DENR Recommends

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INDIGENOUS FOREST TREE SPECIES IN LAGUNA PROVINCE

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Foreword

Indigenous forest tree species are those which have evolved in the same area, region, or biotype where the forest stand is growing and are adapted to the specific ecological conditions predominant at the time of the establishment of the stand. These species form a valuable component of the dwindling timber resources of the country and deserve timely attention.

Increasing use of indigenous forest tree species is gaining headway. It augments the value and economic importance of these species and at the same time encourages the sustainable management of this particular forest resource.

The promotion, planning, and scientific monitoring and evaluation of this increased use of indigenous forest tree species must, however, be based on relevant or up-to-date information or data. It is for this reason that some diligent ERDB researchers have taken an initial step toward botanical research. With meager research funding, these researchers have trailblazed along botanical collecting and exploration in a very specific locality in Laguna Province.

This 15th series of the DENR Recommends focuses on 13 species highlighting research-based seed technology particularly on initial moisture content and germination together with seed longevity and storage. The list of indigenous forest tree species presented herein is not at all exhaustive. It can, nonetheless, serve as starter reference for those interested in botanical explorations along indigenous forest tree species.

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Introduction

The Philippine government has undertaken, time and again, massive reforestation activities. Vast tracts of degraded and open lands had been planted, but survival rate of seedlings was reportedly low. One probable reason for such seemingly unsuccessful endeavor was the apparent reliance on trees selected from a very short list of internationally-known fast-growing species. These were often exotic species which may not be suitable or adaptable to certain site conditions.

Recent trend shows that the government resorts to exploring the possibilities of utilizing indigenous or native forest tree species that will address the reforestation objectives of the country, satisfy timer requirement, and help conserve the country's biodiversity. In the long run, these species may yet outsurvive and outgrow the exotic species.

In light of this, botanical collecting and explorations were initiated in Sta. Mria, Laguna Province. With meager funding, the study started a the NSJ (Nestor S. Jumawan) Farm in Barangay Cueva where these indigenous forest tree species were naturally growing. The ripe fruits were collected together with the herbarium specimens of each species for proper identification. Seeds where extracted from fruits and processed. The morphological characteristics were described and seeds per kilogram were counted. Also, initial moisture content and germination together with seed longevity and storage were determined. Photographs of the natural stand of each species including the fruit and seeds were taken for the readers/users to easily identify the species.

Besides the species herein listed, there were still other indigenous forest tree species in the area but no flowers and fruits at the time of collection. It is hoped that another batch of seeds can be collected and studied. By giving ample time and more attention to the study of these species, a deliberate effort to broaden the species and genetic base of these existing native forest tree species is thereby ensured.

APIN

Ternstroemia gitingensis Elmer

Description

This is usually an evergreen tree up to 30-35 m tall (Fig. 1). Its bole straight, cylindrical, branchless for up to 20 m, up to 60-100 cm in diameter. Its leaves are arranged spirally often congested at the end of twigs and in false whorls, simple, entire, exstipulated. The flowers are axillary, solitary, or in a small fascicle of 2-3. The fruit emerges from the nodal leaf bud in bunch of 5-6 fruitlets, with 1-4 berries. It is round, glossy, green, which turns black when ripe, measuring 6-8 mm x 7-8 mm seed, 4 mm x 4mm, triangular in shape, particularly in the apex, with a smooth, thin seed coat (Fig. 1b). The embryo is big and centrally located.

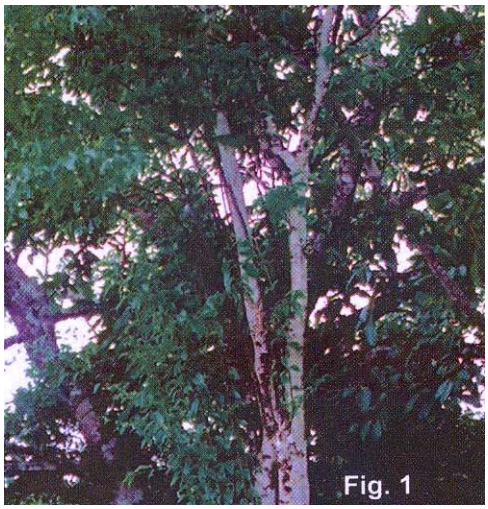
Fig. 1

Phenology

Flowering	October-November
Fruiting	December-March
Seed collection	April-June
Place of collection	Sta. Maria, Laguna

Seed extraction/processing

Soak the fruit in tap water to soften the pericarp. Macerate the fleshy part to separate the seeds. Clean the seeds in running water.

Seed count 200,000/kg

Seed type Recalcitrant


Fig. 1b

Seed germination

Newly extracted seeds started to germinate three days after sowing and 100% germination was attained after a week. Paper towel and 1:1 ordinary garden soil (OGS) and coconut coir dust in plastic trays were used

Storage

Seeds can be stored only for two weeks with 26.5% moisture content (MC) and 50% germination. Beyond one month, seeds will no longer germinate.

Distribution

This species is found in the Philippines, specifically in Sta. Maria in the province of Laguna.

Uses

The wood is used for light construction under cover, internal flooring, door and window frames, moldings, furniture, mining timber, joinery, tool handles and shafts, carvings, toys, turnery and when treated, is suitable for railways sleepers. It is also suitable for the production of veneer and plywood, and of pulp and paper. The bark is used as a fish poison and in Ivian Jaya it is still used against head lice. The fruit is scraped and applied to cuts and sores.

Properties

This *Ternstroemia* species yields a medium-weight hardwood with a density of 530-790 kg/m^3 at 15% MC. Heartwood is pale reddish-brown to dark purple-brown, not differentiated from the paler sapwood. Grain is straight to slightly interlocked or irregular; texture is fine and even.

Shrinkage upon seasoning is moderate to very high. The wood is moderately hard and easy to work with all hand-and-machine tools. It has a slightly lustrous finish and takes a high polish.

