celebes, the Philippines (Babuyan Is., Luzon, Palawan, Mindanao), the Moluccas (Buru, Tanimbar, Key), and New Guinea and adjacent islands. Outside Malesia I saw it from Australia (Northern Territory, Queensland), and New Caledonia.

The distribution of this variety is nearly the same as that of var. *albescens*, but in Malesia it is less common and it also occurs in North Australia.

*Notes:* Hochreutiner mentioned under his variety *Forbes 3330* among a dozen other specimens; this collection is of good quality and in fair accordance with the description and has therefore been designated as the lectotype.

*A. grandiflorum* G. Don from tropical and subtropical Africa looks very similar to the present variety, but differs mainly by having less deeply incised calyces. This is in my opinion another form of *A. indicum* (L.) Sweet.

I have not seen the specimens recorded from Papua by F. von Mueller.

**C. ssp. guineense** (Schumach.) Borss., *stat. nov.* — *Sida guineensis* Schumach., Kongl. Danske Vidensk. Selsk. Skr. 4 (1829) 81. — *A. guineense* (Schumach.) Baker f. & Exell, J. Bot. 74 (1936) Suppl. 222; Meeuse, Fl. Zamb. 1 (1961) 495, t. 93 f. 12. — *Sida asiatica* Linné, in Torner, Cent. Pl. 2 (1756) 26; Amoen. Acad. 4 (1759) 324; Sp. Pl. ed. 2 (1763) 964. — *A. asiaticum* (L.) Sweet, Hort. Brit. ed. 1 (1826) 53; G. Don, Gen. Syst. 1 (1831) 503; Span., Linnaea 15 (1841) 171; Thw., En. Pl. Zeyl. (1858) 27; Miq., Fl. Ind. Bat. 1, 2 (1858) 145; Mast., in Fl. Br. Ind. 1 (1875) 326; Baker f., J. Bot. 31 (1893) 214; Tiimen, Handb. Fi. Ceyl. 1 (1893) 144; Gagn., in Fl. Gén. I.-C. 1 (1910) 408; Hochr., in Fl. Madag. fam. 129 (1955) 139, t. 34 f. 5, 6. — *A. muticum* var. *parvifolia* Baker f., J. Bot. 31 (1893) 214. — *A. indicum* var. *asiaticum* Hochr. ex Backer, Fl. Bat. 1 (1907) 108, *ex descr.* — *A. indicum* [non (L.) Sweet] Backer, Schoolfl. Java (1911) 118, *p.p.*; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 1, *p.p.* — *A. taiwanensis* Hu, Fl. China, fam. 153 (1955) 32, t. 17 f. 5. — **Fig. 19c.**

Types: *Sida guineensis* Schumach.: Guinea (holotype: BM); *A. muticum* var. *parvifolia* Baker f.: Queensland, Keppel Bay, *R. Brown 5117* (holotype: BM); *A. taiwanensis* Hu: Formosa, Kuara, *Gressitt 462* (isotype: U).

Stems, petioles and pedicels tomentose by stellate hairs (coarser than in ssp. *indicum* and in ssp. *albescens*), usually also with scattered, slender, simple hairs. *Leaves* at apex obtuse to acute, rarely shortly acuminate, 1½—8 by 1—6 cm, crenate to dentate or entire, above *in sicco* slightly rough by stellate hairs, glabrescent, also somewhat rugose, beneath tomentose by stellate hairs, also with slender, simple hairs, especially on the nerves. *Pedicels* 4—5 cm. *Calyx* campanulate, 10—12 mm high and *c.* 10 mm  $\varnothing$ , slightly accrescent, 5-lobed to -parted, the tube often slightly inflated; segments triangular to ovate, shortly acuminate, 5—6 by *c.* 5 mm; calyx obsolete nerved, outside densely tomentose

by minute stellate hairs and simple hairs, inside woolly by long stellate hairs and simple hairs. *Mericarps* at apex long-acute, dorsally woolly by long-stellate hairs and simple hairs, *c.* 10 by 6 mm. *Seeds* glabrous or nearly so.

*Distribution*: Semi-arid regions of tropical Africa, Asia, and locally also in Australia. In Malesia found in W.-E. Java, Timor, Alor, SW. Celebes, Ambon, and SE. New Guinea. The subspecies is probably a native of Asia.

*Ecology*: All localities in Java and most of them outside that island are situated in areas subject to a seasonally dry period.

*Notes*: In literature the present subspecies has frequently been considered conspecific with *Sida asiatica* L. There is, however, a discrepancy between the Linnean types and his descriptions. The specimen of *Sida asiatica* in the Linnean herbarium bearing Linnaeus's handwriting (*viz. n.* 866.27) does not differ essentially from that under the name *Sida indica* L. (*n.* 866.29), as was already observed by Hochreutiner (*Ann. Cons. Jard. Bot. Genève* 6, 1902, 19) and which I have corroborated. The plate of Hermann, on which rests the entry of *Flora Zeylanica*, cited by Linnaeus, as well as the figure of Plukenet, also mentioned by Linnaeus, likewise belong undoubtedly to *A. indicum* (L.) Sweet, *sens. str.*, as has been examined and pointed out by Miss Hillcoat (personal communication from Mr. A. W. Exell).

As the descriptions of *Sida asiatica* and *Sida indica* are, however, quite different, and Linnaeus himself pointed out under *Sida asiatica* the differences with *Sida indica* (*cf.* *Species Plantarum* ed. 2), the specimen of *Sida asiatica* in the Linnean herbarium cannot be its true type specimen.

According to the description *Sida asiatica* is conspecific with *Sida guineensis* and this should be the proper evaluation in absence of the type. I cannot agree with the authors on the African flora who, on the basis of the types in the Linnean herbarium, argue that *Sida asiatica* is a synonym of *Sida indica* and accept for the taxon *A. guineense* (Schumacher.) Baker *f.* & Exell as the correct name.

On the other hand the absence of a type specimen which agrees with Linnaeus's description of *Sida asiatica* makes caution necessary. Therefore I have, in subordinating *Sida asiatica* to *A. indicum*, chosen the epithet *guineensis* and not *asiatica*.

Miss Hillcoat has kindly confirmed that the specimens I have of the taxon match those of *A. guineense*.

#### APPENDIX

**Abutilon arboreum** (L. *f.*) Sweet, Hort. Brit. ed. 1 (1826) 53. — *Sida arborea* Linné *f.*, Suppl. (1781) 307; DC., Prod. 1 (1824) 469.

Medium-sized shrub. Twigs, as the petioles and pedicels stellate-tomentose, also with simple hairs. *Leaves* orbicular, at base deeply cordate, at apex shortly acuminate, 7–12 cm  $\varnothing$ , crenate to dentate, at base 7-nerved, above stellate-velutinous, beneath stellate-tomentose, on the nerves also with simple hairs; petiole 4–7½ cm. *Stipules* filiform, 7 mm. *Flowers* axillary, solitary. Pedicel *c.* 12 cm, near apex jointed and geniculate. *Calyx* in bud ovoid, acuminate, 5-winged, when open campanulate, *c.* 2½ cm high and 3 cm  $\varnothing$ , 5-fid; segments ovate, acuminate, *c.* 16 by 10 mm; calyx outside prominently nerved, stellate-tomentose, also with simple hairs, inside stellate-velutinous. *Corolla* up to 7½ cm  $\varnothing$ , bright orange with dark brown blotch at base of each petal (*N.G.F.* 14619).

NEW GUINEA. East New Guinea: Morobe Distr., Sum Sum, Watut R., Millar & Womersley, *N.G.F.* 14619 (L).

*Note:* The specimen described above lacks fruits and cannot be classified with certainty, but it matches *A. arboreum* (L. f.) Sweet, a species from South America (Peru) often cultivated as an ornamental in the tropics, but never encountered in Malesia.

## EXCLUDED SPECIES

*Abutilon fruticosum* Guillemain & Perrottet, Fl. Seneg. 1 (1831) 73; Baker f., J. Bot. 31 (1893) 214; Backer, Schoolf. Java (1911) 118.

Backer gave a description with the annotation (in Dutch): 'Perhaps found in Java'. This statement was, no doubt, based on Baker f. (1893) who mentioned Java as part of the area of distribution. I have not seen any specimen of it from Malesia.

## 17. SIDA

Linné, Gen. Pl. ed. 5 (1754) 306; Sp. Pl. (1753) 683; B. & H., Gen. Pl. 1 (1862) 203; K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 42; Baker f., J. Bot. 30 (1892) 138; Kearney, Am. Midl. Nat. 46 (1951) 124; Clement, Contr. Gray Herb. 180 (1957) 13. — *Malvinda* Boehm. in Ludwig, Defin. (1760) 74; Medicus, Malv. (1787) 23. — *Lamarkia* Medicus, Phil. Bot. 1 (1789) 28, *nom. nud.*

Lectotype: *S. rhombifolia* L. (cf. Hitchcock & Green, Int. Rules Bot. Nomencl. ed. 3, 1935, 145; Clement, Contr. Gray Herb. 180, 1957, 14).

Annual or perennial herbs or undershrubs. *Leaves* simple, rarely divided (not in Malesia) or lobed, penni- or palminerved, without extrafloral nectaries. *Flowers* usually small, axillary, solitary or by the development of accessory axillary buds often in axillary clusters (short racemes), or by decrescence or abortion of the upper leaves sometimes in racemes or panicles. Pedicels jointed. *Epicalyx* present (not in Malesia) or lacking. *Calyx* mostly widely campanulate, usually angular by prominent costae and marginal nerves. *Corolla* rotate, usually yellow, rarely (not in Malesia) pink. *Staminal column* usually shorter than the petals. Carpels and styles or style branches 5—14; cells of ovary with 1 ovule. *Schizocarp* globular to obovate. Mericarps often more or less trigonous, at apex muticous or biaristate, outside smooth or prominently reticulate, indehiscent or dehiscent at apex only, after falling leaving a truncate, slender columella. *Seeds* closely enveloped by the wall of the mericarps, whether or not released by the withering of these walls.

*Distribution:* About 150 spp. in the tropics and subtropics of the world. About two thirds of these are restricted to the New World, a fact which might evoke the conclusion, that the genus originated in the New World. Some species, however, viz. *S. mysorensis* W. & A. and *S. subcordata* Span., are restricted to SE. Asia, and several others are found only in Australia, the Pacific Islands, or Africa. Kearney (1951, 126) on the basis of the morphological diversity within the genus, suggested that *Sida* could be of polyphyletic origin.

In Malesia the genus is represented by sect. *Malacroideae* G. Don, sect. *Nelavaga* Borss., and sect. *Sida* [sect. *Malvinda* (Boehm.) DC.]. Of the first section only *S. ciliaris* L. occurs; it is introduced from the New World in the Philippines. To the other two sections belong some species, which have become widely distributed, probably mainly by human agency, throughout the tropics for more than a century, as can be concluded from old collections. They are *S. cordata* (Burm. f.) Borss. of sect. *Nelavaga* Borss., and *S. rhombifolia* L., *S. spinosa* L., *S. cordifolia* L., and *S. acuta* Burm. f., all sect. *Sida*.

It is tempting to consider SE. Asia as the centre of origin of the last-named two sections, since *S. mysorensis* W. & A. of sect. *Nelavaga* and *S. subcordata* Span. of sect. *Sida* are restricted to this area. On the other hand it is striking that certain forms of the now

pan-tropical *S. acuta* Burm. f. and *S. cordifolia* L., both of sect. *Sida*, do not occur in Asia, unless as occasional immigrants.

*Ecology:* The Malesian species are mainly heliophilous herbs or undershrubs, usually occurring in open places, especially in the lowland. Many of them are restricted to the seasonally dry parts of Malesia. *S. javensis* Cav. and *S. cordata* (Burm. f.) Borss. seem to prefer light shade.

*Note:* The delimitation of the genus *Sida* against related genera has offered some difficulties, but a discussion of this lies beyond the scope of the present work, especially because the assumed intermediate species involved do not occur in Malesia.

#### KEY TO THE SECTIONS

1. Pedicel adnate to the petiole. *Sp.* 1 . . . . . 1. sect. **Malacroideae**
1. Pedicel free from the petiole.
  2. Styles and mericarps 5; mericarps without prominent reticulate venation, thin-walled, not dehiscent; seeds released by withering of the wall. Leaves palminerved. *Spp.* 2—5 . . . . . 2. sect. **Nelavaga**
  2. Styles and mericarps 5—10; mericarps outside prominently reticulately veined, dehiscent at the apex, usually not releasing the seeds. Leaves penninerved. *Spp.* 6—12 . . . . . 3. sect. **Sida**

#### KEY TO THE SPECIES OF 2. SECT. NELAVAGA

1. Erect herbs or undershrubs. Flowers in axillary or terminal racemes or panicles. Mericarps without awns.
  2. Herb *in vivo* viscid, with many gland-hairs. Leaves regularly serrate to crenate. Pedicel 4—15 mm. Calyx 6—8 mm long. Staminal column glabrous . . . . . 2. ***S. mysorensis***
  2. Herb not viscid, without gland-hairs. Leaves irregularly and coarsely serrate to crenate. Pedicels 10—20 mm. Calyx 7—10 mm long. Staminal column pubescent . . . . . 3. ***S. elongata***
1. Prostrate slender herbs, *in vivo* never viscid, no gland-hairs. Flowers axillary, solitary or in few-flowered (mostly 2) racemes. Mericarps mostly with awns, rarely without.
  3. Stems never rooting at the nodes; stems, petioles, and pedicels with both patent simple and stellate hairs. Leaves acute to shortly acuminate. Mericarps without awns . . . . . 4. ***S. cordata***
  3. Stems rooting at the nodes. Mericarps with awns. For the indumentum is referred to the key on p. 184. . . . . 5. ***S. javensis***

#### KEY TO THE SPECIES OF 3. SECT. SIDA

1. Stipules of each pair different, one linear to lanceolate, 3—6-nerved, the other linear to filiform, mostly shorter, 1—4-nerved. Styles and mericarps 6—10, mostly 7—8. Green parts sparsely hairy, soon glabrescent . . . . . 6. ***S. acuta***
1. Stipules of every pair not different. Green parts usually more or less densely stellate-hairy.
  2. Styles and mericarps 5.
    3. Green parts more or less densely covered with gland-hairs, *in vivo* viscid. Leaves cordate at base. Flowers in loose panicles . . . . . 7. ***S. glutinosa***
    3. Green parts without gland-hairs, never viscid. Leaves acute to rounded at base. Flowers axillary, solitary, or in axillary clusters.
      4. Erect herbs or undershrubs. Stems at the base of the petioles provided with 1 or 2 minute, finally more or less spiny emergences . . . . . 8. ***S. spinosa***
      4. Prostrate herbs. Stems without spiny emergences . . . . . 9. ***S. parvifolia***
  2. Styles and mericarps 7—14, mostly 8—10.
    5. Mericarps with or without awns, the awns never retrorsely hairy. Mericarps (without the awns)  $2\frac{1}{2}$ — $3\frac{1}{2}$  mm long. Calyx 9—12 mm  $\varnothing$ , velutinous to glabrous . . . . . 10. ***S. rhombifolia***
    5. Mericarps with retrorsely hairy awns, rarely awnless.
      6. Leaves averagely  $\approx 1\frac{1}{2}$  times as long as wide, at apex obtuse to slightly acute, usually tomentose. Calyx 5—8 mm  $\varnothing$ , tomentose. Mericarps 3— $3\frac{1}{2}$  mm long (awns excepted) . . . . . 11. ***S. cordifolia***
      6. Leaves averagely  $\pm$  twice as long as wide, at apex acute to shortly acuminate, usually velutinous to glabrous. Calyx 14—17 mm  $\varnothing$ , velutinous to glabrous. Mericarps (awns excepted) 4—5 mm long . . . . . 12. ***S. subcordata***

I. Section *Malacroideae*

G. Don, Gen. Syst. 1 (1831) 498; Clement, Contr. Gray Herb. 180 (1957) 16. — *Sida* sect. *Pseudomalachra* K. Sch., in E. & P., Nat. Pfl. Fam. 3, 6 (1890) 43; in Fl. Bras. 12, 3 (1891) 280.

Lectotype: *S. ciliaris* L. (cf. Clement, l.c. 17).

Flowers congested in head-like, contracted racemes at the apices of the branches. Pedicels adnate to the petioles.