Ecology

Most timber-yielding *Ternstroemia* species inhabit lowlands to montane, evergreen, primary rain forests, up to 1,700-2,350 m altitude. They are particularly often reported from poor soils, swamps, and ultrabasic locations.

APIN-BUNDOK

Ternstroemia gymnanthera (W. & A.) Sprague

Description

This tree grows up to 20 m high and 25-30 cm in diameter (Fig. 2). The fruit, 6-7 mm x 8 mm, is globose and an irregularly dehiscent berry with arillate seeds. It comes in 1-5 berries with per twig and turns black when ripe (Fig. 2a). The seed is sickle-shaped, light brown similar to a malapapaya seed, with four grooves, and measures 4-5 mm x 2 mm (Fig. 2b).

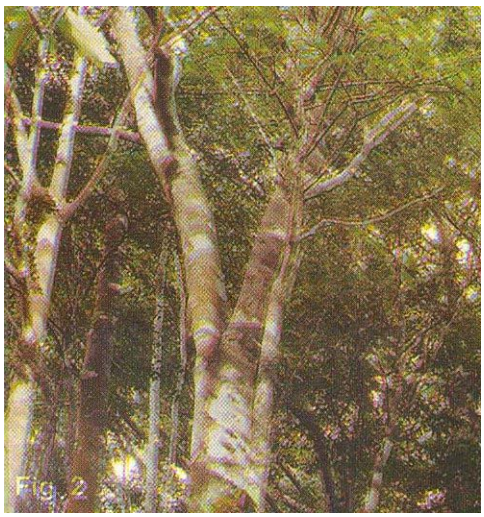
Fig. 2

Phenology

Flowering	October-November
Fruiting	February-April
Seed collection	April-May
Place of collection	Barangay Cueva, Sta. Maria, Laguna

Seed count 80,000/kg

Seed type With 10.44% initial MC, probably orthodox


Fig. 2a


Fig. 2b

Seed germination
Initial trial

Seeds collected in April 2006 were sown in Petri dishes with moistened filter paper and incubated in a germination chamber with light. For seeds treated with 15% HCl and 15% H2SO4 for 15 and 30 minutes, no germination occurred after four months of observation in the laboratory.

Storage

Information on proper storage of seeds of apin-bundok has not been made available yet. This aspect will have to be addressed and studied in the near future.

Distribution

This species is found in India, Myanmar, Indonesia, China, Taiwan, Japan, Thailand, Java-Borneo, and the Philippines, specifically in Sta. Maria, Laguna.

Uses

Like apin (T. gitingensis), the wood of apin-bundok is also used for light construction, door and window frames, moldings, furniture, mining timber, tool handles and shafts, carvings, and toys. The species is also suitable for the production of veneer and plywood, and pulp and paper.

Properties

The wood is fairly resistant to termites. The sapwood is rarely susceptible to Lyctus. The mean fiber length of this species is 1.44-2.06 mm.

Ecology

Like apin, this species also thrives in lowland to montane, evergreen, primary rain forests, up to 1,700 (-2,350) m altitude. Some extend their ecological range to thickets and bushy grassland, and to monsoon and deciduous forests.

LANETENG-GUBAT

Kibatalia gitingensis (Elmer) Woods.

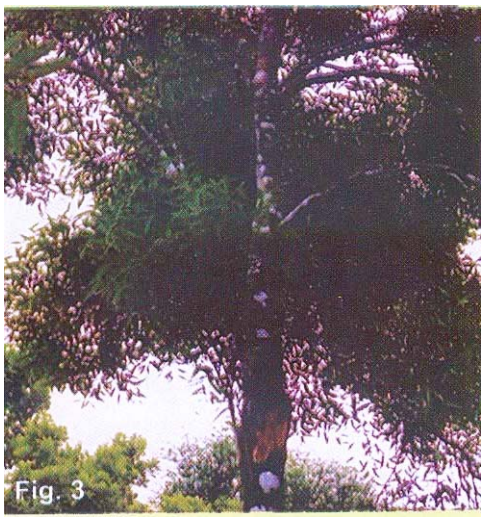
Fig. 3

Description

This is an evergreen, sometimes a small to large tree up to 45-65 m tall (Fig. 3). Its bole is straight, branchless for up to 30-40 m, up to 120 cm in diameter. Its bark surface is smooth to fissured. The leaves are simple, opposite, smooth, shining ovate pointed at both ends. The flowers are white to pale green, single or in pairs or clusters (Fig. 3a). The fruit, a cylindrical follicle dehiscent, 16-18 cm x 3-5 mm, turns dark brown to black when ripe (Fig.3b). The seed is brown, pointed or beaked, with a tuft of hairs. Clean seeds measure 15-25 mm x 2 mm.

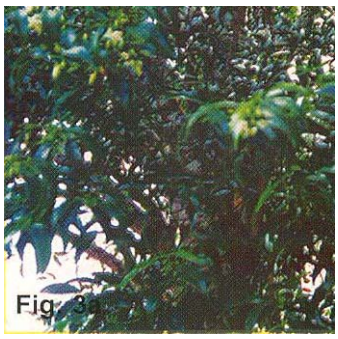
Fig. 3a

Phenology

Flowering	May-June; December-January
Fruiting	July-October; January-April
Seed collection	April-May; November-December
Place of collection	Barangay Cueva, Sta. Maria, Laguna

Seed extraction/processing

Extract the seeds from the follicle and remove the hairy tufts manually.

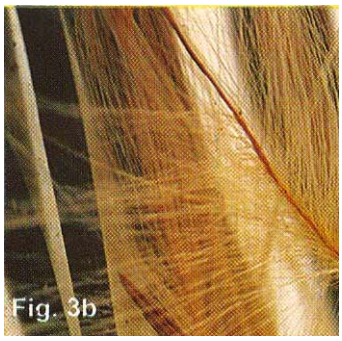
Fig. 3b

Seed count 33,000/kg

Seed type Intermediate

Seed germination

Seeds collected from the ground started to germinate a week after sowing in 1:1 OGS and coconut coir dust potting medium or in moistened paper towel in plastic trays. Complete germination occurred a month after sowing.

Seeds extracted from the follicle started to germinate three to four weeks after sowing them in the potting medium. The last germination took place three months after sowing.

Storage

Seeds can be stored in bottles for 60 days with 35% germination. After three months of storage, seeds will no longer germinate.

Distribution

The species thrives in secondary and primary forests at low and medium altitudes. Known only in the Philippines, it is found in the province of Cagayan, Ilocos Sur, Batangas, Laguna, Mindoro, Catanduanes, Sibuyan, Guimaras, Negros, and Leyte.

Uses

In Sta. Maria and nearby towns of Paete and Pakil, in the province of Laguna, wood is used for door and window frames, tool handles, and in carvings. Old stands are used in charcoal making while twigs and branches are used as firewood.

Properties

This species yields a lightweight to medium-weight hardwood, with a density of 385-610 kg/m^3 at 15% MC. Heartwood is white; the grain is straight and the texture fine and even. Shrinkage upon seasoning is low but the wood needs to be dried rapidly to prevent stain. The wood is soft and very easy to work. It is not durable and is readily attacked by sap-staining fungi. The bark contains several medicinally potential alkaloids.

Ecology

This is found scattered in the canopy or subcanopy layer of lowland and lower montane, primary rain forests on well-drained places like slopes, sometimes along streams or in swamp forests, 500-1,200 m altitude. It is found on a wide variety of soil types such as sandy, limestones, and volcanic. Occasionally, individual species are found in freshwater swamp forest and savannas.

PAGURINGON

Cratoxylum sumatranum (Jack)
Blume ssp Sumatranum

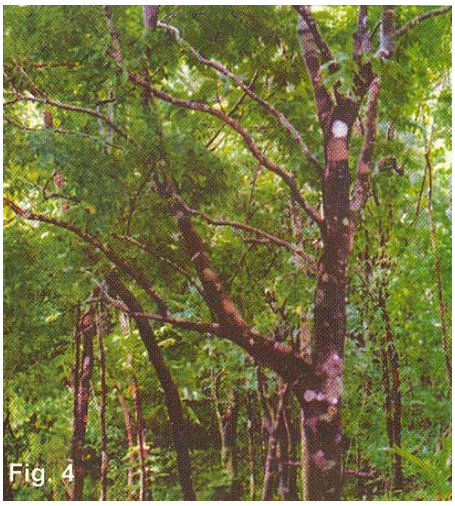
Fig. 4

Description

This tree reaches a height of 15 m and a diameter of 20 cm (Fig.4). Its bark is longitudinally checked, brownish with occasionally whitish spots on the exposed portions, brittle and hard to debark. The leaves are somewhat paler beneath, opposite, glabrous, shining on the upper surface. Inflorescense is in panicles, terminal and short. The flower is reddish tinged (Fig. 4a). The fruit is a capsule, brown, 1 cm long or less (Fig. 4b). The seed is short winged.

Phenology

Flowering	March-May; August-September
Fruiting	April-June; August-September
Seed collection	May-June; August-September
Place of collection	Sta. Maria, Laguna; Cavinti, Laguna

Seed extraction/processing


Fig. 4a

Shake the twigs with fruits so that the small winged seeds will be easily dislodged from the capsule.

Seed count 3M/kg

Seed type Intermediate

Seed germination


Fig. 4b

Initial 100% germination was attained when seeds were sown right after extraction but only 80% germination occurred when seeds were sown a week after extraction using 1:1 OGS and coconut coir dust. Seeds sown in the same potting medium will no longer germinate three months after collection.

Storage

Seeds can be stored in bottles at room temperature, or in the refrigerator at 7°C for three months. Beyond this period, the seeds will no longer be viable.

Distribution

This species is found only in the Philippines, specifically in Luzon (Cagayan to Sorsogon and Mindoro), Masbate, Leyte, and Mindanao provinces.

Uses

The wood of *Cratoxylum sumatranum* is used for charcoal. It is also used as firewood.

Properties

There are no available information regarding properties of this species.

Ecology

Paguringon thrives in thickets, secondary forests, and sometimes in open places at low and medium altitudes.

BANATONG-PUTI

Mallotus korthalsii (Muell. –Arg.


Fig. 5

Description

An evergreen, this species reaches a height of 10 m and a diameter of 25 cm (Fig. 5). Its leaves are simple, alternate, oblong-ovate, entire or sinuate-toothed with stalk 4-7 cm long. Upper portion of the leaves is dark green and the lower, grayish. Inflorescence is axillary, male spike solitary or fascicled, 5-8 cm long, densely flowered. The flower is about 3 mm in diameter. The fruit, one-seeded, is subglobose, 6-8 mm in diameter, unarmed, densely covered with a red or crimson powder. It turns gray to black when ripe with a thin pericarp, 3 mm x 2 mm in diameter. The seed, 2 mm x 2 mm, is black, round with hard seed coat (Fig. 5a).

Phenology

Flowering	February-March
Fruiting	March-May
Seed collection	May-June
Place of collection	Sta. Maria, Laguna


Fig. 5a

Seed extraction/processing

Soak the fruit in tap water to soften the thin pericarp. Macerate by hands and wash in running water to clean the seeds.

Seed count 71,000/kg

Seed type With 41.35% initial MC, probably recalcitrant

Seed germination

The seeds started to germinate 12 days after sowing and 35% germination was obtained after one and a half months of observation.

Storage

Seeds of this species can be placed in bottles and stored at room temperature for three months. After three months, these will no longer be viable.

Distribution

Widely distributed in the Philippines, this species is specifically found in Sta. Maria and Mt. Makiling in Laguna Province.

Uses

The species is used as fuelwood; it is also used for charcoal.

Properties

With regard to properties of this species, there are no available information on hand.