*Distribution*: Tropical and subtropical America, one species, viz. *S. ciliaris* L., introduced in the Philippines.

1. *Sida ciliaris* Linné, Syst. Nat. ed. 10, 2 (1759) 1145; Fl. Jamaica. (1759) 401; Amoen. Acad. 5 (1760) 401; Sp. Pl. ed. 2 (1763) 961; Cav., Diss. 1 (1785) 21, t. 3 f. 9; op. cit. 5 (1788) t. 127 f. 2; DC., Prod. 1 (1824) 461; K. Sch., in Fl. Bras. 12, 3 (1891) 283; Baker f., J. Bot. 30 (1892) 141; Clement, Contr. Gray Herb. 180 (1957) 24. — *S. muricata* Cav., Ic. 6 (1801) 78, t. 597 f. 2; DC., Prod. 1 (1824) 460. — *S. longistipula* Merr., Philip. J. Sc. 13 (1918) Bot. 30; En. Philip. Fl. Pl. 3 (1923) 34.

Types: *S. ciliaris* L.: Jamaica, Browne s.n., Herb. Linn. n. 866.6 (lectotype: LINN); *S. muricata* Cav.: Mexico, Chalma, Née s.n. (holotype: MA); *S. longistipula* Merr.: Luzon, Burgos, Ramos B.S. 32704 (isotypes: K, P, US).

Small, annual or perennial undershrub, branched at base; branches spreading, prostrate or ascending, c. 20 cm long. Stems tuberculate by prominent leaf-scars; stems, petioles, and pedicels with minute, stellate hairs. Leaves small, oblong, at base shallowly cordate or rounded, at apex obtuse or truncate, 2–7 by 1–2½ mm, sharply serrate, penninerved, at base 3–5-nerved, above with scattered, appressed, simple hairs or glabrous, beneath cinereous by minute stellate hairs; petiole 3–10 mm. Stipules linear to spatulate, 6–12 mm, ciliate by simple hairs. Flowers in 2–8-flowered inflorescences, occasionally solitary in the lower axils. Pedicels 2–3 mm. Calyx widely campanulate, 6–7 mm ø, slightly accrescent, without visible costae or nerves, 5-parted; segments triangular, acute, 4–5 by 3–4 mm; calyx outside cinereous by minute stellate hairs, also with scattered, long, simple hairs, inside glabrous except for the margin. Corolla 6–15 mm ø, yellow; petals oblong to ovate, obtuse, at base ciliate. Staminal column 3–5 mm, glabrous or sparsely short hairy. Mericarps 5, tetrahedral, 3–4 mm long, on top with 2 short awns c. 1 mm long, dorsally reticulately veined, and densely stellate-hairy. Seeds ovoid, 2–2½ mm long, shortly stellate-hairy, especially near the hilum, brown.

*Distribution*: Tropical and subtropical America, introduced in Luzon (Ilocos Norte).

*Ecology*: In Luzon found in open, dry places and thickets at low altitude.

*Notes*: Linnaeus cited in Systema Naturae (ed. 10, 1759) plate 96 of Sloane's Catalogue of Jamaican Plants. As Clement (1957, 24) stated, 'the plate shows a plant which is very doubtful of this species, since it much resembles *S. spinosa*'. He has therefore chosen as the type the specimen n. 866.6 in the Linnean herbarium, collected in Jamaica by Patrick Browne. Clement believed that Linnaeus based the original description on this plant. In Species Plantarum (ed. 2, 1763) Linnaeus cited the place where this plant is mentioned in Browne's 'Civil and Natural History of Jamaica'. I second Clement's choice, although the specimen in Sloane's herbarium, after which the plate was made, should have been verified; it was not examined by Linnaeus, and not by Clement and myself.

Clement distinguished five varieties. The Philippine specimens belong to var. *ciliaris*.

2. Section *Nelavaga* Borss., *sect. nov.*

Holotype: *S. cordata* (Burm. f.) Borss.

Herbae prostratae, saepe repententes, vel suffrutices ascendentes. Folia palmatinervia. Pedicellus a bractea sive folio florali pertinente separatus. Styli et mericarpia 5; mericarpia sine venatione reticulato-prominente, indehiscentia, pariete membranacea; semina per putredinem parietarum mericarpiorum liberata.

*Distribution*: Tropics throughout the world.

*Note*: The present group of species evidently forms a distinct taxon and I have expressed this in making it a section. The name has been derived from the vernacular name 'nelavaga' under which Van Rheede tot Draakestein described and pictured a plant which undoubtedly belongs to this group, presumably to *S. cordata* (Burm. f.) Borss.

2. *Sida mysorensis* W. & A., *Prod.* (1834) 59; Thw., *En. Pl. Zeyl.* (1858) 28; Mast., in *Fl. Br. Ind.* 1 (1875) 322; Fern.-Vill., *Novis. App.* (1880) 22; King, *J. As. Soc. Beng.* n.s. 60, ii (1891) 40; Trimén, *Handb. Fl. Ceyl.* 1 (1893) 142; Ridley, *Trans. Linn. Soc. Bot.* II, 3 (1893) 279; Merr., *Philip. J. Sc.* 1 (1906) *Suppl.* 403; *Fl. Manila* (1912) 317; *Philip. J. Sc.* 12 (1917) *Bot.* 106; Ridley, *Fl. Mal. Pen.* 1 (1922) 254; Merr., *En. Philip. Fl. Pl.* 3 (1923) 35; Craib, *Fl. Siam. En.* 1 (1931) 151; Merr. & Chun, *Sunyatsenia* 5 (1940) 127; Backer, *Bekn. Fl. Java* (em. ed.) 4C (1943) *fam.* 109, p. 13; Hu, *Fl. China*, *fam.* 153 (1955) 23, t. 16 f. 2; Backer & Bakh. f., *Fl. Java* 1 (1963) 427. — ? *S. racemosa* Burm. f., *Fl. Ind.* (1768) 148; Merr., *Philip. J. Sc.* 19 (1921) 364; Alston, *Handb. Fl. Ceyl.* 6 (1931) 28. — *S. hirta* (non Lamk) Wall., *Cat.* (1828) n. 1855. — *S. urticifolia* W. & A., *Prod.* (1834) 59, non St. Hil., 1828. — *S. wightiana* Dietr., *Synops.* 4 (1847) 845. — *S. glutinosa* Roxb., [*Hort. Beng.* (1814) 97, *nom. nud.*] *Fl. Ind.* ed. Carey 3 (1832) 172, non Cav., 1785; Backer, *Schoolfl. Java* (1911) 115; ? Heyne, *Nutt. Pl.* (1927) 1026. — *S. fasciculiflora* Miq., *Fl. Ind. Bat.* 1, 2 (1858) 140; Baker f., *Synops. Malv.* (1894) 112. — *S. glutinosa* var. *confertiflora* O.K., *Rev. Gen. Pl.* 1 (1891) 73.

*Types*: *S. mysorensis* W. & A.: Mysore, *Wight prop.* 183 (lectotype: K ex Herb. Hooker); *S. urticifolia* W. & A. and *S. wightiana* Dietr.: Trichinopoly, *Wight prop.* 182 (lectotype: K ex Herb. Hooker); *S. glutinosa* Roxb., non Cav.: Moulmein, *Wallich* 1855, 3 (neotype: K-W); *S. fasciculiflora* Miq.: Bondowoso, *Zollinger* 668Z (holotype: U; isotypes: BO, P); *S. glutinosa* var. *confertiflora* O.K.: Ambarawa, O. *Kuntze* 5501 (holotype: NY).

Erect, annual, viscid undershrub,  $\frac{1}{2}$ — $1\frac{1}{2}$  m. Stems, petioles and pedicels densely covered by minute stellate hairs, patent simple hairs, and gland-hairs. *Leaves* usually ovate, occasionally orbicular or oblong, at base cordate, at apex acuminate, 2—9 by 1—7 cm, serrate to crenate, palminnerved, at base 5—9-nerved, on both surfaces densely covered with minute stellate hairs and gland-hairs; petioles 1—5 cm. *Stipules* filiform, 3—7 mm. *Flowers* axillary, initially solitary, by development of accessory buds finally in condensed racemes or panicles; bracts usually represented only by their stipules. Pedicels thin, 4—15 mm, slightly accrescent, jointed at  $\frac{1}{3}$  to  $\frac{1}{2}$  from apex. *Calyx* widely campanulate, 6—8 mm long,  $4\frac{1}{2}$ —5 mm  $\varnothing$ , accrescent to 5—6 mm  $\varnothing$ , 5-fid; segments triangular, acute to acuminate, c.  $2\frac{1}{2}$ —3 by  $2\frac{1}{2}$  mm; calyx outside covered with minute stellate hairs and gland hairs, inside except for the margin glabrous. *Corolla* slightly exceeding the calyx, 10—12 mm across, yellow; petals obtriangular, glabrous. *Staminal column* 4 mm, basal part wide, conical, upper part thin, tubular, glabrous. *Styles* connate downwards. *Mericarps* 5, tetrahedral with rounded angles, at apex acute, without awns, c.  $2\frac{1}{2}$  mm long, at apex short hairy. *Seeds* ovoid, faintly trigonous, c. 2 mm long, glabrous brown-black.



*Distribution*: S. and SE. Asia: Peninsular India, Ceylon, Bengal, Birma, Siam, Indo-China, Hainan, South China, in Malesia chiefly in Central and East Java (also Madura I.) and the Philippines (Luzon, Mindoro), locally in Sumatra (Toba Lake: Samosir), the Malay Peninsula, West Java and the Lesser Sunda Islands (Lombok, Flores).

*Ecology*: Heliophilous and occurring preferably under seasonal climatic conditions, in waste places, teak-forests, coconut plantations, secondary growths, along road-sides, etc., from sea-level up to c. 700 m (cf. p. 13).

*Notes*: According to Cavanilles *S. racemosa* Burm. f. might be identical with *S. glutinosa* Cav.; Merrill (1921, 364) believed it, however, to be conspecific with *S. mysorensis* W. & A. This is more likely, as the latter is endemic in tropical Asia, whereas *S. glutinosa* Cav. was introduced from America. The poor description does not permit a definite conclusion and I have not seen Burman's type.

I have not found any specimen bearing a label with the name *S. glutinosa* Roxb. in the handwriting of Roxburgh. Wallich gave this name under n. 1855 of his Catalogue as a synonym of *S. hirta* Lamk. The latter name is a misidentification; all his material belongs to *S. mysorensis* W. & A. Unless a more suitable specimen is discovered, one of the specimens of Wallich n. 1855 can be designated as a neotype, as it may be assumed that Wallich was familiar with Roxburgh's species. I have chosen the specimen 1855, 3 (K-W) which is in fair accordance with Roxburgh's clear description.

The specimen of Zollinger 668Z at Utrecht, which appears to be a mere fragment, is the only specimen I have seen labelled by Miquel himself *S. fasciculiflora* Miq. Therefore I consider this specimen to be the holotype.

I have not been able to find any essential character to distinguish *S. urticifolia* W. & A. or *S. glutinosa* var. *confertiflora* O.K. as separate taxa. *S. wightiana* Dietr. was a new name for *S. urticifolia* W. & A., non St. Hil.

*S. mysorensis* W. & A. is often confused with the related *S. elongata* Blume, *S. javensis* Cav., and *S. cordata* (Burm. f.) Borss., but it can always be distinguished from these by the presence of gland-hairs.

Baker f. (J. Bot. 30, 1892, 293) referred *S. mysorensis* to *S. glutinosa* Cav. which belongs, however, to another section.

### 3. *Sida elongata* Blume, Bijdr. 2 (1825) 76.

*See for synonyms and types under the varieties.*

Upright, stout, annual undershrub,  $\frac{1}{2}$ –1½ m. Stems, petioles, pedicels, and leaves on both sides densely set with rather coarse stellate hairs, and patent simple hairs, more rarely with scattered minute stellate and simple hairs or glabrous. *Leaves* orbicular to ovate, upwards more lanceolate, at base cordate, at apex acute to acuminate, rarely tricuspidate, 2½–10 by 1–8 cm, usually coarsely and irregularly serrate or crenate, occasionally slightly lobed, palminerved, at base 7–9-nerved, petioles 1–4 cm. *Stipules* linear, 2–3 mm. *Flowers* axillary, initially solitary, but by development accessory buds and decrescence of sustaining leaves finally in long, lax racemes or panicles; bracts leaf-like, lanceolate, often represented only by their stipules. *Pedicels* thin, 1–2 cm, jointed at  $\frac{1}{3}$  to  $\frac{1}{2}$  from apex, accrescent to c. 4 cm. *Calyx* widely campanulate, 7–10 mm long, c. 6 mm  $\varnothing$ , accrescent to c. 8 by 8 mm, 5-fid; segments long-triangular, acute to acuminate, 3 by 2½ mm; calyx outside with stellate and simple hairs, inside except for the margin glabrous, rarely with scattered minute stellate hairs only. *Corolla* c. 20 mm  $\varnothing$ , yellow; petals obtriangular, glabrous. *Staminal column* c. 6 mm covered with patent simple hairs, basal part conical, wide, upper part tubular, thin. *Mericarps* 5, tetrahedral, slightly rounded on the angles, c. 2½ mm long, without awns, dorsally short hairy. *Seeds* ovoid, slightly trigonous, c. 2½ mm long, glabrous, greyish.

*Distribution:* Restricted to East Java and Lesser Sunda Islands (Bali, Lombok, Timor, Alor, and Leti).

*Ecology:* Obviously confined to areas subject to a severe dry season, on open dry grounds, secondary growths, and teak-forests, from sea-level up to c. 900 m.

#### KEY TO THE VARIETIES

1. Green parts sparsely set with minute stellate hairs and simple hairs, or glabrous . . . a. var. *elongata*  
 1. Green parts densely provided with coarse stellate hairs and simple hairs . . . . . b. var. *balica*

**a. var. *elongata*.** — *S. elongata* Blume, Bijdr. 2 (1825) 76; Span., *Linnaea* 15 (1841) 172; Miq., *Fl. Ind. Bat.* 1, 2 (1858) 139. — *S. elongata* var. *diversifolia* Span., [in Hook., *Comp. Bot. Mag.* 1 (1836) 344, *nom. nud.*] *Linnaea* 15 (1841) 172.

Types: *S. elongata* Blume: Timor, *Reinwardt 1318* (isotypes: L); *S. elongata* var. *diversifolia* Span.: Roti, *Spanoghe s.n.* (holotype: L 908.140-554).

*Distribution:* Restricted to the eastern Lesser Sunda Islands (Roti and Timor), 2 collections.

*Notes:* I have seen only two specimens provided with the name *S. elongata* Blume in the handwriting of Blume, viz. specimens which, according to the label, were collected by Reinwardt in Timor. Blume gave as locality: 'ad margines viarum prope Bataviam'; this, I believe, is an error, as the species has never been found with certainty in West Java.

I do not consider *S. elongata* var. *diversifolia* Span. essentially distinct.

**b. var. *balica*** (Miq.) Borss., *stat. nov.* — *S. balica* Miq., *Fl. Ind. Bat.* 1, 2 (1858) 141; Backer, *Bekn. Fl. Java* (em. ed.) 4C (1943) fam. 109, p. 13; Backer & Bakh. *f.*, *Fl. Java* 1 (1963) 427.

Type: Timor, *Zollinger 704Z* (lectotype: P; isotypes: P, U).

*Distribution:* East Java (eastwards of Mt Pandan in Kediri Res.) and the Lesser Sunda Islands (Bali, Lombok, Timor, Alor, and Leti Is.).

*Note:* A good specimen of *Zollinger 704Z* labelled *S. balica* Miq. in the handwriting of Miquel is preserved at Paris. I have chosen this as a lectotype; the specimen at Utrecht is only a fragment.