Ecology

Information regarding the ecology of this species is not available yet.

BANIAKAU

Cryptocarya foxworthyi.

Description

This tree grows up to 15-20 m tall with a diameter of 15-25 cm (Fig. 6). Its leaves are alternate, smooth, entire, ovate-elliptic, obtuse at the base and measure 9-9.5 cm x 2-3 cm (Fig.6). The fruit is a drupe, oblong-ovate, mottled, 1-3 per stalk, attached with the based sunk in persistent perianth. It is light green when young, red when mature and turns black when ripe and measures 2.2-2.6 cm x 0.8-1.2 cm. The seed, 2-2.3 cm x 0.9-1.1 cm, is light brown to black and oblong –ovate (Fig. 6a).

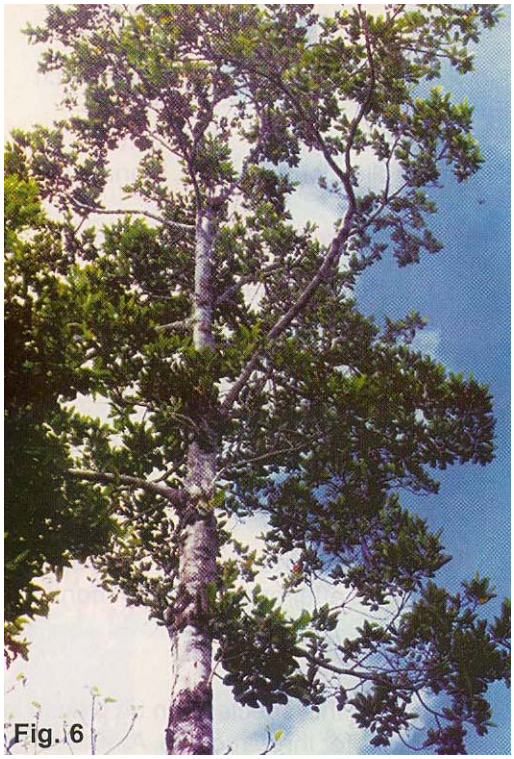

Fig. 6

Phenology

Flowering	November-December
Fruiting	February-May
Seed collection	March-June
Place of collection	Barangay Cueva, Sta. Maria, Laguna

Seed extraction/processing

Remove the pericarp manually to extract the seeds.

Seed count 3,000/kg

Seed type With 51.62% initial MC, probably recalcitrant

Seed germination

Black and newly extracted seeds started to germinate 15 days after sowing while light brown and newly extracted seeds germinated after 45 days. Of the 400 seeds sown, 50 seeds germinated; that is 12.5% germination occurred three months after sowing. Germinants were very slow growing. Soaking of the seeds with seed coat intact and seeds without seed coat in fungicidal solution did not have any effect on the rate of germination.

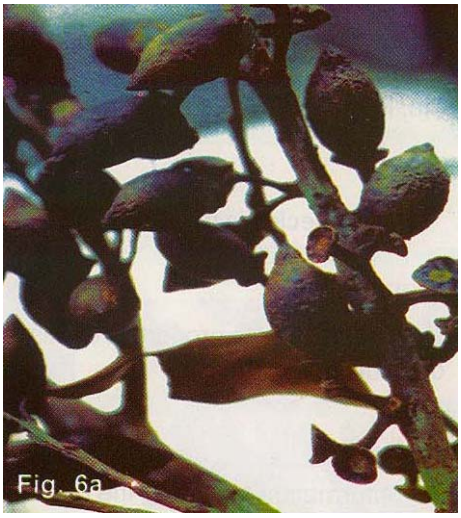
Fig. 6a

Storage

The viability of the baniakau seeds is quite short. Thus, storage is not possible.

Distribution

Insofar distribution of this species is concerned, it is found only in Barangay Cueva, town of Sta. Maria, in the province of Laguna.

Uses

The wood of baniakau is used for light construction and for door and window frames. Its branches and twigs are used as fuelwood.

Properties

As regards properties of this species, there are no available information.

Ecology

Baniakau thrives in forests at low and medium altitudes. It is endemic in the provinces of Laguna and Quezon.

MATANG-HIPON

Breynia vitis-idaea (Burm.f.)

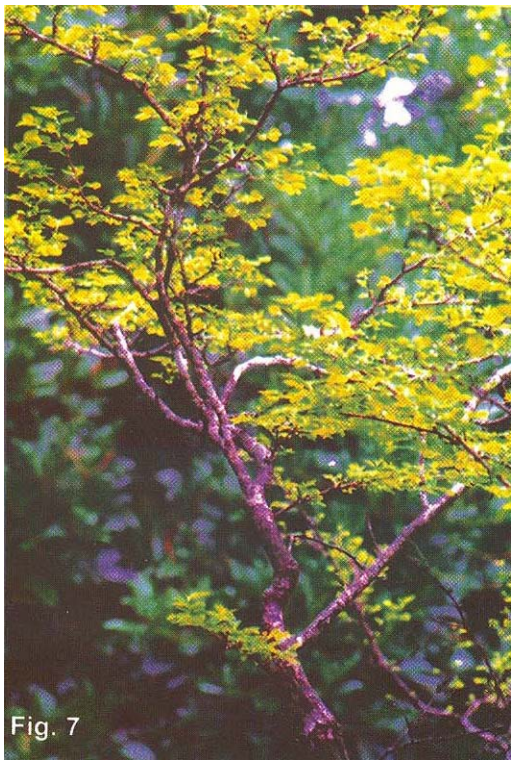
Fig. 7

Description

An erect, monoecious, slender, smooth shrub, this speice stands 1.5-4 m tall. Its leaves are distichous, elliptic to elliptic-ovate, 1-3 cm long (Fig. 7). The flower is very small, greenish and axillary, 1 mm in diameter. The fruit, somewhat fleshy, is pink to red which turns black when ripe and measures 2-3 mm in diameter. The seeds is black and has a very hard seed coat.