**4. *Sida cordata*** (Burm. f.) Borss., *comb. nov.* — *Melochia cordata* Burm. f., *Fl. Ind.* (1768) 143. — *S. veronicifolia* Lamk, *Encycl.* 1 (1783) 5; Cav., *Diss.* 1 (1785) 7, t. 1 f. 3; op. cit. 5 (1788) t. 127 f. 3; DC., *Prod.* 1 (1824) 463; Baker *f.*, *J. Bot.* 30 (1892) 293, *excl. synonym.* *S. balica* Miq. et *S. elongata* Blume; Merr., *En. Philip. Fl. Pl.* 3 (1923) 36, *excl. synonym.* *S. supina* L'Hérit.; Merr. & Chun, *Sunyatsenia* 5 (1940) 127; Hu, *Fl. China*, fam. 153 (1955) 23, t. 5 f. 11—13, t. 16 f. 1. — *S. humilis* var. *veronicifolia* (Lamk) Mast., in *Fl. Br. Ind.* 1 (1875) 322. — *S. radicans* Cav., *Diss.* 1 (1785) 8, t. 9 f. 3; DC., *Prod.* 1 (1824) 463. — *S. morifolia* Cav., *Diss.* 1 (1785) 9, t. 10 f. 2; DC., *Prod.* 1 (1824) 463. — *Lamarkia morifolia* (Cav.) Medicus, *Phil. Bot.* 1 (1789) 28, *comb. inval.* — *S. multicaulis* Cav., *Diss.* 1 (1785) 10, t. 1 f. 6; DC., *Prod.* 1 (1824) 463; Hu, *Fl. China*, fam. 153 (1955) 24, t. 16 f. 8. — *S. veronicifolia* var. *multicaulis* (Cav.) Baker *f.*, *J. Bot.* 30 (1892) 293. — *S. humilis* Cav., *Diss.* 5 (1788) t. 134 f. 2; Willd., *Sp. Pl.* 3, 1 (1800) 744, *pro var. a*; DC., *Prod.* 1 (1824) 463; Miq., *Fl. Ind. Bat.* 1, 2 (1858) 139, *p.p.*; Mast., in *Fl. Br. Ind.* 1 (1875) 322. — *S. veronicifolia* var. *humilis* (Cav.) K. Sch., in *Fl. Bras.* 12, 3 (1891) 320. — *S. unilocularis* L'Hérit., *Stirp. Nov.* 1 (1789) 117 bis t. 56. — *S. supina* (*non* L'Hérit.) Gagn., *Not. Syst.* 1 (1909) 32; in *Fl. Gén. I.-C.* 1 (1910) 404; Merr. & Chun, *Sunyatsenia* 5 (1940) 127. — *Nela-vaga* Rheede, *Hort. Malab.* 10, p. 137, t. 69.

Types: *Melochia cordata* Burm. f.: *s. coll. s.n.* (holotype: G); *S. veronicifolia* Lamk.: 'Les Indes', *Sonnerat s.n.* (holotype: P-LA); *S. radicans* Cav.: Rheede, Hort. Malab. t. 69 (holotype); *S. morifolia* Cav.: Mauritius, *Commerson s.n.* (holotype: MA); *S. multicaulis* Cav.: Malabar, ? *Sonnerat s.n.* (holotype: MA); *S. unilocularis* L'Hérit.: L'Hérit., Stirp. Nov. t. 56 (holotype); *S. humilis* Cav.: Luzon, Port Cavite, *Née s.n.* (neotype: MA).

Prostrate or ascending, slender herb, not or rarely rooting at the nodes, branched especially at base, up to *c.*  $\frac{1}{2}$  m long. Stems, petioles and pedicels with scattered, patent, long, thin, simple hairs and scattered minute stellate hairs. *Leaves* orbicular, at base shallowly cordate, at apex acuminate, 1—5 by 1—4 cm, crenate to serrate, palmately-veined, at base 5—7-nerved, on both surfaces with appressed simple hairs and minute stellate hairs; petiole  $\frac{3}{4}$ —4 cm. *Stipules* linear or filiform, 1—2 mm. *Flowers* axillary, initially solitary, afterwards by development of an accessory bud in short few-flowered racemes, by abortion of the upper leaves sometimes in loose panicles. Pedicel as long as or longer than the petiole, 15—25 mm, slightly accrescent, thin, jointed somewhat above the middle. *Calyx* widely campanulate, *c.* 6 mm  $\varnothing$ , slightly accrescent, 5-fid; segments triangular, acuminate, 2—3 mm  $\varnothing$ ; calyx outside with patent simple hairs and a few stellate hairs, inside glabrous except for the margin. *Corolla* 8—9 mm  $\varnothing$ , yellow; petals obovate, at base ciliate. *Staminal column* short, *c.* 2 mm, glabrous or with patent simple hairs, basal part wide, conical, tubular part short. *Mericarps* 5, tetrahedral with rounded angles, *c.* 2½ mm long, glabrous or at apex short-hairy, awnless. *Seeds* ovoid, *c.* 2 mm long, brown-black, glabrous.

*Distribution*: Pantropical species of unknown origin, rare and obviously not native in Malesia: locally in the Philippines: Luzon (Manila, Lepanto, Cavite), found twice on Purmerend = Pulau Sakit (Bay of Djakarta).

*Notes*: The oldest name for the present species appears to be *Melochia cordata* Burm. f. The description is not very clear, but the type admits of no doubt. The sheet bears a stem with leaves, flower-buds, and fruits without awns, as well as a separate leaf, severely damaged by insects. On the sheet the name is written apparently by N. G. Burman himself. Glued to the sheet there is also a label with a botanical description and a medical indication, certainly not applying to the plant. Hochreutiner, who already encountered the sheet, added a ticket (*d.d.* 1930) with the combination '*Sida cordata* (Burm.) Hochr. & Merrill', but as far as I know, this has never been published.

Cavanilles commenced his work on *Malvaceae* with a study of the genus *Sida*. Probably due to lack of experience, he described many species, which in some cases must be considered as representing different phases of development or as mere modifications. I have included some of his names, of which I have seen type material, in the synonymy of the present species; there may be more.

For *S. humilis* Cavanilles referred to a living specimen in the Paris botanical garden of which I saw no herbarium material. At Madrid I have found a specimen, well fitting the description, collected by Née at Cavite. Since this specimen is labelled *Sida humilis* Cav. by Cavanilles himself, I have designated this as a neotype.

*S. radicans* Cav. is based on *Nela-vaga* of Rheede. The poor plate and inadequate description of Rheede do not allow a definite conclusion, but I am inclined to refer it to *S. cordata*, rather than to *S. mysorensis* W. & A. to which it was sometimes reduced in the past.

*S. supina* L'Hérit., to which Gagnepain erroneously referred the specimens from Indo-China, is a relative of *S. spinosa* L., and *S. parvifolia* DC. of sect. *Sida*.

Backer misinterpreted *S. veronicifolia* Lamk in his Floras of Java. The specimens involved belong to *S. javensis* Cav. (*sens. lat.*).

*S. cordata* (Burm. f.) Borss. may be confused with *S. mysorensis* W. & A., but the latter differs by having an erect, stout habit and a dense covering of gland-hairs.

*S. javensis* Cav., the nearest relative of the present species, differs by awned mericarps and rooting branches.

**5. *Sida javensis* Cav., Diss. I (1785) 10, t. I f. 5, emend. Borss.**

*See for synonyms and types under the subspecies.*

Prostrate herb, branched at base, with stems rooting at the nodes. *Leaves* orbicular in outline, at base cordate, 5—60 mm  $\varnothing$ , crenate to serrate, palminerved, at base 5—9-nerved; petiole 5—60 mm. *Stipules* linear to lanceolate, 2—2½ mm. *Flowers* axillary, usually solitary, sometimes by the development of an accessory bud, in few-flowered short axillary racemes. Pedicels jointed at ¼—½ from apex. *Calyx* widely campanulate, 5-fid; segments triangular, acuminate. *Corolla* yellow; petals obovate, often emarginate, glabrous or ciliate at base. *Staminal column* short, with patent simple hairs, basal part wide, conical, apical part short, tubular. *Mericarps* 5, tetrahedral with rounded angles, with 2 awns, dorsally and on the awns short-hairy. *Seeds* ovoid, 2—2½ mm long, at the hilum short hairy, brown-black.

*Notes:* Backer has named the present species in his Floras *S. veronicifolia* Lamk, which is in accordance with the wide concept of Baker f. (1892, 293). In his Flora van Batavia (1907, 99) Backer distinguished two forms without giving them names; they are identical with the two subspecies accepted here. In his Onkruidflora Backer mentioned these two forms as varieties, viz. var. *typica* Backer and var. *javensis* (Cav.) Baker f. respectively. *S. veronicifolia* Lamk in the strict sense, however, is specifically different from both forms distinguished by Backer, and a synonym of *S. cordata* (Burm. f.) Borss.

Another, equally old, might be *S. hederifolia* Cav., which is based on a MS plate of Plumier with description, preserved at Paris, later published in J. Burman's edition of Plumier's *Plantae Americanarum* (fasc. 7, 1758, 163, t. 169 f. 3). The plate as well as the description, though poor and inaccurate, point to the present species, but in my opinion there is no certainty regarding its identity. In case *S. hederifolia* Cav. is considered conspecific, it is not possible to state with certainty, to which subspecies it belongs, so that there will be difficulty in naming these.

Although the two forms do not differ much in ecology or distribution, I have given them the rank of subspecies as the morphological differences are too multiple to mark them as mere varieties.

KEY TO THE SUBSPECIES

1. Leaves usually  $\pm$  trilobed, at apex acuminate. Pedicel 20—25 cm, accrescent to c. 35 mm. Calyx 6—7 mm  $\varnothing$ . Stems, petioles, and pedicels sparsely stellate-hairy, rarely with some simple hairs.

A. ssp. *javensis*

1. Leaves never lobed, at apex rounded or obtuse, rarely acute. Pedicel 7—15 mm, accrescent to c. 20 mm. Calyx c. 4 mm  $\varnothing$ . Stems, petioles, and pedicels densely set with minute stellate hairs and patent simple hairs . . . . . B. ssp. *expilosa*

**A. ssp. *javensis*.** — *S. javensis* Cav., Diss. I (1785) 10, t. I f. 5; DC., Prod. I (1824) 465; Blume, Bijdr. 2 (1825) 76; ? A. Gray, Bot. Wilkes U.S. Expl. Exp. (1854) 160; Miq., Fl. Ind. Bat. 1, 2 (1858) 139; Gagn., in Fl. Gén. I.-C. I (1910) 404; Merr., En. Philip. Fl. Pl. 3 (1923) 34, '*javanensis*', excl. *synon. S. humilis* Cav.; Hend., J. Mal. Br. R. As. Soc. 17 (1939) 37; Hu, Fl. China, fam. 153 (1955) 25, t. 16 f. 6. — *S. veronicifolia* var. *javensis* (Cav.) Baker f., J. Bot. 30 (1892) 293; Backer, Onkruidfl. Jav. Suikerr.

(1930) 441. — ? *S. hederifolia* Cav., Diss. I (1785) 8, t. 9 f. 3; DC., Prod. I (1824) 463; *certe* Hassk., Tijds. Nat. Gesch. Phys. 12 (1845) 100. — *S. veronicifolia* (non Lamk) Mor., Syst. Verz. (1846) 28; Backer, Fl. Bat. I (1907) 98, p.p.; Schoolfl. Java (1911) 114, p.p.; Koord.-Schum., Syst. Verz. I, fam. 175 (1911) 3; Koord., Exk. Fl. Java 2 (1912) 581, p.p.; Ridley, Fl. Mal. Pen. I (1922) 254, *excl. synonym.* *S. humilis* Cav.; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 13, p.p.; Backer & Bakh. f., Fl. Java I (1963) 427, p.p. — *S. humilis* (non Cav.) Miq., Fl. Ind. Bat. I, 2 (1858) 140, p.p.; Vidal, Phan. Cuming. Philip. (1885) 97; Rev. Pl. Vasc. Filip. (1886) 609; Merr., Philip. J. Sc. I (1906) Suppl. 91; ? Ridley, J. Str. Br. R. As. Soc. 59 (1911) 76. — *S. humilis* var. *veronicifolia* (non Lamk) Miq., Pl. Jungh. (1854) 287.

Type: Java, *Commerson s.n.* (isotypes: P, P-JU 12271).

Stems, petioles, and pedicels with sparse, minute, stellate hairs, rarely with some simple hairs, glabrescent. *Leaves* usually more or less trilobed, at apex acuminate, above with appressed, short simple hairs, beneath with minute stellate hairs. Pedicel 20–25 mm, accrescent to c. 35 mm. *Calyx* c. 6–7 mm  $\varnothing$ ; segments 4–5 by 4 mm; calyx outside covered with minute stellate hairs, occasionally also with long simple hairs, inside glabrous except for the margin. *Corolla* 10–15 mm  $\varnothing$ . *Staminal column* c. 3 mm. *Mericarps* 4–5 mm long, with  $1\frac{1}{2}$ –2 mm long awns.

*Distribution*: SE. Asia and Malesia. I have not seen any specimen from tropical America, and only one from Africa, viz. Nyassa Highland, Kyimbila, *Stolz 1496* (GRO, L).

Owing to the frequent confusion of the present subspecies with related taxa, it is not well possible to derive its distribution from literature.

In Malesia it is fairly common in Java and in the Philippines (Luzon, Mindoro, Panay, Mindanao); also collected in the Malay Peninsula (Perlis), SW. Celebes, the Lesser Sunda Islands (Sumbawa, Sumba), and the Moluccas (Ternate, Key, and Tanimbar Is.), never found in Sumatra, Borneo, and New Guinea.

*Ecology*: Less adapted to seasonal dry conditions, but more tolerant and also ascending to higher altitude than ssp. *expilosa*, from sea-level up to c. 1500 m (cf. p. 14).

*Note*: Cavanilles refers under *S. javensis* Cav. to a specimen collected by Commerson in Java, which he obtained from Thouin. I have not found such a specimen in Madrid, but at Paris there is a specimen labelled 'Sida javensis W. no 88 Java Commerson' in the handwriting of Cavanilles, which is at least an isotype. No doubt the specimen 12271 in the Herbarium de Jussieu at Paris is another isotype.

**B. ssp. *expilosa*** Borss., *stat. et nom. nov.* — *S. pilosa* Cav., Diss. I (1785) 9, t. 1 f. 2, non Mill., 1768, *nec* Retz, 1781, *nec* L'Hérit., 1789, *nec* Vellozo, 1825; DC., Prod. I (1824) 463. — *S. veronicifolia* (non Lamk) Backer, Fl. Bat. I (1907) 98, p.p.; Schoolfl. Java (1911) 114, p.p.; Koord., Exk. Fl. Java 2 (1912) 581, p.p.; Merr., Philip. J. Sc. II (1916) Bot. 290, p.p.; Backer, Onkruidfl. Jav. Suikerr., atlas (1939) t. 416; Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 13, p.p.; Backer & Bakh. f., Fl. Java I (1963) 427, p.p. — ? *S. humilis* (non Cav.) Miq., Fl. Ind. Bat. I, 2 (1858) 140, p.p.; Hemsl., Rep. Voy. Chall. (Bot.) I, 3 (1885) 123. — ? *S. humilis* var. *repens* Forbes, Natur. Wand. (1885) 354. — *S. veronicifolia* var. *typica* Backer, Onkruidfl. Jav. Suikerr. (1930) 441.

Type: *S. pilosa* Cav.: Santo Domingo, *Desportes s.n.* (holotype: MA).

Stems, petioles, and pedicels densely covered with minute stellate hairs and patent, rather long simple hairs. *Leaves* never lobed, at apex rounded or obtuse, rarely acute, above with appressed, short simple hairs, beneath with minute stellate hairs. Pedicel 7–15 mm, accrescent to c. 20 mm. *Calyx* c. 4 mm  $\varnothing$ ; segments 2–3 by  $1\frac{1}{2}$ –2 mm; calyx outside covered with long simple hairs, and minute stellate hairs, inside glabrous

except for the margin. *Corolla* c. 8 mm  $\varnothing$ . *Staminal column* c. 1½ mm. *Mericarps* c. 3 mm long, with 1 mm long awns.

*Distribution*: Native (?) in the West Indies. In Malesia found in Java (also Madura and Kangean Is.), the Lesser Sunda Islands (Bali, Lombok, Sumba, Timor), SE. Celebes (Buton I.), the Philippines (Luzon, Manila, one old record), the Moluccas (Ambon, Key, Tanimbar).

*Ecology*: Along road-sides, in teak-forests, secondary growths, on forest edges, etc., up to c. 400 m, in Malesia distinctly bound to areas subject to a dry season, the Moluccas excepted (cf. p. 14).