Phenology

Flowering	January-March
Fruiting	March-April
Seed collection	April-May
Place of collection	Barangay Cueva, Sta. Maria, Laguna

Seed extraction/processing

Soak the fruit in tap water overnight. Macerate the softened pericarp to separate the seeds. Wash the seeds thoroughly under running water to remove remnants of the pericarp. Use a fine mesh strainer, if necessary. Air-dry the seeds

Seed count 200,000/kg

Seed type With 49.55% initial MC, probably recalcitrant

Seed germination

Seeds were sown in moistened filter paper in Petri dishes and exposed under fluorescent lamps for three months. With the three-month observation, the seeds did not germinate. Even with the extension of the observation to four months, germination did not occur

Storage

Seeds can be placed in bottles and stored at room temperature for three months only. After three months, the seeds will no longer be viable.

Distribution

Matang-hipon is found throughout the Philippines. It also occurs in IndoChina and Malaya.

Uses

The bark when boiled is an astringent used to prevent hemorrhage.

Properties

Information pertaining to the wood properties of matang-hipon is not available, thus far.

Ecology

With regard to the ecology of matang hipon, information has not been made available yet.

MAKAASIM

Syzygium nitidum Benth.

Description

This species reaches a height of about 25 m and a diameter of 60 cm or more (Fig. 8). Its bark is brownish and slightly flaky. The leaves are simple, entire, elliptical oblong to broadly oblanceolate. These are lucid above and light green beneatrh with 8-12 pairs of nerves. The flower is white (Fig. 8a). Fruit is one-seeded, globose, 9-12 mm across, crowded by the persistent calyx (Fig. 8b). It is dark purple when ripe; its pericarp is succulent and tastes sour. The seed, 8-11 mm x 8-10 mm is globose, purple-tinged in the seed coat. The embryo is central, not so distinctly separated from the endosperm or cotyledon.

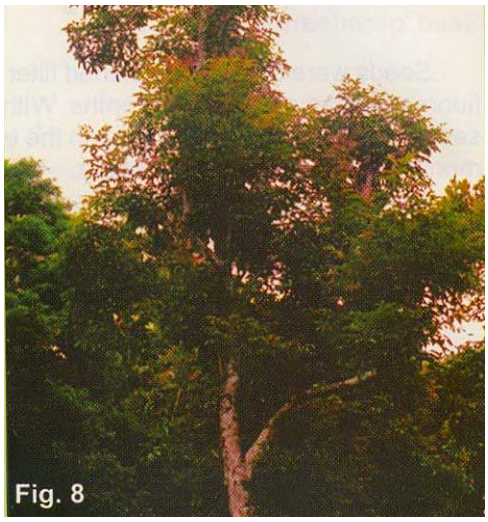

Fig. 8

Phenology

Flowering	January-March
Fruiting	April-June
Seed collection	July-August
Place of collection	Sta. Maria and Alaminos in Laguna

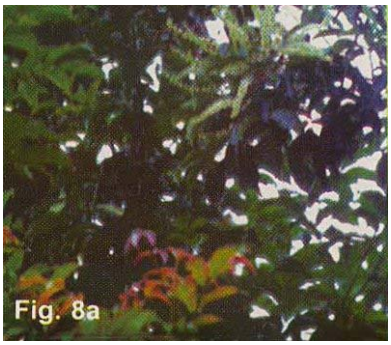

Fig. 8a

Seed extraction/processing

Soak the fruit in tap water to soften the pericarp; macerate to remove the fruit remnants. Wash the seeds in running water. Air-dry for two to three hours before sowing.

Seed count 1,112/kg (for bigger seeds); 2,500/kg (for smaller seeds)

Seed type Recalcitrant

Seed germination

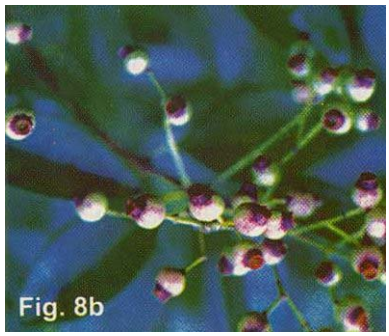
Fig. 8b

The seeds started to germinate six days after sowing with OGS and coconut coir dust. The radicle emerged from the lateral side of the seed. Newly collected seeds without fungicide had 90% germination after 26 days of sowing while seeds treated with fungicide had only 81%. For both treatments, germination started to decline after air-drying the seeds for three days, with 82% and 58% germination, respectively. The germination further reduced to 57% and 45% after six days and 0% germination was observed for both treatments after 12 days of drying at room temperature. Some of the germinants from the fungicide-treated seeds exhibited dwarfism. The initial MC ranged from 40% to 42%. Beyond this, seeds were no longer viable.

Storage

The seeds of this species are highly recalcitrant so storing them is not possible. Immediate sowing of the seeds is needed to obtain high percent germination.

Distribution

Makaasim is found throughout the country: from northern Luzon to Tawi-Tawi

Uses

The wood is used in general construction work. In Atimonan, Quezon, wood of makaasim is used for making palettes which are distributed in different factories in Sta. Rosa, Laguna (information was taken from personal interviews). Wood remnants from pallete-making are in turn used in making charcoal for distribution in various towns of Laguna Province.

Properties

The outer bark is very thin, papery, and ochre. The surface of the inner bark is avocado-green. The inner bark itself is 4 mm, pinkish-red, and fibrous. It contains a clear, slightly sticky sap. The sapwood is light brownish-yellowish

Ecology

This species thrives in well-drained soils of low and middle altitudes.