*Note*: Baker f. (1892) incorporated *S. pilosa* Cav. erroneously in the synonymy of *S. supina* L'Hérit., which does not belong to sect. *Nelavaga*, but is a relative of *S. spinosa* L., and *S. parvifolia* DC. of sect. *Sida*.

### 3. Section *Sida*

*Sida* sect. *Malvinda* (Boehm.) DC., Prod. 1 (1824) 459. — *Malvinda* Boehm. in Ludwig, Defin. (1760) 74; Medicus, Malv. (1787) 23.

Prostrate, but mostly ascending or erect herbs or undershrubs. *Leaves* penninerved. Pedicels free from the bract or floral leaf. Style and mericarps 5—14; mericarps with a prominent, reticulate venation, fairly thick-walled, dehiscent for the upper part. *Seeds* usually not released.

*Distribution*: Tropics and subtropics.

6. *Sida acuta* Burm. f., Fl. Ind. (1768) 147; *emend.* K. Sch., in Fl. Bras. 12, 3 (1891) 326; Baker f., J. Bot. 30 (1892) 238.

*See for synonyms and types under the subspecies.*

Erect or ascending, annual undershrub, ½—1½ m; branches often somewhat dorsiventral in which case the leaves are seemingly distichous. *Leaves* ovate, oblong, lanceolate, or linear, unequal-sided at base; petiole much shorter than the blade, 3—6 mm. *Stipules* of each pair different (cf. key on p. 178), 4—11 by ¼—1½ mm. *Flowers* axillary, solitary, by development of an accessory bud in clusters of 2—8 flowers. Pedicel 2—5 mm, usually jointed  $\pm$  at the middle, slightly accrescent. *Calyx* campanulate, 5—6 mm  $\varnothing$ , slightly accrescent, 5-fid; segments triangular, long-acuminate, 2½—3 by 2—2½ mm. *Corolla* 12—15 mm  $\varnothing$ , light yellow, rarely white; petals obliquely obovate, usually emarginate, at base ciliate. *Staminal column* short. *Ovary* globular. *Mericarps* 6—10, mostly 7—8, about tetrahedral, 2—2½ mm long, at apex usually with 2 awns 1—1½ mm long, glabrous. *Seeds* triangularly ovoid, c. 2 mm long, glabrous except for the short hairy hilum, dark brown.

*Note*: Two out of the many names which have been in use for this species occur frequently in the literature on the Malesian flora, viz. *S. acuta* Burm. f., the oldest one, and *S. carpinifolia* L. f. These names refer to two different forms and are only synonymous in a wide concept of the species; these forms are here treated as subspecies.

#### KEY TO THE SUBSPECIES

1. Leaves lanceolate to linear, rarely (the lower ones) ovate to oblong, at base mostly acute, rather coarsely and remotely serrate. Indumentum without or with few simple hairs. Flower in 2(—3)-flowered clusters. . . . . **A. ssp. *acuta***
1. Leaves ovate to oblong, at base mostly rounded, finely and densely serrate, the teeth ending in a simple hair. Indumentum with many simple hairs. Flowers in clusters of up to 8. . . . . **B. ssp. *carpinifolia***

**A. ssp. acuta.** — *S. acuta* Burm. f., Fl. Ind. (1768) 147; Cav., Diss. 1 (1785) 15, t. 2 f. 3; DC., Prod. 1 (1824) 460; Roxb., Fl. Ind. ed. Carey 3 (1832) 171; W. & A., Prod. (1834) 57; Ic. 1 (1838) t. 95; Hassk., Tijds. Nat. Gesch. Phys. 12 (1845) 100; Miq., Pl. Jungh. (1854) 286; A. Gray, Bot. Wilkes U.S. Expl. Exp. (1854) 159; Thw., En. Pl. Zeyl. (1858) 28; Miq., Fl. Ind. Bat. 1, 2 (1858) 143; ? Britten, in Forbes, Natur. Wand., App. 6 (1885) 500; Baker f., J. Bot. 30 (1892) 238; Trimen, Handb. Fl. Ceyl. 1 (1893) 142; Backer, Fl. Bat. 1 (1907) 99; Merr., Philip. J. Sc. 3 (1908) Bot. 77; Gagn., in Fl. Gén. I.-C. 1 (1910) 402; Backer, Schoolfl. Java (1911) 114; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 1; Koord., Exk. Fl. Java 2 (1912) 582; Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 241; Merr., Fl. Manila (1912) 318; Int. Rumph. Herb. Amb. (1917) 356; Sp. Blanc. (1918) 253; En. Born. Pl. (1921) 374; Philip. J. Sc. 19 (1921) 364; Doct. van Leeuwen, Ann. Jard. Bot. Btzg 32 (1922) 173; Merr., En. Philip. Fl. Pl. 3 (1923) 3; Koord., Fl. Tjibodas 2 (1923) 177; Baker f., J. Bot. 62, Suppl. (1924) 11; Craib, Fl. Siam. En. 1 (1925) 149; Heyne, Nutt. Pl. (1927) 1026; Merr., Lingn. Sc. J. 5. (1927) 124; Backer, Onkruidfl. Jav. Suikerr. (1930) 439, atlas t. 414; Van der Pijl, Trop. Natuur 19 (1930) 162; Doct. van Leeuwen, Blumea 2 (1937) 260, 271; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 12; Steen., Fl. Schol. Indon. (1949) 270; Hend., Mal. Wild Flow. 1 (1949) 37; Hu, Fl. China, fam. 153 (1955) 18, t. 16 f. 3; Backer & Bakh. f., Fl. Java 1 (1963) 426. — *S. carpinifolia* var. *acuta* (Burm. f.) Kurz, J. As. Soc. Beng. n.s. 45, ii (1876) 119; O.K., Rev. Gen. Pl. 1 (1891) 73; Specht, Rec. Am.-Austr. Sc. Exp. Arnhem Land 3 (1958) 259. — *S. orientalis* Cav., Diss. 1 (1785) 21, t. 21 f. 1. — *S. lanceolata* Retz., Observ. 4 (1786) 28; Roxb., Hort. Beng. (1814) 50; ? Blume, Cat. (1823) 89; Roxb., Fl. Ind. ed. Carey 3 (1832) 175; Blanco, Fl. Filip. (1837) 548. — *S. frutescens* (non Cav.) Blanco, Fl. Filip. ed. 2 (1845) 384; ed. 3, 2 (1879) 341, t. 366. — *S. stauntoniana* DC., Prod. 1 (1824) 460; Mor., Syst. Verz. (1846) 28; Miq., Pl. Jungh. (1854) 286; Fl. Ind. Bat. 1, 2 (1858) 143; Suppl. (1860) 163; op. cit. (1861) 398. — *S. paucifolia* DC., Prod. 1 (1824) 472; Miq., Fl. Ind. Bat. 1, 2 (1858) 143; Koord., Meded. Lands Plantent. 19 (1898) 360. — *S. carpinifolia* (non L. f.) Mast., in Fl. Br. Ind. 1 (1875) 323; Fern.-Vill., Novis. App. (1880) 22; Vidal, Sinopsis. Pl. Filip., Atlas (1883) 15, t. 16 f. A; Phan. Cuming. Philip. (1885) 97; Rev. Pl. Vasc. Filip. (1886) 63; King, J. As. Soc. Beng. n.s. 60, ii (1891) 40; Merr., Philip. J. Sc. 1 (1906) Suppl. 91; Koord.-Schum., Syst. Verz. 3 (1910) 35; Ridley, J. Fed. Mal. St. Mus. 8, 4 (1917) 22; Fl. Mal. Pen. 1 (1922) 255; J. Mal. Br. R. As. Soc. 1 (1923) 54. — ? *S. malayana* Gandoger, Bull. Soc. Bot. Fr. 71 (1924) 628. — ? *S. subracemosa* Gandoger, l.c. — ? *S. acridentata* Gandoger, l.c. — ? *S. malaccensis* Gandoger, l.c. — ? *S. ridleyi* Gandoger, l.c. — *S. acuta* var. *typica* K. Sch., in Fl. Bras. 12, 3 (1891) 326; Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 241; Nova Guinea 14 (1924) 159. — *S. acuta* var. *intermedia* Hu, Fl. China, fam. 153 (1955) 19. — *S. spinosa* (non L., Sp. Pl.) Linné, in Stickman, Herb. Amb. (1754) 26; Amoen. Acad. 4 (1759) 134. — *S. rhombifolia* (non L.) Merr., Philip. J. Sc. 29 (1926) 392, *quoad specim.* — *Tsjeru-parua* Rheede, Hort. Malab. 10, p. 105, t. 53. — *Sigalurium longifolium* Rumph., Herb. Amb. 6, lib. 10, p. 45, t. 18 f. 2. — ? *Sigalurium album* Rumph., l.c. 45.

Types: *S. acuta* Burm. f.: Java, s. coll. s.n. (lectotype: G); *S. orientalis* Cav.: India Orientalis, *Sonnerat s.n.* (holotype: P-LA); *S. lanceolata* Retz.: India, *König s.n.* (holotype: LD, n.v.); *S. stauntoniana* DC.: China, *Staunton s.n.* (holotype: G-DC); *S. paucifolia* DC.: Timor, *Riedlé ? s.n.* (holotype: G-DC); *S. acuta* var. *intermedia* Hu: Hainan, *Lau 3642* (isotype: P).

Stems, pedicels and petioles sparsely covered with minute stellate hairs, often also with few short simple hairs, or glabrous. *Leaves* lanceolate to linear, rarely (the lower

ones) ovate to oblong, at base mostly acute, more rarely obtuse to rounded, at apex acute,  $1\frac{1}{2}$ — $7\frac{1}{2}$  by  $\frac{1}{2}$ — $2\frac{1}{2}$  cm, rather coarsely and remotely serrate, on both surfaces sparsely covered with stellate hairs or glabrous, above occasionally with few short simple hairs. *Flowers* axillary, solitary, or in clusters of 2(—3). *Calyx* outside with few minute stellate hairs, or glabrous, occasionally also with few short simple hairs, inside glabrous.

*Distribution*: Pantropical, throughout Malesia.

*Ecology*: Common in waste places, road-sides, fallow fields, pastures, secondary growths, teak-forests, plantations etc.; in rice-fields only after harvest; frequently also near the sea; collected up to an altitude of c. 1700 m, but chiefly below c. 100 m (fig. 20, left). According to Van der Pijl (1930, 162) the flowers unfold at about 8.30 in the morning and close or wilt at about 11 h.

*Notes*: Burman's description appears to be insufficient to recognize his species. His citation of plates of Plukenet, Rumphius, and Rheede (the latter two with descriptions), however, does not leave any doubt as to its identity. In Geneva I have not found any specimen with the name in the handwriting of Burman f., but there are three specimens from his collection provided with the Malay names 'Selagori perampuan', 'Selagori pandjang', and 'Selagori laki'. 'Selagori' is undoubtedly a corruption of *sidagori* or *sadagori*, both variations of the vernacular name given to the species in Java. Although Burman f. gave 'India' as the provenance, the type collection came in all probability from Java, as in his time botanists used to have a wide concept of India (*orientalis*). I have chosen one of the specimens mentioned above as a lectotype.

Fischer (Kew Bull. 1932, 52) has considered a specimen collected by König, now in the Herbarium of Lund, to be the holotype of *S. lanceolata* Retz. According to him it belongs to *S. acuta* Burm. f. *sens. str.*

Subsequently Retzius' name was used by Blanco in the first edition of his Flora. In the second and third editions it was replaced by the older *S. frutescens* Cav. I do not know whether the last mentioned name in the original sense (Diss. 1, 1785, 12, t. 10 f. 1) is synonymous with ssp. *acuta*, though the description of Cavanilles evidently deals with a plant belonging to *S. acuta* Burm. f. *sens. lat.* Cavanilles referred to a living plant in the Paris botanical garden. I have not seen a specimen which could be considered the type.

Hu distinguished a var. *intermedia* Hu, said to differ from the common form in China, which is completely glabrous, by sparsely stellate-hairy leaves. I do not consider this variety sufficiently important to represent a separate taxon.

The present subspecies can always be distinguished from *S. rhombifolia* L. by its peculiar stipules. The nerves of the leaves of ssp. *acuta* are underneath paler green than the intervenium; this can mostly also be observed in dried specimens. In addition it may be useful to state that I have never seen Malesian specimens of *S. rhombifolia* L. with simple hairs.

Both ssp. *acuta* and ssp. *carpinifolia* have often been confused with *Malvastrum coromandelianum* (L.) Garcke, but that has always strigose stellate hairs of which the arms are in line and possesses an epicalyx.

**B. ssp. *carpinifolia* (L. f.) Borss., stat. nov.** — *S. carpinifolia* Linné f., Suppl. (1781) 307; Cav., Diss. 1 (1785) 21; op. cit. 5 (1788) 274, t. 134 f. 1; DC., Prod. 1 (1824) 461. — *Malvastrum carpinifolium* (L. f.) A. Gray, Mem. Am. Acad. Sc. II, 4 (Pl. Fendl.) (1849) 22, *haud quoad specim.* — *S. acuta* var. *carpinifolia* (L. f.) K. Sch., in Fl. Bras. 12, 3 (1891) 326; Baker f., J. Bot. 30 (1892) 238. — *S. acuta* var. *hispida* K. Sch., in Fl. Bras. 12, 3 (1891) 327.

Types: *S. carpinifolia* L. f.: Madera, Masson *s.n.* (holotype: ? LINN); *S. acuta* var. *hispida* K. Sch.: Peru, Lechler 2398 (*n.v.*).



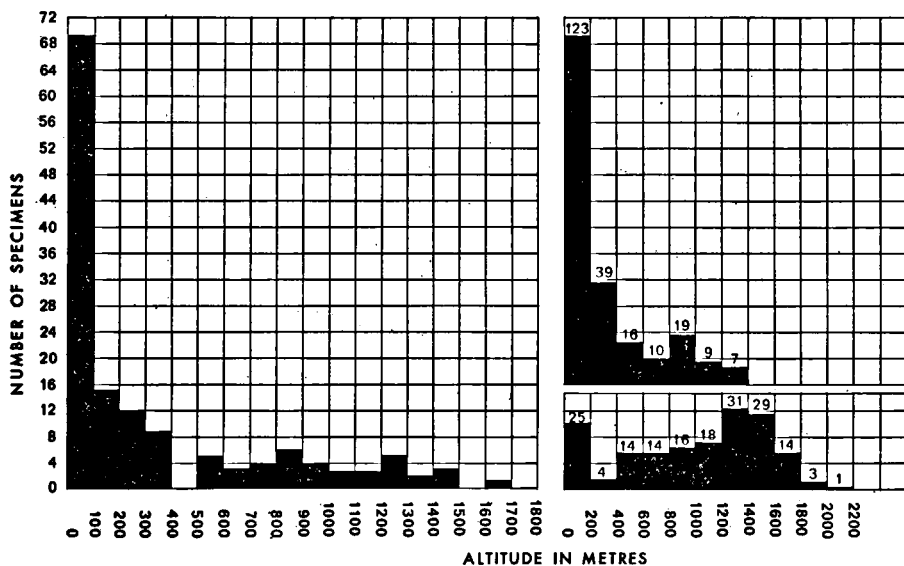


Fig. 20. Left graph: relation between number of specimens and altitude in *Sida acuta* Burm. f. sens. str.

Right graphs: Similar relation in the two subspecies of *Urena lobata* L. (*ssp. sinuata* above, *ssp. lobata* below); the 25 collections of *ssp. lobata* from 0—200 m are mainly from Medan and vicinity (NE. Sumatra), Singapore, the Riouw-Lingga Islands, and Djambi.

Stems, pedicels and petioles usually stouter than in *ssp. acuta*, more or less densely covered with long patent simple hairs, also with scattered minute stellate hairs, glabrescent. *Leaves* ovate to oblong, at base mostly rounded, occasionally obtuse, at apex acute, larger than in *ssp. acuta*, 2—1.5 by  $\frac{1}{2}$ —6 cm, finely and densely serrate, the teeth ending in a simple hair, on both surfaces with scattered minute stellate hairs, glabrescent. *Flowers* axillary, solitary, finally in clusters of up to 8. *Calyx* outside with scattered minute stellate hairs and long simple hairs, inside glabrous.

*Distribution*: Tropics of America and Africa; locally in the Pacific Islands, e.g. Hawaiian Is., Kawai I., Heller 2424 (L). I have not seen any specimen from tropical Asia (mainland) or from Australia. In Malesia presumably only adventitious, once in Central W. Sumatra, once in Luzon (Bontoc), also cultivated in the Botanic Gardens at Bogor.

*Notes*: It is surprising, that the original description of *S. carpinifolia* L. f., which is actually very clear, has caused so much confusion. The accuracy of the younger Linné may be illustrated by the fact that he mentioned the teeth of the leaves ending in a simple hair, 'serraturis terminatis pilo s. seta rigida'. This character is always present, and does not occur in *ssp. acuta*.

I have been looking for a type specimen in the herbarium of J. E. Smith (LINN), but I have found only a good specimen of this form, mounted on a blank sheet, without any annotation. Since it is known (cf. Savage, Catalogue of the Linnaean herbarium, 1945) that Linnaeus f. in dealing with specimens was less careful than his father, it is well possible that this specimen, which matches the description very well, is the type. Anyway it is illustrative for my interpretation.

I have not seen the type of *S. acuta* var. *hispida* K. Sch., but judging from the description it must be looked upon as belonging to the present subspecies.

*Ssp. carpinifolia* has often been confused with *Malvastrum coromandelianum* (L.) Garcke for which I refer to the note under *ssp. acuta*.

**7. *Sida glutinosa*** Commerson ex Cav., Diss. 1 (1785) 16, t. 2 f. 8; DC., Prod. 1 (1824) 464; Baker f., J. Bot. 30 (1892) 293, *excl. synonym. p.p.*; Craib, Fl. Siam. En. 1 (1931) 150; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 12; Backer & Bakh. f., Fl. Java 1 (1963) 426. — *S. nervosa* DC., Prod. 1 (1824) 465; Wall., Cat. (1828) n. 1853, *p.p.* — *S. viscidula* Blume, Bijdr. 2 (1825) 76; Hassk., Tijds. Nat. Gesch. Phys. 12 (1845) 99; Miq., Fl. Ind. Bat. 1, 2 (1858) 139. — *S. paniculata* (non L.) Backer, Ann. Jard. Bot. Btzg Suppl. 3 (1910) 413; Schooffl. Java (1911) 114; Koord.-Schum., Syst. Verz. 1, fam. 175 (1911) 2; Koord., Exk. Fl. Java 2 (1912) 582.

Types: *S. glutinosa* Cav.: Mauritius, Commerson *s.n.* (lectotype: P-JU 12278A); *S. nervosa* DC.: Santo Domingo, Bertero *s.n.* (holotype: G-DC); *S. viscidula* Blume: ? *Blume s.n.* (holotype: L 908.139-1221).

Erect, viscid undershrub, 1–2 m. Stems, petioles, axes of inflorescences, and pedicels with patent, simple hairs and gland-hairs, also with scattered, stellate hairs, glabrescent. *Leaves* widely ovate to oblong, upper ones to lanceolate, at base cordate, at apex acuminate, occasionally acute or even obtuse, 1–10 by  $\frac{1}{2}$ –6 cm, regularly crenate to serrate to almost entire, penninerved, at base 7–9-nerved, stellate-hairy, especially beneath; petiole usually 3–6 cm. *Stipules* linear, c. 10 mm. *Flowers* axillary, solitary, by decrease of upper leaves in finally a widely branched, lax panicle. Pedicel thin, 7–15 mm, accrescent to c. 20 mm, jointed at  $\frac{1}{3}$  to  $\frac{1}{2}$  from apex. *Calyx* widely campanulate, 4–5 mm high and 3–4 mm  $\varnothing$ , slightly accrescent, 5-lobed, with rounded incisions; segments shortly triangular, acuminate, 1–1 $\frac{1}{2}$  by c. 1 mm; calyx outside with many gland-hairs and few simple hairs, inside glabrous. *Corolla* c. 8 mm  $\varnothing$ , yellow; petals deeply emarginate. *Mericarps* 5, trigonous, 2–3 mm long, radially and tangentially c. 1 $\frac{1}{2}$  mm, dorsally faintly reticulately nerved, with gland-hairs, at apex with simple hairs and erecto-patent hairy awns 2 $\frac{3}{4}$ –1 $\frac{1}{4}$  mm long. *Seeds* oblong to reniform, c. 1 $\frac{1}{2}$  mm  $\varnothing$ , glabrous, brown-black.

*Distribution*: Native in tropical America, introduced in some places in SE. Asia. It is impossible to derive its exact distribution there from literature, owing to a frequent confusion of this species with *S. mysorensis* W. & A. (= *S. glutinosa* Roxb., non Cav.) and *S. paniculata* L. The lectotype is from Mauritius; I have also seen specimens from Réunion collected by d'Alleizette (L, P). In Malesia locally in West Java. There is one specimen labelled SE. Borneo (leg. Korthals), but that may be erroneously localized and have come from Java.

*Ecology*: Waste places and road-sides, up to c. 300 m.

*Notes*: The type collection of *S. glutinosa* Cav. was cited by Cavanilles as follows: 'Habitat in Insulis S. Dom. et Franciae. Hic eam observavit Commerson. V. S. communic. a D. Thouin, et aliud exemplar americanum a D. de Jussieu.' Although the clause 'V. S. communic. a D. Thouin' suggests that the type specimen would be present at Madrid, I failed to find one there. At Paris, however, in the herbarium De Jussieu, there is a specimen from Santa Dominica as well as a specimen from Mauritius (Isle de France), both collected by Commerson. Since the former specimen is a rather poor one, I have chosen the latter one, which is accompanied by a label with the name apparently in the handwriting of Cavanilles, as the lectotype.

I have found neither at Paris nor at Leyden a specimen accompanied by a label with the name *Sida viscidula* Blume in the handwriting of Blume. At Leyden there is an old specimen (L 908.139-1221) well matching the description, which bears a label with

'e Hort.' and 'Sida viscidula' in the handwriting of Korthals. Since Blume stated 'Habitat: in locis cultis' after the description, I consider this specimen to be the holotype, assuming that Blume omitted to label it. *S. viscidula* Blume is undoubtedly conspecific with the present species.

Cavanilles questioned whether *S. racemosa* Burm. f. (Fl. Ind. 1768, 148) could be synonymous with *S. glutinosa* Cav. Merrill (Philip. J. Sc. 19, 1921, 364) believed it to be identical with *S. mysorensis* W. & A. which seems to be more likely since the latter apparently is endemic in tropical Asia, whereas the former has been introduced from America. I have not seen a type specimen of the former. In my opinion the poor description does not permit a definite conclusion on its identity. See also under *S. mysorensis* W. & A.

Backer (1911, 114) and Koorders (1912, 582) erroneously referred their Javanese specimens to *S. paniculata* L. The latter, though resembling *S. glutinosa* Cav. in habit, differs by having smaller flowers with dark violet, usually reflexed petals and a relatively long staminal tube, and moreover by completely dehiscent mericarps without awns.

**8. *Sida spinosa*** Linné, Sp. Pl. (1753) 683; Cav., Diss. 1 (1785) 11, t. 1 f. 9; DC., Prod. 1 (1824) 460; Benth., Fl. Austr. 1 (1863) 196; Mast., in Fl. Br. Ind. 1 (1875) 323; F. v. M., Descr. Not. Pap. Pl. 4 (1876) 55; Rolfe, J. Bot. 23 (1885) 210; K. Sch., in Fl. Bras. 12, 3 (1891) 297; Baker f., J. Bot. 30 (1892) 237; Trimen, Handb. Fl. Ceyl. 1 (1893) 142; Bailey, Queensl. Fl. 1 (1899) 114; ? Ridley, J. Str. Br. R. As. Soc. 45 (1906) 174; Backer, Schoolfl. Java (1911) 114; Ewart & Davies, Fl. North. Terr. (1917) 184; Domin, Bibl. Bot. 22 (1928) 944; Hochr., in Fl. Madag. fam. 129 (1955) 150, t. 35 f. 1, 2. — *Malvinda spinosa* (L.) Medicus, Malv. (1787) 23. — *Malva spinosa* (L.) Krause, in Sturm, Fl. Deutschl. ed. 2, 6 (1902) 244. — *S. alnifolia* (non L.) Cav., Diss. 1 (1785) 12, t. 1 f. 13; DC., Prod. 1 (1824) 461.

See for further synonymy and type under *b. var. angustifolia*.

Type: Herb. Linn. n. 866.1 (lectotype: LINN).

Erect, annual or perennial undershrub, up to c.  $\frac{1}{2}$  m. Stems, petioles and pedicels cinereous by minute, stellate hairs. Leaves ovate to oblong, or lanceolate to linear, rarely orbicular, at base and at apex rounded to obtuse, or acute, 10–40 by 3–22 mm, regularly serrate, at base 3-nerved, penninerved, cinereous on both surfaces by minute stellate hairs, glabrescent above; petiole 2–15 mm. Stipules linear, 2–4 mm. Flowers axillary, solitary or in clusters of 2–5 flowers. Pedicel 2–5 mm, accrescent to c. 10 mm, jointed about the middle. Calyx widely campanulate, 3–5 mm  $\varnothing$ , somewhat accrescent, 5-lobed; segments triangular, acute to acuminate, 1–2 by  $1\frac{1}{2}$ –2 mm; calyx outside cinereous by minute stellate hairs and scattered simple hairs, inside glabrous. Corolla small, yellow. Mericarps 5, trigonous, 2–3 mm long, at apex with two short horns or awns up to 1– $1\frac{1}{2}$  mm long, dorsally with a strongly prominent-reticulate venation, at apex short stellate-hairy as are the awns. Seeds ovoid, obscurely trigonous, c.  $1\frac{1}{2}$  mm long, glabrous, dull brown-black.

*Distribution*: Pantropical, rare in Malesia: W. Java (Djakarta), the Lesser Sunda Islands (Timor), Central W. Celebes (Palu), the Philippines (Luzon; Mindanao: Cotabatu; Paragua I.), and SE. New Guinea (Moresby) and adjacent islets Thursday and Jervis I. Also reported from Christmas I. (Indian Ocean, S. of Java) but I have not seen specimens from there.

*Ecology*: Heliophilous, found as a ruderal in waste places and along road-sides, obviously in Malesia with a preference for a severe seasonal climate (cf. p. 16).

*Notes*: In the first edition of Species Plantarum Linnaeus gave for *S. spinosa* L. the

same phrase which he had used in the earlier Hortus Upsaliensis and in Flora Zeylanica, to which works he referred. The only specimen in the Linnean herbarium, 866.1, has no annotation 'HU' on the sheet, but is marked number '1', which corresponds with the number of the species in Species Plantarum and which is *S. spinosa* L. The sheet in Hermann's herbarium on which the entry in Flora Zeylanica was based, viz. vol. I, fol. 4, n. 254, does not belong to *S. spinosa* L., but probably to *S. cordifolia* L. The third element of the protologue is the reference to Hortus Cliffortianus. The relevant specimen in Clifford's herbarium is conspecific with the one in the Linnean herbarium. The remaining elements only refer to plates with descriptions.

*S. alnifolia* L. as interpreted by Cavanilles, followed by De Candolle, falls according to its description under *S. spinosa* L. Cavanilles refers to a specimen collected by Commerçon in Réunion, which was apparently sent to him by Thouin. In Madrid I failed to locate that specimen, but in the herbier De Jussieu at Paris there is one, n. 12260, which I consider a duplicate.

*S. spinosa* has often been confused with *S. rhombifolia* L., but can be distinguished from the latter by the styles and the mericarps always being 5 in number, and by the spine-like scars of the fallen stipules. The mericarps have a more prominent-reticulate venation than in *S. rhombifolia* L.

#### KEY TO THE VARIETIES

1. Leaves ovate to oblong, rarely orbicular . . . . . a. var. *spinosa*  
 1. Leaves lanceolate to linear . . . . . b. var. *angustifolia*

#### a. var. *spinosa*.

*Distribution*: The same as the species, see above.

**b. var. *angustifolia*** (Lamk, non Mill.) Griseb., Fl. Br. W. Ind. Is. (1859) 74; K. Sch., in Fl. Bras. 12, 3 (1891) 298; Baker f., J. Bot. 30 (1892) 237; Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 242. — *S. angustifolia* Lamk, Encycl. 1 (1783) 4, non Mill. 1768; Cav., Diss. 1 (1785) 14, t. 2 f. 2; L'Hérit., Stirp. Nov. 1 (1789) 109, t. 52; DC., Prod. 1 (1824) 291.

Type: *s. loc.*, *s. coll. s.n.* (holotype: P-LA).

*Distribution*: In Malesia only found in the Philippines (Luzon: *Cuming* 431; Paragua I.: *Merrill* 710).

*Note*: Lamarck refers to a living specimen in the 'Jardin du Roi'. In Lamarck's herbarium there is a specimen fitting the description, without locality, which I consider to be the holotype.

Merrill (En. Philip. Fl. Pl. 3, 1923, 35) referred *S. spinosa* to *S. rhombifolia*.

**9. *Sida parvifolia*** DC., Prod. 1 (1824) 461; Baker f., J. Bot. 30 (1892) 291, *excl. synonym.* *S. microphylla* Cav.; Hochr., in Fl. Madag. fam. 129 (1955) 148, t. 35 f. 13, 14. — *S. discolora* Baker f., J. Bot. 30 (1892) 291, non *S. discolor* Hook., 1834. — *S. humilis* var. *veronicifolia* (non Lamk) Span., Linnaea 15 (1841) 172. — *S. javensis* (non Cav.) Span., l.c.

Types: *S. parvifolia* DC.: Réunion (Bourbon), *Bory s.n.* (holotype: G-DC); *S. discolora* Baker f.: Sumba, *Teysmann HB 10804* (holotype: K; isotypes: BO, FI ex Herb. Beccari 1567, L).

Prostrate herb with trailing or ascending branches up to c. 60 cm long, usually rooting at the joints. Stems, petioles and pedicels cinereous by minute stellate hairs, glabrescent. *Leaves* orbicular to broadly ovate, at base rounded to obtuse or acute, rarely shallowly

cordate, at apex rounded to obtuse,  $\frac{1}{2}$ — $2\frac{1}{2}$  by  $\frac{1}{2}$ —2 cm, crenate to serrate, at base entire, penninerved, at base 3—5-nerved, beneath cinereous by minute stellate hairs, above with scattered minute stellate and simple hairs, glabrescent; petiole 2—5 mm. *Stipules* linear, 1—2 mm. *Flowers* axillary, solitary. Pedicel 2—10 mm, slightly accrescent, jointed near apex. *Calyx* widely campanulate, 3—5 mm high, 2—5 mm  $\varnothing$ , slightly accrescent, 5-lobed; segments broadly triangular, acute to slightly acuminate,  $2-2\frac{1}{2}$  by 2—3 mm, outside cinereous by stellate hairs, inside almost glabrous. *Corolla* exceeding the calyx, yellow. *Mericarps* 5, trigonous, c. 2 mm long, on top with 2 short horns, short-hairy or glabrous. *Seeds* ovoid, slightly trigonous, glabrous, dull black.

*Distribution:* Owing to a frequent confusion of *S. parvifolia* DC. with other species, for example *S. spinosa* L., *S. rhombifolia* L., *S. cordata* (Burm. f.) Borss., etc., it is difficult to ascertain its distribution from literature. It has been found on the Pacific Islands, on Réunion, the Seychelles and occurs in Malesia only in the Lesser Sunda Islands (Sumba, Timor) and in the Philippines (Babuyan Is.), a rare species.

*Ecology:* In Malesia it prefers coralline sea shore sites and a seasonally dry climate as far as can be concluded from the few collections available.

*Notes:* Baker f. (1892, 291) considered *S. parvifolia* DC. a synonym of *S. microphylla* Cav., but Cavanilles stated that his species possesses 7 birostrate carpels. The type of the latter species, viz. 'India Orientalis, Sonnerat s.n.' (P-LA) has no fruits (anymore), but judging from its habit, it could be a form of *S. rhombifolia* L. *sens. lat.* [cf. *S. rhombifolia* var. *microphylla* (Cav.) Mast., in Fl. Br. Ind. 1, 1875, 324].