IGYO

Dysoxylum gaudichaudianum (A. Juss)

Description

This is a medium-sized evergreen tree reaches a height of 10 m and a diameter of 50 cm (Fig. 9). Its bark smooth and light gray has yellowish inner bark. The leaves, 50-80 cm long, are compound, crowded toward the ends of the twigs, marked with leaf scars. Leaflets, 10 or more pairs, are opposite of alternate toward the base, very unequal size and shape. The flowers, pale yellow and sessile, are scattered, solitary, or clustered. The fruit, a 2-6 valved capsule, clustered below the foliage is compressed globose, velvety yellow and finely rugose, 2 cm thick. Capsules open longitudinally when ripe and release dark orange to red seeds. Some fruit may contain a seed, usually with an opaque, orange-yellow to red aril or sarcotesta, is covered with a very smooth and thick seed coat, 8-12 mm.

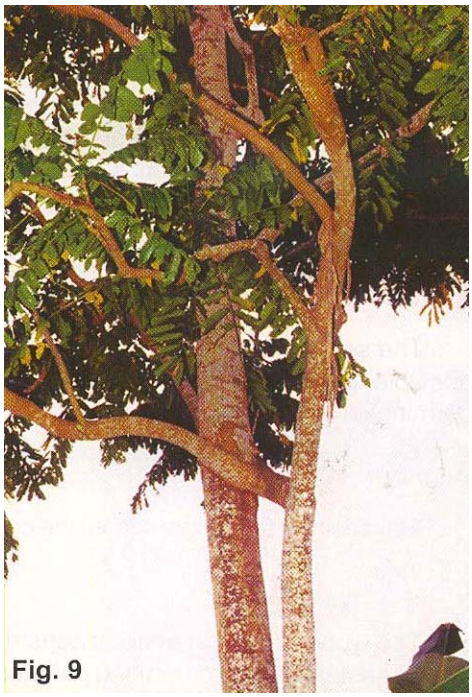

Fig. 9

Phenology

Flowering	March-May
Fruiting	June-September
Seed collection	October-December
Place of collection	Mt. Makiling and Sta. Maria, Laguna

Seed extraction/processing

Extract the seeds manually by hand.

Seed count 1,536/kg

Seed type Recalcitrant

Seed germination

Seeds without seed coat germinated one week after sowing in plastic trays with moistened paper towel. Germination of 89% occurred after three weeks. Three-week-old seedlings had an average growth of 5 cm. Seeds with intact seed coat started to germinate after nine days and only 45% germination occurred after one and a half months.

Storage

Seeds in open container and stored at room temperature can be stored only for two weeks with 35% germination. Beyond two weeks with 25% MC, seeds are no longer viable.

Distribution

The species is widely distributed in the Philippines. It is also found in Java and New Guinea.

Uses

The bark has medicinal value.

Properties

Igyo yields a medium-weight to heavy hardwood with a density of 400 kg/m^3 at 15% MC. The heartwood is pale reddish-brown or reddish-yellow. Shrinkage is moderate and the wood seasons well, but may check or twist slightly. The wood is moderately hard to hard and strong. It is moderately easy to easy to work. It is reported to be nondurable to moderately durable when exposed to the weather or in contact with the ground. Resistance to fungal and insect attack is very variable but the sapwood is susceptible to Lyctus.

Ecology

Igyo thrives in well-drained habitats in the lowland on clayey to sandy soils; some species extend into the montane zones, up to 2,000 (-2,900) m altitude.

BATINO

Alstonia macrophylla

Description

A medium to large tree, it reaches height of 25 m and a diameter of 30 m. Its bark is smooth and pale gray. The leaves, whorl of three, are oblong, obovate, 10-30 cm long and 5-7 cm wide, pointed at the both ends, in short stalks (Fig. 10). Inflorescence is borne on short terminal cyme. The flower is small and yellowish white. The fruit, in double follicle, pendant and slender, is 20-40 cm long. The seed is small, flat with deep brown hairs especially along the edges. Seeds per fruit range from three to 62, with each seed measuring 4-5 mm x 1-2 mm (Fig. 10a). The seed coat is thin; the embryo, large and linear, is centrally located inside the seed.

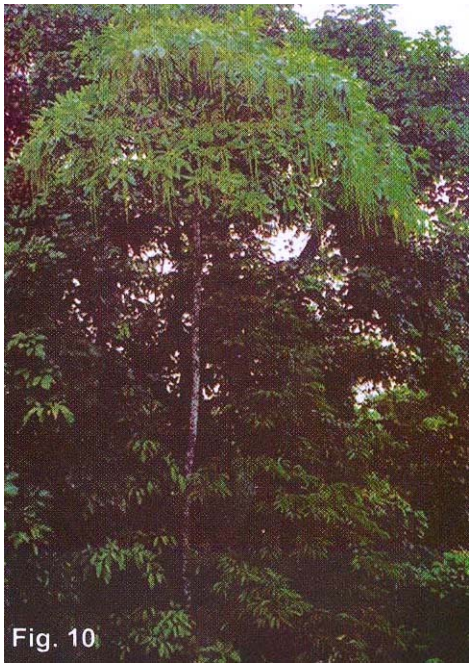

Fig. 10

Phenology

Flowering	March-May
Fruiting	June-September
Seed collection	July-November
Place of collection	Luisiana, Cavinti and Sta. Maria, Laguna

Seed extraction/processing

Extract the seeds manually, then air-dry the seeds for five days.

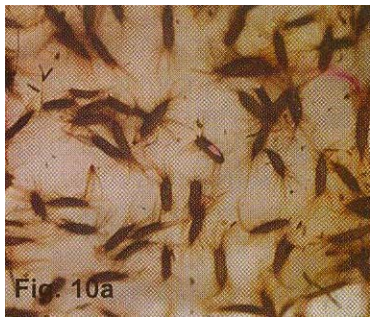
Fig. 10a

Seed count 365,000/kg

Seed type Orthodox

Seed germination

Seeds were sown in sterilized soil in plastic trays, then were covered with fine sterilized soil. They started to germinate 10-14 days after sowing. Complete germination occurred after 20 days with 95% germination.