Although the type specimens of *S. discolora* Baker f., and the other Lesser Sunda Islands specimens differ by shorter pedicels and by slightly smaller flowers, I do not consider this sufficient for specific distinction. The collection of *Teysmann HB 10809* is provided with labels with 'Timor' printed or written on them; part of the specimens have in addition a label with the locality 'Soemba Kadoemba'. The specimen *BO 59267* bears a label with this locality in the handwriting of Teysmann himself. Therefore it is probable that the type is from Sumba rather than from Timor.

**10. *Sida rhombifolia* Linné, Sp. Pl. (1753) 684; emend. Mast., in Fl. Br. Ind. 1 (1875) 323; Benth., Fl. Austr. 1 (1863) 196; King, J. As. Soc. Beng. n.s. 60, ii (1891) 41; K. Sch., in Fl. Bras. 12, 3 (1891) 337; Baker f., J. Bot. 30 (1892) 239; Koord., Med. Lands Plantent. 19 (1898) 360; Bailey, Queensl. Fl. 1 (1899) 115; Backer, Fl. Bat. 1 (1907) 100; Gagn., in Fl. Gén. I.-C. 1 (1910) 405; Backer, Schoolfl. Java (1911) 115; Koord., Exk. Fl. Java 2 (1912) 582; Merr., En. Born. Pl. (1921) 374; Ridley, Fl. Mal. Pen. 1 (1922) 254; Backer & Sloot., Jav. Theeconkr. (1924) 170, t. 170; Craib, Fl. Siam. En. 1 (1925) 151; Heyne, Nutt. Pl. (1927) 1026; Steen., Fl. Schol. Indon. (1949) 270; Hend., Mal. Wild Flow. 1 (1949) 38; Hochr., in Fl. Madag. fam. 129 (1955) 146.**

*See for synonyms and types under the subspecies.*

Annual or perennial undershrub. Stems, petioles, and pedicels cinereous by minute stellate hairs, glabrescent. *Leaves* towards the base entire, apically serrate to crenate, penninerved, at base 3(—5)-nerved, above with scattered, minute, stellate hairs or glabrous, beneath cinereous by minute stellate hairs, exceptionally tomentose; petiole 1—30 mm. *Stipules* filiform, 3—10 mm. *Flowers* axillary, mostly solitary, sometimes in clusters of 2—5 flowers. *Calyx* campanulate, 9—12 mm  $\varnothing$ , 5-lobed to -fid; segments triangular to ovate, acuminate; calyx with 5 prominent costae, moreover with 5 prominent nerves to the sinuses splitting into slightly prominent marginal nerves, outside with scattered minute stellate hairs, inside glabrous or nearly so. *Corolla* yellow to pale orange; petals cuneate, mostly more or less oblique,

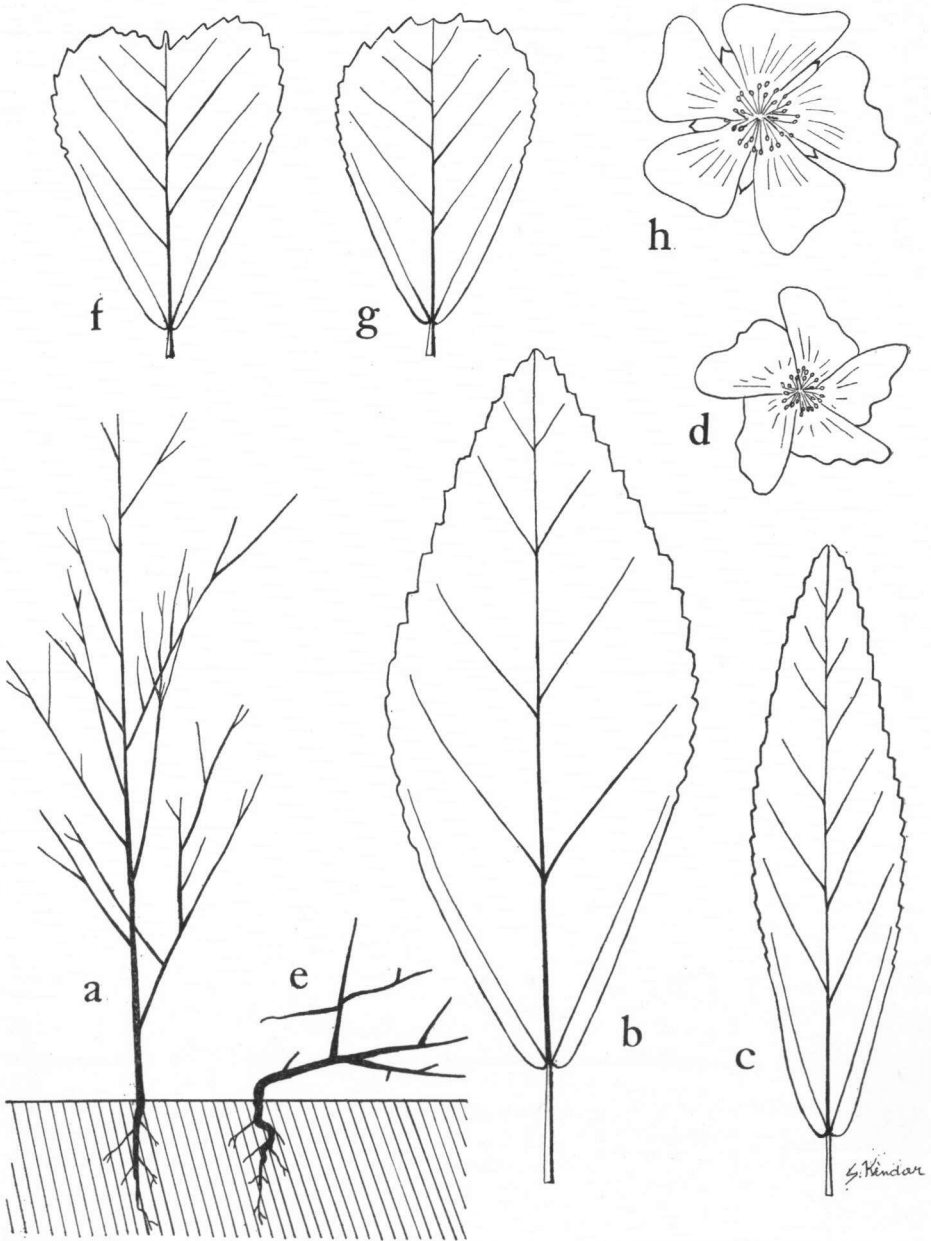


Fig. 21. *Sida rhombifolia* L. ssp. *rhombifolia*. a. Scheme of branching habit, b-c. leaves, d. flower. — Ssp. *retusa* (L.) Bors. e. Scheme of branching habit, f-g. leaves, h. flower (b-d, f-h,  $\times 2$ ).

usually emarginate, glabrous or nearly so. *Staminal column* c. 3 mm long, short-hairy or glabrous. *Ovary* conical, c.  $1\frac{1}{2}$  mm  $\varnothing$ , minutely stellate hairy; styles 9—12. *Mericarps* 9—12, flattened trigonous,  $2\frac{1}{2}$ — $3\frac{1}{2}$  mm high, radially c.  $2\frac{1}{2}$  mm, tangentially c. 2 mm, at apex mucicous, with 2 short mucros, or with 2 awns 1—3 mm long, dorsally and on the awns stellate hairy or glabrous. *Seeds* flattened reniform, c. 2 mm  $\varnothing$ , glabrous, dark brown or black.

*Distribution*: Tropical and subtropical regions of both the Old and the New World, common throughout Malesia.

*Ecology*: Common in waste places, road-sides, pastures, fallow fields, plantations, teak-forests, etc., in flooded rice-fields only after harvest. In pastures usually only ssp. *retusa* is found, which may be due to its growth habit which probably gives more protection against browsing and trampling. Under both everwet and seasonal climatic conditions, from sea-level up to 1800 m.

*Notes*: In 1875 Masters substantially widened the circumscription of *S. rhombifolia*; this was followed by many subsequent authors and is also accepted here.

The Malesian material can be divided into two groups, known in literature mostly as *S. rhombifolia* and *S. retusa*. Most authors differentiated them by leaf-shape. Ridley (1922) pointed to difference in habit: 'tall, slender plant' and 'more condensed and woody' respectively. Backer (1943) recognized the difference in flower size. I have formerly discussed the differences (Trop. Natuur 33, 1953, 21—29); see fig. 21.

Although the forms may grow side by side, transitional specimens seem to be very rare, if they occur at all. I do not believe that those described under the names *S. philippica* DC., *S. semicrenata* Link, and *S. rhombifolia* var. *obovata* Wall. ex Mast. represent transitions. The absence of intermediates may, at least in part, be due to the fact that the anthesis of the two forms does not overlap, by which the chance of cross-fertilisation is reduced.

Because the differences between the groups are several they can not merely be regarded as varieties and I have consequently given them the rank of subspecies.

#### KEY TO THE SUBSPECIES

1. Erect undershrub, mostly with ovate to oblong, rhomboid or lanceolate leaves. Pedicels much longer than the petioles, up to c. 40 mm. Corolla 15—17 mm  $\varnothing$  . . . . . **A. ssp. *rhombifolia***  
 1. Prostrate or ascending undershrub, mostly with obovate to orbicular leaves. Pedicels  $\pm$  as long as the petioles or slightly longer, up to c. 30 mm. Corolla 20—25 mm  $\varnothing$  . . . . . **B. ssp. *retusa***

**A. ssp. *rhombifolia***. — *S. rhombifolia* Linné, Sp. Pl. (1753) 684; Cav., Diss. 1 (1785) 23, t. 3 f. 12; op. cit. 2 (1786) 47; DC., Prod. 1 (1824) 462; Roxb., Fl. Ind. ed. Carey 3 (1832) 176; Hassk., Tijds. Nat. Gesch. Phys. 12 (1845) 101; ? A. Gray, Bot. Wilkes U.S. Expl. Exp. (1854) 158; Miq., Pl. Jungh. (1854) 286; Fl. Ind. Bat. 1, 2 (1858) 142; Suppl. (1860) 163; op. cit. (1861) 398; Fern.-Vill., Novis. App. (1880) 22; ? Britten, in Forbes, Natur. Wand. App. 6 (1885) 500; K. Sch., Bot. Jahrb. 9 (1887) 209; K. Sch. & Hollr., Fl. Kaiser Wilhelmsl. (1889) 55; Warb., Bot. Jahrb. 13 (1891) 374; Trimen, Handb. Fl. Ceyl. 1 (1893) 143; K. Sch. & Laut., Fl. Deutsch. Schutzgeb. Südsee (1901) 436; Perk., Fragm. Fl. Philip. (1904) 109; Merr., Philip. J. Sc. 1 (1906) Suppl. 91; op. cit. 3 (1908) Bot. 77, 420; op. cit. 5 (1910) Bot. 361; Fl. Manila (1912) 318; Philip. J. Sc. 11 (1916) Bot. 290; Ridley, J. Fed. Mal. St. Mus. 8, 4 (1917) 22, p.p.; Merr., Sp. Blanc. (1918) 252; En. Philip. Fl. Pl. 3 (1923) 35, *excl. synonym. S. retusa* L.; ? Baker f., J. Bot. 62, Suppl. (1924) 11; Bartlett, Pap. Mich. Ac. Sc. 6 (1926) 30; Domin, Bibl. Bot. 22 (1928) 944; ? C. T. White, J. Arn. Arb. 10 (1929) 238; Van der Pijl, Trop. Natuur 19

(1930) 165; Merr., *Lign. Sc. J.* 9 (1930) 40; Backer, *Bekn. Fl. Java* (em. ed.) 4C (1943) fam. 109, p. 14; *Hend., Mal. Wild Flow.* 1 (1949) f. 27; Borss., *Trop. Natuur* 33 (1953) 22, f. 2, 3a-d; Meeuse, *Fl. Zamb.* 1 (1961) 480, t. 92 f. A; Backer & Bakh. f., *Fl. Java* 1 (1963) 427. — *Napaea rhombifolia* (L.) Moench, *Meth. Pl.* (1794) 621. — *Malva rhombifolia* (L.) Krause, in *Sturm, Fl. Deutschl.* ed. 2, 6 (1902) 238. — *S. alba* (non L.) Cav., *Diss.* 1 (1785) 22, t. 3 f. 8; op. cit. 2 (1786) 48. — ? *S. orientalis* Cav., *Diss.* 1 (1785) 21, t. 12 f. 1; Hu, *Fl. China*, fam. 153 (1955) 18. — *S. semicrenata* Link, *En. Hort. Berol.* 2 (1822) 202; DC., *Prod.* 1 (1824) 472; Blanco, *Fl. Filip.* ed. 2 (1845) 384; ed. 3, 2 (1879) 341, t. 248. — *S. rhombifolia* var. *typica* K. Sch., in *Fl. Bras.* 12, 3 (1891) 324, t. 63; Backer, *Fl. Bat.* 1 (1907) 101; Hochr., *Nova Guinea* 14 (1924) 159; Onkruidfl. Jav. Suikerr. (1930) 440, atlas t. 415 (left). — *S. rhomboidea* Roxb. ex Fleming, *As. Res.* 6 (1810) 178; ed. 2, 11 (1812) 178; Roxb., *Hort. Beng.* (1814) 50; DC., *Prod.* 1 (1824) 462; Roxb., *Fl. Ind.* ed. Carey 3 (1832) 176; W. & A., *Prod.* (1834) 57; Decne, *Herb. Timor.* (1835) 105; Span., *Linnaea* 15 (1841) 171. — *S. rhombifolia* var. *rhomboidea* (DC.) Mast., in *Fl. Br. Ind.* 1 (1875) 324; Ridley, *Fl. Mal. Pen.* 1 (1922) 255. — *S. compressa* DC., *Prod.* 1 (1824) 462. — *S. philippica* DC., l.c.; Miq., *Fl. Ind. Bat.* 1, 2 (1858) 142. — *S. rhombifolia* var. *obovata* Wall. ex Mast., in *Fl. Br. Ind.* 1 (1875) 324; Baker f., *J. Bot.* 30 (1892) 239. — *S. obovata* Wall., *Cat.* (1828) n. 1864, nom. nud. — *S. rhombifolia* var. *typica* forma *aristata* et *mutica* Backer, *Fl. Bat.* 1 (1907) 101. — *S. rhombifolia* var. *typica* forma *umbrosa* Hochr., *Ann. Cons. Jard. Bot. Genève* 15–16 (1912) 242. — *S. rhombifolia* var. *pedunculata* Hochr., *Nova Guinea* 14 (1924) 159. — **Fig. 21a-d.**

Types: *S. rhombifolia* L.: Herb. Clifford (lectotype: BM); *S. alba* (non L.) Cav.: s. coll. s.n. (holotype: MA); *S. semicrenata* Link: Manila, *Merrill Sp. Blanc.* 450 (neotype: US; isotypes: A, BO, K, L, P); *S. rhomboidea* Roxb. ex Fleming: s. loc., s. coll. c. n. 2228 (lectotype: BR—Herb. Mart.); *S. philippica* DC.: Philippines, ? *Perrottet s.n.* (holotype: G-DC ex Herb. Thibaud); *S. compressa* DC.: Nepal, *Wallich 1866* (holotype: G-DC; isotype: K-W); *S. rhombifolia* var. *obovata* Wall. ex Mast.: Birma, *Wallich 1864* (lectotype: K-W); *S. rhombifolia* var. *typica* forma *umbrosa* Hochr.: Java, Depok, *Hochreutiner 2542* (lectotype: G); *S. rhombifolia* var. *pedunculata* Hochr.: New Guinea, Manokwari, *Janowsky 510* (lectotype: L; isotypes: BO, G, K, U).

Stout, erect undershrub,  $\frac{1}{2}$ –1 $\frac{1}{2}$  m high, with many erect to erecto-patent branches. Stems and other herbaceous parts very often tinged red. *Leaves* usually ovate to oblong, often more or less rhomboid, occasionally lanceolate, rarely long obovate, at base acute to obtuse or rounded to truncate, often slightly cordate, at apex obtuse to acute, occasionally acuminate, rarely rounded,  $\frac{1}{2}$ –10 by  $\frac{1}{3}$ –5 $\frac{1}{2}$  cm. Pedicels usually much longer than the petiole, up to c. 40 mm, jointed at  $\frac{1}{3}$ – $\frac{1}{4}$  from apex. *Calyx* 4–5 mm long during flowering, after anthesis up to 6–7 mm. *Corolla* 15–17 mm  $\varnothing$ ; petals very oblique. *Mericarps* mostly muticous or with 2 short mucros, occasionally with 2 awns 1–3 mm long.