Storage

Seeds with 10.5% MC can be stored at room temperature for six months with 76% germination. It was observed that beyond six months, germination started to decline and 0% germination was noted after the 9th month of storage. Seeds with the same MC and stored in the refrigerator at 7°C had a lower germination percentage (25.5-48%) during the first six months of storage but increased to 88.4% after the 9th month and 87% on the 12th month of storage. These results came about after the ripening of the seed embryo. Seeds, stored in the refrigerator at 7°C for 24 months with 7.5% MC, still reached 31.5% germination.

Distribution

The species is found all over the Philippines. But it is grown more abundantly in humid areas like Luisiana, Cavinti, and Sta. Maria in Laguna Province; in Mt. Palay-palay, Cavite; and in Puerto Princesa, Palawan.

Uses

The wood is used for furniture, pallets, window and door frames, vegetable crates, and for wooden clogs. The bark, in powder decoction, infusion, tincture or wine preparation, is used as an emmenagogue, a tonic, and a vulnerary. Its leaves when greased with coconut oil and heated are applied as a poultice on sprains, bruises, and dislocated joints.

Properties

The bark pattern is smooth, ochre-grey with very fine fissures. The outer bark is 1mm and brown. The surface of the inner bark is reddish-brown, with pock-marks. The inner bark itself is 20 mm, yellow with orange dots, and brittle. It exudes white sap. The cambium turns dark on exposure.

Ecology

Batino thrives in primary and secondary growth thickets at low altitude and up to 1,000 m altitude.

BUNGLIU

Polyscias florosa Philips.

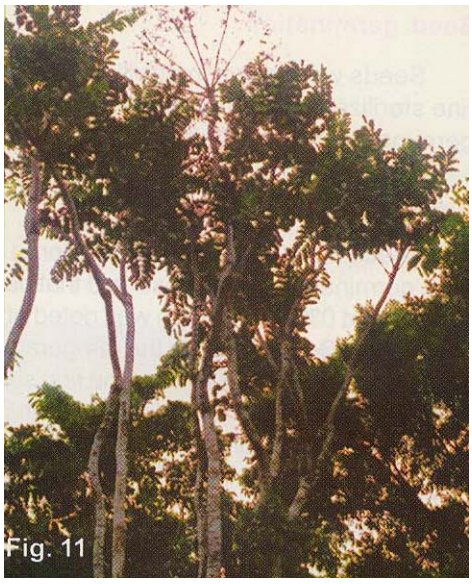
Fig. 11

Description

This is a small to medium-sized tree up to 25-30 m tall. Its bole is branchless for up 50 15-18 m, and up to 60 cm in diameter without buttresses (Fig. 11). Its bark surface, pale gray to brown, has vertical lines and the inner bark, white with yellow rays, is very brittle. The leaves are arranged spirally, crowded at the end of branches. The flowers are small, in capitula which are borne racemosely along the secondary inflorescence branches (Fig. 11a). The fruit is a subglobose yellowish-red drupe. The seed, 8-9 mm x 6-8 mm, is obovate and brown with hard, opaque, light brown seed coat. The embryo is very small, centrally located in the apical portion of the seed.

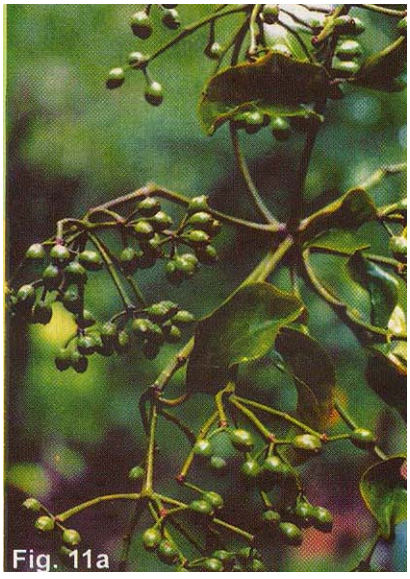
Fig. 11a

Phenology

Flowering	January-February
Fruiting	March-July
Seed collection	August-October
Place of collection	Barangay Cueva, Sta. Maria, Laguna

Seed extraction/processing

Soak the ripe fruit in tap water overnight to soften the tissue. Macerate the fleshy part to separate the seeds. Clean the seeds thoroughly in running water. Oven-dry the seeds for several hours before taking initial moisture content and germination.

Seed type Recalcitrant

Seed count 4,500/kg

Seed germination

Seeds without seed coat and treated with fungicide started to germinate eight days after sowing while those with intact seed coat, 60 days.

Distribution

This species is distributed in the Philippines, specifically in Barangay Cueva, Sta. Maria in Laguna Province; Mt. Bulusan in Sorsogon Province; and Mt. Malinao in Albay Province, all in Luzon.

Storage

Seeds can be stored in plastic bags at room temperature for only a month. Beyond one month, the seeds will no longer be viable.

Uses

The wood of bungliu is regarded as one of the best for small objects like boxes, matches, pencil slats, popsicle sticks, toothpicks, chopsticks, and ice-cream spoons. It has also been used for wooden shoes, fence posts, and handles for rice-knives. Large diameter logs are suitable for veneer and plywood production.

Properties

Bungliu yiels a lightweight hardwood with a density of 300-515 kg/m^3 at 15% MC. Shrikage of the wood is high. It seasons well and warping and checking is negligible. The wood is weak and soft. It is easy to work and fairly durable for interior work, but very perishable when exposed to the weather. The wood is susceptible to dry-wood termites and the sapwood to Lyctus.

Ecology

Bungliu is found scattered in primary or more often in secondary evergreen or deciduous forests, sometimes in dipterocarp forest, or in thickets, up to 1,000 m altitude. It occurs on permanently moist or periodically dry soils.