*Distribution:* From Malesia I have examined c. 225 collections but of ssp. *retusa* c. 425. Where I collected I never had an impression that ssp. *retusa* is more common than ssp. *rhombifolia*. It is possible that the higher frequency of ssp. *retusa* in herbaria is caused by the preference of collectors to collect during the cool morning hours, when the nice bright flowers of ssp. *retusa* are open and attract attention, whereas those of ssp. *rhombifolia* unfold their less showy flowers at noon.

From Borneo I have seen only one sheet, viz. s. loc., *Korthals s.n.* (L).

*Ecology:* The flowers of ssp. *rhombifolia* begin to unfold late in the morning or about at noon, and fade early in the afternoon (see also Van der Pijl, *Trop. Natuur* 19, 1930, 165; Doct. van Leeuwen, op. cit. 22, 1933, 150–155; *Ann. Jard. Bot. Btzg* 48, 1938, 30–34; Borss., *Trop. Natuur* 33, 1953, 21–29).



*Notes:* Since Linnaeus used in *Species Plantarum* as phrase name for *S. rhombifolia* L. the one he introduced in 'Viridarium Cliffortianum' and 'Hortus Cliffortianus' I have chosen the appertaining specimen in Clifford's herbarium as the lectotype. The specimens are in accordance with the Linnean phrase, and of better quality than those in the Linnean herbarium (Savage's numbers 866.3, 4), and also than the specimen in Hermann's herbarium (Vol. II, fol. 11, n. 252), which I all consider to be paratypes. The mericarps of the lectotype possess short awns, an observation which may be of use to taxonomists who like to distinguish varieties with awns and such without awns (cf. Backer, 1907, 101).

*S. alba* (non L.) Cav. is conspecific with *S. rhombifolia* L., and belongs to the present subspecies, as can be concluded from Cavanilles's description and figure. With 'Vidi vivam in R. h. P.' he referred to a living specimen in the Paris botanical garden. In the Madrid herbarium there is a specimen which is in accordance with the description and accompanied by a part of Cavanilles's manuscript dealing with *S. alba* Cav.; this is consequently the type.

As to *S. rhomboidea* Roxb., most authors referred to his *Hortus Bengalensis* (1814), or to the second edition of his *Flora Indica*, but it was already validly published by Fleming in 1810, as stated by Hu (1955, 18). Fleming undoubtedly described his species after a specimen named by Roxburgh. I have seen two specimens accompanied by a label with the name in Roxburgh's handwriting, viz. a sheet at Brussels (Herb. Martius), and one in Wallich's collection at Kew (*Wallich 1862E*). The latter specimen consisting of 2 branches belongs in my opinion to *S. spinosa* L. It has 5 mericarps per fruit, whereas *S. rhomboidea* Roxb. ex Fleming has 10 or about 10, according to the descriptions of Fleming and Roxburgh. Roxburgh (1832, 176) wrote: 'It differs from *rhombifolia* (LINN.) in the arils having no horns.' In addition, the Wallich specimen does not fit the description regarding the leaf-shape. It is obviously misidentified. The specimen at Brussels matches the description very well and is here designated as the lectotype.

I am not sure that *S. orientalis* Cav. should be considered a synonym of *S. rhombifolia* L. *sens. str.* Judging from the description it could be a form of the latter. Cavanilles referred to a specimen collected by Sonnerat in 'India Orientalis', in Lamarck's herbarium. In that herbarium I have seen only one sheet bearing a label with Cavanilles's name, but not in his handwriting. This specimen is very poor, but seems to me to belong to *S. acuta* Burm. f. Baker f. (1892, 238, 239) mentioned *S. orientalis* Cav. in the synonymy of *S. acuta* Burm. f., as well as in that of *S. rhombifolia* L., without explaining this discrepancy. I have not seen the specimens cited by Hu (1955, 18) under her concept of *S. orientalis* Cav., but judging from her description, and observing the fact that she cited *S. rhomboidea* Roxb. ex Fleming as a synonym, it seems likely that these specimens rather belong to the present subspecies. Similarly as Roxburgh she attached too much value to the presence or absence of awns on the mericarps in *S. rhombifolia* L. and relatives. Also in her key to the species of *Sida* she distinguished *S. orientalis* Cav. from *S. rhombifolia* L. by the fruits being muticous, that is, without awns.

*S. semicrenata* Link, *S. philippica* DC., and *S. rhombifolia* var. *obovata* Mast. represent the same form of *S. rhombifolia* L. which has at least partly long obovate, at apex more or less rounded leaves. This could point to ssp. *retusa*, but the flowers agree with those of ssp. *rhombifolia*. The type material of the first binomial which came from Manila, is lost. Blanco's description of *S. semicrenata* and the specimens of Merrill, *Sp. Blanc. 450*, are identical with *S. semicrenata* Link. Therefore I have designated the US specimen of Merrill, *Sp. Blanc. 450*, which is also from Manila, as the neotype of *S. semicrenata* Link.

*S. compressa* DC. merely represents a fasciation.

*S. rhombifolia* var. *typica* forma *umbrosa* Hochr. and *S. rhombifolia* var. *pedunculata*

Hochr. seem to be unimportant modifications. In the field I have observed that *S. rhombifolia* L. has a tendency to develop large, thin leaves and longer pedicels in the shade.

Peckel in his manuscript on the flora of the Bismarck Archipelago (vol. 7, 1166) described and pictured a form which is cultivated and has run wild in these islands, and which he calls var. *culta*. The leaves of this form are lanceolate, coarsely and irregularly serrate or undulate, long cuspidate, and usually drooping.

**B. ssp. retusa** (L.) Borss., *stat. nov.* — *S. retusa* Linné, Sp. Pl. ed. 2 (1763) 961; Cav., Diss. 1 (1785) 18, t. 3 f. 4; op. cit. 5 (1788) t. 132 f. 2; DC., Prod. 1 (1824) 462; Blume, Bijdr. 2 (1825) 75; Roxb., Fl. Ind. ed. Carey 3 (1832) 175; W. & A., Prod. (1834) 58; Decne, Herb. Timor. (1835) 106; Hassk., Tijds. Nat. Gesch. Phys. 12 (1845) 102; Miq., Pl. Jungh. (1854) 287, p.p.; Fl. Ind. Bat. 1, 2 (1858) 142; Suppl. (1860) 162; op. cit. (1861) 398; Merr., Philip. J. Sc. 1 (1906) Suppl. 91; Fl. Manila (1912) 318; Hall, f., Med. Rijksherb. 12 (1912) 13; Merr., Int. Rumph. Herb. Amb. (1917) 356; Sp. Blanc. (1918) 252; En. Philip. Fl. Pl. 3 (1923) 35; Bartlett, Pap. Mich. Ac. Sc. 5 (1926) 55; Merr., Philip. J. Sc. 29 (1926) 392; Lingn. Sc. J. 5 (1927) 125; Van der Pijl, Trop. Natuur 19 (1930) 165; Merr., Contr. Arn. Arb. 8 (1934) 101; Ridley, Kew Bull. (1938) 221; Backer, Bekn. Fl. Java (em. ed.) 4C (1943) fam. 109, p. 14; Borss., Trop. Natuur 33 (1953) 22, f. 1, 3e—h. — *S. rhombifolia* var. *retusa* (L.) Mast., in Fl. Br. Ind. 1 (1875) 324; Vidal, Phan. Cuming. Philip. (1885) 97; Rev. Pl. Vasc. Filip. (1886) 62; K. Sch. in Fl. Bras. 12, 3 (1891) 338; Baker f., J. Bot. 30 (1892) 239; Trimen, Handb. Fl. Ceyl. 1 (1893) 143; Ridley, Trans. Linn. Soc. Bot. II, 3 (1893) 279; Backer, Fl. Bat. 1 (1907) 101; Gagn., in Fl. Gén. I.—C. 1 (1910) 406; Ridley, Fl. Mal. Pen. 1 (1922) 255; Backer, Onkruidfl. Jav. Suikerr. (1930) 440; Steen., Fl. Schol. Indon. (1949) 270; Backer & Bakh, f., Fl. Java 1 (1963) 427. — *S. rhombifolia* var. *retusa* forma *depauperata* O.K., Rev. Gen. Pl. 1 (1891) 73. — *S. alnifolia* Linné, Sp. Pl. (1753) 684; in Stickman, Herb. Amb. (1754) 26; Amoen. Acad. 4 (1759) 134; Syst. Nat. ed. 10, 2 (1759) 1145. — *S. philippica* (non DC.) Wall., Cat. (1828) n. 1869; W. & A., Prod. (1834) 58; Blanco Fl. Filip. ed. 2 (1845) 383; ed. 3, 2 (1879) 340. — *S. truncatula* Blanco, Fl. Filip. (1837) 548, non J. F. Gmelin, 1791. — *S. cumingii* Gandoger, Bull. Soc. Bot. Fr. 71 (1924) 631. — *S. rhombifolia* sensu Doct. van Leeuwen, Ann. Jard. Bot. Btzg 32 (1922) 173; Trop. Natuur 22 (1933) 150—155, fig.; Ann. Jard. Bot. Btzg 48 (1938) 30—34, t. 7 f. 1—2; Backer, Onkruidfl. Jav. Suikerr., atlas (1939) t. 415 (right). — *S. rhombifolia* var. *typica* sensu Hochr., Ann. Cons. Jard. Bot. Genève 15—16 (1912) 241, p.p. — *S. spinosa* (non L.) Rolfe, J. Bot. 23 (1885) 210; Vidal, Rev. Pl. Vasc. Filip. (1886) 63. — *Karundoti* Rheede, Hort. Malab. 10, p. 33, t. 18. — *Sigalurium rotundum vulgare* Rumph., Herb. Amb. 6, lib. 10, p. 44, t. 19. — **Fig. 21e-h.**

Types: *S. retusa* L.: Herb. Linn. n. 866.7 (holotype: LINN); *S. alnifolia* L.: Herb. Hermann, Vol. III, fol. 4, Linn. n. 260 (lectotype: BM); *S. truncatula* Blanco: Merrill, Sp. Blanc. 123 (neotype: US; isotypes: BO, GH, L, P); *S. rhombifolia* var. *retusa* f. *depauperata* O.K.: O. Kuntze 5499 (holotype: NY); *S. cumingii* Gandoger: Cuming 721 (isotypes: FI, G, K, L, MEL, P).

Usually low, dense, prostrate or ascending undershrub, up to c.  $\frac{1}{2}$  m high, with erecto-patent to patent branches. Stems and other green parts rarely tinged red. Leaves shortly obovate to cuneate or orbicular, at base acute to acuminate, at apex rounded or truncate, mostly retuse and than usually mucronate,  $\frac{1}{2}$ — $5\frac{1}{2}$  by  $\frac{1}{2}$ — $4\frac{1}{2}$  cm. Pedicels ± as long as or slightly longer than the petiole, up to c. 30 mm, jointed near base. Calyx 7—8 mm long, in fruit not or hardly longer. Corolla 20—25 mm  $\varnothing$ ; petals slightly oblique. Mericarps mostly with 2 awns 1—3 mm long.

*Distribution:* Similar to ssp. *rhombifolia*. I have not seen any specimen from the New Guinea mainland, and only one from the adjacent island of Japan.

*Ecology:* The flowers of ssp. *retusa* begin to unfold early in the morning, and fade about noon (see also: Van der Pijl, Trop. Natuur 19, 1930, 165; Doct. van Leeuwen, op. cit. 22, 1933, 150—155; Ann. Jard. Bot. Btzg 48, 1938, 30—34; Borss., Trop. Natuur 33, 1953, 21—29). Privault (Bull. Soc. Bot. Fr. 84, 1937, 146—149) studied the anatomy of the opening and fading of the flower; he named his material *S. rhombifolia* L., but judging from the times of opening and closing mentioned, it is likely that he had ssp. *retusa* (L.) Borss.

*Notes:* *S. retusa* L., published in the second edition of Species Plantarum, was based on *S. alnifolia* L. var.  $\beta$  in the first edition, but a new phrase name as well as a new element, viz. 'Sigalurium. Rumph. amb. 6. p. 44. t. 19.' was added. In the Linnean herbarium there is a specimen, n. 866.7, fitting the phrase, accompanied by the quotation 'Rumph. VI. t. 19' and the name 'Sida alnifolia' both in the handwriting of Linnaeus. This I have considered the holotype.

For *S. alnifolia* Linnaeus gave a phrase which he already used in some of his former publications. These are quoted in the same paragraph as the phrase: 'Hort. cliff. 346. Hort. ups. 200. Fl. zeyl. 253.\*. Roy. lugd. 349.' In Clifford's herbarium there is no specimen, and in the Linnean herbarium there is no authentic specimen from Hortus Upsaliensis. I have therefore designated Hermann's plant as the lectotype. It is in accordance with the phrase as well as with Dillenius's plate which is cited as another element under this Linnean species. The only difference between *S. alnifolia* L. and *S. retusa* L. is in the leaves which are retuse at apex in the latter.

In both *S. alnifolia* L. and *S. retusa* L. the type specimens have schizocarps without awns, an observation which may be of use for taxonomists who like to distinguish varieties on that character.

I have chosen the epithet *retusa* for the name of the present subspecies because it is in general use. In case this taxon is considered a distinct species, it should be named *S. alnifolia* L.

*S. truncatula* Blanco, non J. F. Gmelin, belongs to ssp. *retusa* according to the descriptions, as already pointed out by Merrill (1918, 252). I designated Merrill *Sp. Blanc. 123* (US) as the neotype, as it is fairly matching the description and is a topotype. In the second and third editions of his Flora *S. truncatula* Blanco has been erroneously referred to *S. philippica* DC. *S. truncatula* J. F. Gmelin is according to Baker f. an *Abutilon* species.

The remarks on the variability of ssp. *rhombifolia* also apply to ssp. *retusa*.

**II. *Sida cordifolia* Linné, Sp. Pl. (1753) 684; Cav., Diss. 1 (1785) 19, t. 3 f. 2; DC., Prod. 1 (1824) 464; Roxb., Fl. Ind. ed. Carey 3 (1832) 177; W. & A., Prod. (1834) 58; Thw., En. Pl. Zeyl. (1858) 28; Miq., Fl. Ind. Bat. 1, 2 (1858) 140; Suppl. (1860) 162; op. cit. (1861) 398; Benth., Fl. Austr. 1 (1863) 196; Mast., in Fl. Br. Ind. 1 (1875) 324; Fern.-Vill., Novis. App. (1880) 23; Vidal, Phan. Cuming. Philip. (1885) 97; King, J. As. Soc. Beng. n.s. 60, ii (1891) 42; K. Sch., in Fl. Bras. 12, 3 (1891) 329, t. 62; Baker f., J. Bot. 30 (1892) 291; Trimen, Fl. Ceyl. 1 (1893) 143; Ridley, Trans. Linn. Soc. Bot. II, 3 (1893) 279; Bailey, Queensl. Fl. 1 (1899) 115; Perk., Fragm. Fl. Philip. (1904) 109; Merr., Philip. J. Sc. 1 (1906) Suppl. 91; Backer, Fl. Bat. 1 (1907) 96; Gagn., in Fl. Gén. I.-C. 1 (1910) 401; Backer, Schoolfl. Java (1911) 115; ? Ridley, J. Str. Br. R. As. Soc. 59 (1911) 76; Koord., Exk. Fl. Java 2 (1912) 581; Merr., Fl. Manila (1912) 23; Int. Rumph. Herb. Amb. (1917) 357; Ewart & Davies, Fl. North. Terr. (1917) 184; Merr., En. Philip. Fl. Pl. 3 (1923) 34; Craib, Fl. Siam. En. 1 (1925) 150; Merr., Lingn.**

Sc. J. 5 (1927) 125; Domin, *Bibl. Bot.* 22 (1928) 945; Backer, *Bekn. Fl. Java* (em. ed.) 4C (1943) fam. 109, p. 13; Hend., *Mal. Wild Flow.* 1 (1949) 39, f. 28; Hochr., in *Fl. Madag.* fam. 129 (1955) 146, t. 35 f. 9; Hu, *Fl. China*, fam. 153 (1955) 15, t. 5 f. 8, t. 15 f. 4; Specht, *Rec. Am.-Austr. Sc. Exp. Arnhem Land* 3 (1958) 259; Backer & Bakh. f., *Fl. Java* 1 (1963) 427. — *S. rotundifolia* Lamk, *Encycl.* 1 (1783) 5; Cav., *Diss.* 1 (1785) 20, t. 3 f. 6; op. cit. 6 (1788) 349, t. 194 f. 2; DC., *Prod.* 1 (1824) 464; Presl, *Reliq. Haenk.* 2 (1835) 110; Span., *Linnaea* 15 (1841) 172. — *S. teysmannii* Baker f., *J. Bot.* 30 (1892) 292. — *Katu-uren* Rheede, *Hort. Malab.* 10, p. 107, t. 54. — *Abutilon agreste sive montanum* Rumph., *Herb. Amb.* 4, lib. 6, p. 32.

Types: *S. cordifolia* L.: *Herb. Linn. n.* 866.12 (holotype: LINN); *S. rotundifolia* Lamk: Mauritius, *Commerson s.n.* (lectotype: P-JU 12284); *S. teysmannii* Baker f.: Sumba, *Teysmann HB 10804* (holotype: K; isotypes: BO, FI-Herb. Beccari 1561, L).

Erect, much-branched undershrub,  $\frac{1}{2}$ –1 m, with an unpleasant smell. Stems, petioles and pedicels velutinous to tomentose or occasionally densely tomentose by minute stellate hairs, intermingled with many or few patent simple hairs. *Leaves* ovate to oblong, rarely orbicular, at base usually shallowly cordate, occasionally truncate or rounded, at apex obtuse to acute, 1–7 by  $\frac{1}{2}$ –5 $\frac{1}{2}$  cm, serrate to crenate, penninerved, at base 5–7-nerved, on both surfaces velutinous to tomentose or occasionally densely tomentose by minute stellate hairs, beneath on the nerves intermingled with simple hairs; petiole 3–10 mm. *Stipules* filiform, 3–10 mm. *Flowers* axillary, mostly solitary, sometimes in clusters of 2–5 flowers especially towards the ends of the stems. Pedicel  $\frac{3}{4}$ –3 mm, accrescent to c. 20 mm, jointed near apex. *Calyx* campanulate to suburceolate, 5–8 mm  $\varnothing$ ,  $\pm$  accrescent; segments triangular, acute to acuminate, 2–4 mm  $\varnothing$ ; calyx outside more or less densely tomentose by stellate hairs, intermingled with many simple hairs, inside on the segments sparsely stellate hairy, for the rest glabrous. *Corolla* 12–15 mm  $\varnothing$ , pale yellow to nearly white; petals obliquely obovate, at apex truncate, at base ciliate. *Staminal column* c. 3 mm, with simple hairs or glabrous. *Ovary* conical, stellate-hairy. *Mericarps* 8–10, flattened-trigonous, 3–3 $\frac{1}{2}$  mm high, radially 2–2 $\frac{1}{2}$  mm, tangentially 1 $\frac{1}{2}$ –2 mm, dorsally and at apex minutely stellate-hairy, at apex with 2 retrorsely hairy awns, usually 3 $\frac{1}{2}$ –5 mm long, rarely shorter. *Seeds* flattened-reniform, c. 2 $\frac{1}{2}$  mm  $\varnothing$ , glabrous but at the hilum mostly short-hairy, brown or black.

*Distribution*: Pantropical, throughout Malesia apparently common along or near the coast, in the interior rare and possibly only adventitious, e.g. in railway yards etc. I have seen no specimens from the Bornean mainland and from West New Guinea.

*Ecology*: Heliophilous, both under everwet and seasonal climatic conditions, preferably occurring in open sandy grounds along or near the coast, sometimes in the pescaprae formation on the beach, and on dunes, also on dikes separating coastal fish-ponds. Yet, it is very unlikely that the species is dispersed by the sea. Presumably it owes its worldwide distribution to human agency (cf. p. 13).

*Notes*: As Linnaeus created in *Species Plantarum* a new phrase for *S. cordifolia*, it appears to be logical to choose a specimen in the Linnean herbarium as a lectotype. The specimen n. 866.12 bearing the epithet 'cordifolia' as well as the number '4', referring to the species number in *Species Plantarum*, in the handwriting of Linnaeus, is a good specimen in fair accordance with the phrase and the description. The majority of the Malesian specimens belong to the same phenotype, viz. plants with a moderately tomentose or velutinous stellate indumentum, intermingled with patent simple hairs, especially on the stems, petioles, pedicels, and calyces.

Lamarck described *S. rotundifolia* from a living plant ('v. v.'). Cavanilles referred to a specimen collected by Commerson in Mauritius (Île de France), which he apparently

obtained from Thouin. I have not found this specimen at Madrid, but there is one in the herbarium De Jussieu (n. 12.284) which I consider a duplicate, bearing the note 'Sida rotundifolia. Lamarck, encyclop. — Cavanilles no. 18'. Since Cavanilles was familiar with the work of Lamarck, and since this specimen is fitting the descriptions of both Lamarck and Cavanilles, I have designated this as a lectotype.

I cannot maintain *S. teysmannii* Baker f. as a separate species. In my opinion Baker f. has trusted in his key too much on a strict constancy of the number of carpels (mericarps) and thereby distinguished too many species. *S. cordifolia* L. belongs in his system to the group with 10—12 carpels. Accordingly *Teysmann* HB 10804 (K) having 8—10 carpels came in his group with 7—10 carpels and was accordingly described as a new species. Though Timor is given as the provenance, and the Bogor sheet bears a label printed 'Timor', there is also a hand-written label by Teysmann bearing 'Soemba Palamendjeli'. Probably it was collected in Sumba I. (cf. the similar case of *S. discolora* Baker f.).

I agree with Merrill (1917, 357) that *Abutilon agreste sive montanum* Rumph. is probably conspecific with *S. cordifolia* L.

*S. cordifolia* L. seems to be rather homogeneous in Malesia. The most common phenotype has a moderately tomentose to velutinous stellate indumentum, intermingled with patent simple hairs on the stems, petioles, pedicels, and calyces. These simple hairs are sometimes lacking or scarce on the stems. In Malesia the indumentum rarely becomes densely tomentose. In that case the plant becomes mostly more robust (*Loher* 130, *Cuming* 1407, *Hoogland* 4668, *Carr* 11400). In Australia, the Pacific Islands, and tropical America densely tomentose specimens seem to be more frequent.

**12. *Sida subcordata*** Span., [in Hook., *Comp. Bot. Mag.* 1 (1836) 344, *nom. nud.*] *Linnaea* 15 (1841) 172; *Miq.*, *Fl. Ind. Bat.* 1, 2 (1858) 140; *Baker f.*, *J. Bot.* 30 (1892) 293; *Backer & Bakh. f.*, *Fl. Java* 1 (1963) 427. — *S. thyrsoflora* *Miq.*, *Pl. Jungh.* (1854) 287; *Fl. Ind. Bat.* 1, 2 (1858) 142; *O.K.*, *Rev. Gen. Pl.* 1 (1891) 73; *Backer, Schoolf. Java* (1911) 115; *Koord.-Schum.*, *Syst. Verz.* 1, fam. 175 (1911) 2; *Doct. van Leeuwen, Blumea* 2 (1937) 273; *Backer, Bekn. Fl. Java* (em. ed.) 4C (1943) fam. 109, p. 14. — ? *S. vitellina* *Hoffmannsegg, Preisverz.* ed. 8, *Nachtr.* (1836) 33; *Walp.*, *Rep. Bot. Syst.* 1 (1842) 315; *Dietr.*, *Synops.* 4 (1847) 845. — *S. zollingeriana* *Miq.*, *Fl. Ind. Bat.* 1, 2 (1858) 141; *Baker f.*, *J. Bot.* 30 (1892) 325; *Backer, Schoolf. Java* (1911) 115; *Koord.-Schum.*, *Syst. Verz.* 1, fam. 175 (1911) 3; *Koord., Exk. Fl. Java* 2 (1912) 582. — *Abutilon furfurellum* *Miq.*, *Fl. Ind. Bat.* 1, 2 (1858) 144. — *S. corylifolia* *Wall.* [*Cat.* (1828) n. 1865] *ex Mast.*, in *Fl. Br. Ind.* 1 (1875) 324; *Baker f.*, *J. Bot.* 30 (1892) 240; *Ceron, Cat. Herb. Manila* (1892) 27; *Merr. & Rolfe, Philip. J. Sc.* 3 (1908) Bot. III; *Gagn.*, in *Fl. Gén. I.-C.* 1 (1910) 402; *Merr.*, *Philip. J. Sc.* 11 (1916) Bot. 290; *Philip. J. Sc.* 14 (1919) 245; *En. Philip. Fl. Pl.* 3 (1923) 34; *Craib, Fl. Siam. En.* 1 (1925) 150; *Bartlett, Pap. Mich. Ac. Sc.* 6 (1926) 30, 55; *Merr.*, *Lingn. Sc. J.* 5 (1827) 125; *Hu, Fl. China, fam.* 153 (1955) 15, t. 16 f. 4. — *S. balabacensis* *Merr. & Rolfe, Philip. J. Sc.* 3 (1908) Bot. III. — *S. puberula* *Merr.*, *Philip. J. Sc.* 7 (1912) Bot. 90; *En. Philip. Fl. Pl.* 3 (1923) 35. — *S. rhombifolia* var. *ceramica* *Warb.*, *Bot. Jahrb.* 13 (1891) 374.

Types: *S. subcordata* Span.: Timor, *Spanoghe s.n.* (isotypes: L 908.140-642, 635, 639); *S. thyrsoflora* *Miq.*: Ungaran, *Junghuhn s.n.* (lectotype: L 908.140-652; isotype: U 39087); *S. zollingeriana* *Miq.*: Modjopahit, *Zollinger 2763* (lectotype: P; isotypes: BO, FI, G, P) = *Zollinger 523Z* (isotypes: P, U 31082B); *Abutilon furfurellum* *Miq.*: Bandung, *Zollinger 907Z* (lectotype: P; isotypes: GH, P, U 31081B); *S. corylifolia* *Wall. ex Mast.*: Sagaing, *Wallich 1865* (lectotype: K-W); *S. balabacensis* *Merr. & Rolfe*: Balabac, *Mangubat BS 456* (isotypes: K, US); *S. puberula* *Merr.*: Bontoc, *Vanoverbergh 853* (isotypes: GRO, L, U, US).

Erect undershrub, 1—2 m. Stems, petioles, leaves and pedicels cinereous by minute stellate hairs and glabrescent, or glabrous. *Leaves* ovate to oblong, rarely almost orbicular or lanceolate, at base rounded to truncate, occasionally shallowly cordate, at apex acute to acuminate, rarely obtuse, 1—16 by  $\frac{1}{2}$ — $8\frac{1}{2}$  cm, crenate to serrate, penninerved, at base 3—5-nerved; petiole  $\frac{1}{2}$ —4 cm. *Stipules* linear to filiform, 3—5 mm. *Flowers* solitary, axillary, by decrescent superior leaves partly in racemes or panicles. Pedicel longer than the petiole, 1— $2\frac{1}{2}$  cm, accrescent to c. 4 cm, jointed at  $\frac{1}{2}$ — $\frac{1}{3}$  from apex. *Calyx* widely campanulate, 7—10 mm high, 14—17 mm  $\varnothing$ , slightly accrescent, 5-fid; segments ovate to triangular, acute or acuminate, 5—8 by 5—6 mm; calyx outside cinereous to glabrous, inside along the margin minutely stellate hairy, for the rest glabrous. *Corolla* rather large,  $2\frac{1}{2}$ —4 cm  $\varnothing$ , yellow; petals obovate, slightly oblique, somewhat emarginate, glabrous. *Staminal column* c. 6 mm, at base stellate-hairy. *Ovary* conical; styles 8—10; stigmas capitate. *Schizocarp* obovate, 4—5 mm  $\varnothing$ . Mericarps 7—10, laterally triangular, 4—5 mm high, radially 2—3 mm, tangentially 1—2 mm, dorsally minutely stellate-hairy to glabrous, with retrorsely hairy awns 3—6 mm long. *Seeds* flattened-reniform, glabrous except for the short hairy hilum, dull black.

*Distribution*: Birma, Siam, Indo-China, locally in the Malay Peninsula, the northern half of Sumatra, Java, especially Central and East Java, the Lesser Sunda Islands, the Philippines, Celebes and the Moluccas, not yet seen from New Guinea.

*Ecology*: Heliophilous and though evidently more common under dry conditions, also found under everwet climatic conditions, in waste places, fallow fields, teak-forests, secondary growths, coconut plantations, along road-sides, on forest-edges, etc., from sea-level up to c. 1200 m (cf. p. 13).

*Notes*: Like most *Sida* species *S. subcordata* is very variable in leaf-shape and density of indumentum, but it is in my opinion impossible to subdivide it further. The variability is obviously due to external conditions but also to the stage at which specimens were collected. It is curious that this taxonomically fairly unimportant variation induced botanists to describe so many variants as species.

The oldest name might be *S. vitellina* Hoffmannsegg, the type of which came from Java. I have not seen it and know it only from the description which is insufficient to decide.

Of *S. zollingeriana* Miq. I have seen only two specimens named in the handwriting of Miquel; the one at Utrecht bears no Zollinger label or number and is obviously a poor fragment retained by Miquel from the Paris material which he borrowed. The Paris specimen is *Zollinger 2763* to which is added a label *Zollinger 532Z = 2763*; this I have designated as the lectotype.

Of *Abutilon furfurellum* Miq. the story is similar; at Utrecht there is a leaf fragment in Miquel's handwriting while at Paris there are two unnamed sheets of *Zollinger 907Z* of which I have designated one as the lectotype. Baker f. J. Bot. 31, (1893, 213) erroneously reduced *Abutilon furfurellum* to *Abutilon graveolens*.

The type of *S. rhombifolia* var. *ceramica* Warb., collected in Ceram, is probably lost, but the description, especially the remark 'es sind 7 Carpelle vorhanden, die 14 stachelartigen Fortsätze sind mit einfachen, rückwärts gerichteten Haaren besetzt', points to *S. subcordata*.

The present species is one of the few Old World endemics in the genus. Taxonomically it occupies a more or less intermediate position between the pantropical *S. rhombifolia* and *S. cordifolia*. It might possibly have descended from hybridisation between these two species in which case it should be a polyploid on account of its fertility. This can only be verified by karyological investigation.

## DOUBTFUL SPECIES

*Sphaeralcea triflora* (Hassk.) Hassk., Cat. Hort. Bog. (1844) 196; T. & B., Cat. Hort. Bog. (1866) 192. — *Sphaeroma triflorum* Hassk., Flora 25, Beibl. II (1842) 38.

This was doubtless an exotic species cultivated in the Hortus Bogoriensis. I can not recognize it from the very brief description and I have not seen a specimen.

## EXCLUDED SPECIES

*Kydia glabrescens* Mast., in Fl. Br. Ind. 1 (1875) 375, is reported by Masters to have been collected by Griffith in Malacca. I have not seen any specimen from Malesia. The genus is restricted to the Himalaya and the higher mountain ranges of the Indo-Chinese Peninsula.

*Malope trifida* Cav.: Backer, Bekn. Fl. Java (em. ed.) 4 C (1943), fam. 109, p. 2; Backer & Bakh. v. d. Brink f., Fl. Java 1 (1963) 422 recorded this from Java as being cultivated. I have not seen any specimen.

*Plagianthus humilis* Blanco, Fl. Filip. (1837) 526; ed. 2 (1845) 367; ed. 3, 2 (1879) 315, t. 181. Merrill, Sp. Blanc. (1918) 208, referred this plant to the genus *Turraea* (*Meliaceae*): *Turraea humilis* (Blanco) Merr.

## INDEX TO SPECIAL PART

Accepted names have been printed in plain type, synonyms in *italics*, new names and combinations in **bold type**. Page numbers in bold type denote main mention, those with an asterisk denote a figure or map.

Names are arranged alphabetically, but in proper subordination: tribes follow direct under the family name, subgenera and sections under the generic names, etc. Misinterpretations have been added at the end of the specific name concerned; see for example under *Hibiscus radiatus*.

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