DUROGO

Knema stellata var. cryptocaryoides


Fig. 12

Description

This is an evergreen, dioecious and medium-sized tree up to 40-50 m tall with a diameter of 60-70 cm (Fig. 12). Its bole is straight, cylindrical, branchless for up to 15 m. The bark surface is smooth to scaly, reddish- or greenish-brown to gray-brown. The leaves are alternate, simple, entire, exstipulate secondary veins often raised above. The flowers are in clusters on short, simple woody knobs. The fruit is a hairy, one-seeded follicle, splitting on 1-2 sides (Fig. 12a). The seed is enclosed in an aril that is lobed at the apex (Fig. 12b).

Phenology

Flowering	August-October
Fruiting	November-March
Collection	April-June
Place of collection	Barangay Cueva, Sta. Maria, Laguna


Fig. 12a

Seed extraction/processing

Air-dry the fruit in a well-ventilated area for 1-2 days to allow it to break or split to release the seeds. To extract the seeds faster, remove them from the fruit manually.


Fig. 12b

Seed count 14,000/kg (newly extracted seeds); 23,000/kg (dried for one week)

Seed type With 55.44% initial MC, probably recalcitrant

Seed germination

The first germination occurred two months after sowing. Of the 4,000 seeds sown, only 10 seeds germinated or 0.25% after three months. The seedlings were very slow-growing. Seeds taken from the potting medium were dissected and were found still alive as reflected in the enlargement of the embryo. Pretreatment (nicking and soaking in fungicide solution) did not hasten germination.

Storage

Seeds kept in sealed bottles and stored at room temperature for two months dried up; the endosperm and embryo turned black.

Distribution

In the Philippines, three species *K. korthalsii* Warb. or *K. mindanensis*, *K. kunstleri* (King) Warb., and *K. stellata* with three varieties can be found and distributed from Babuyan to southern Philippines. *K. stellata* with its three varieties, particularly var. cryptocaryoides, is endemic in Sta. Maria, Laguna.

Uses

The wood of Knema is used for light or temporary construction, house building (posts, beams, planks), flooring. Boat building, interior trim, wall paneling, pattern making, crates, matchboxes and match splints, and for the production of plywood. It is suitable for the manufacture of wrapping and writing paper. It is occasionally used as firewood.

The seeds contain an oil that has been used for illumination. The fruit of some species is edible.

Properties

Knema yield a medium-weight hardwood with a density of 495-880kg/m^3 at 15% MC. The heartwood is pale brown, gray-brown or red-brown not clearly differentiated from the yellow-white sapwood which may have a pinkish tinge. The wood is non-durable, readily attacked by fungi when exposed to the weather or in contact with the ground and susceptible to dry-wood termites and ambrosia beetles. The sapwood is extremely susceptible to Lyctus.

Ecology

Knema is found scattered in lowland to montane rain forests up to an altitude of 1,700 m.

BALASBAS

Evodia crassifolia Merr.

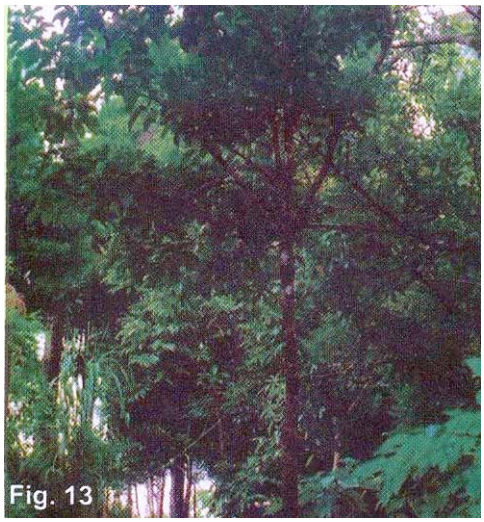
Fig. 13

Description

This is a medium-sized tree that reaches a height of 8-20 m, branchless for up to 4 m and a diameter of 7-20 cm (Fig. 13). The leaves are opposite, trifoliate, entirely glabrous, ovate to lanceolate-ovate, with acute apex attached to apposite slender petioles, 9-11 cm x 3-5 cm in the broadest part of the leaves. The flowers, 4-5 cm long, perfect, white, are attached to a peduncle, densely clustered from the ends of the branchlets. Four cocci or capsules unite in one fruitlet with a hard, dark green to black, endocarp (Fig. 13a). Each of the four cocci dehisces and releases one seed which is smooth, steel black with a hard seed coat and measures 3-4 mm x 3 mm (Fig. 13b).

Phenology

Flowering	November-December; July-August
Fruiting	January-February
Seed Collection	March-April; October-November
Place of collection	Barangay Cueva, Sta. Maria, Laguna

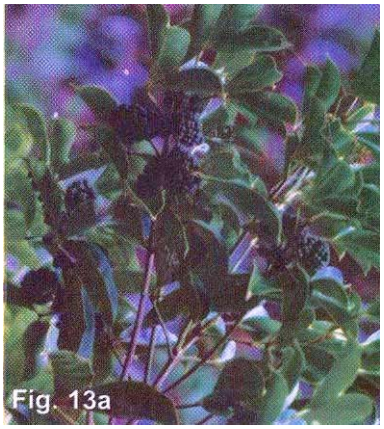
Fig. 13a

Seed extraction/processing

Dehisce the fruit when ripe and extract the seeds manually.

Seed count 12,500/kg

Seed type Recalcitrant


Fig. 13b

Seed germination

The seeds were germinated in Petri dishes with moistened filter paper and in plastic trays with sterilized potting medium. Petri dishes and trays were exposed in a germination chamber with fluorescent lamps for 6 months but no germination occurred. Incubation has been continued and observation has been furthered.

Storage

This has not been studies yet. Thus, there is no available information.

Distribution

In the Philippines, it is found in Sta. Maria in Laguna Province; in Cagayan, Ilocos Norte, Benguet provinces; in the Visayas; in Sulu and Tawi-tawi.

Uses

The wood of balasbas is used for light construction and charcoal. It is also used as fuelwood.

Properties

There is no available information pertaining to the wood properties of balasbas.

Ecology

The species thrives in forests at low and medium altitudes up to 2,200 m.

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