MANNA AND ITS SOURCES.

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INTRODUCTION.

Mannas have been known from the earliest times, particularly in Asia Minor, where some mannas are still regularly used in the preparation of local sweetmeats, which are highly esteemed. Others are better known for their medicinal, mainly laxative, properties.

The word manna has been used very generally to describe saccharine exudations from a number of different plants, belonging to various families. Some of these exudations consist largely of the hexahydric alcohol mannite or mannitol, associated with the sugars manninotriose and manneotetrose ; in others the principle sugars are sucrose and dextrose, and mannite is absent.

In some instances the term manna is applied to the entire organism, as, for example, certain edible lichens and fungi. In other types of manna, the word is applied to substances which are actually of animal origin and are only produced indirectly from plants, although often confused with direct exudations from the plants themselves.

The different kinds of manna may be briefly summarized as follows:—

I. **Plant.**

A. Cryptogams.

Various lichens and fungi have been mentioned in the literature on this subject, the term manna being usually applied to the entire organism and not to any exudation.

B. Phanerogams.

(i). Direct Exudation occurring naturally without any apparent stimulus, e.g. *Myoporum platycarpum* R. Br., in which the cause of the secretion remains obscure. In other instances the exudation may be attributable to minute insect punctures which are not easily observed.

(ii). Direct Exudation, artificially produced by man-made wounds This is the method used in the commercial production of manna from the manna ash (*Fraxinus ornus* L.), the trees being tapped through incisions made in the bark.

II. **Animal.**

(i). Indirect Plant Exudation, being excretion by Aphids or Coccids which feed by sucking up plant juices. This type of manna, an example of which is that produced from certain species of *Tamarix*, is analogous to the honey dew formation which is a familiar phenomenon in this country.

(ii). Animal. A type of manna more obviously of animal origin is Trehala manna, which consists of cocoons of *Larinus nidificans* (*Coleoptera*), found on *Echinops* spp.

It may be seen from this short introduction that mannas are extremely diverse in their origin—as they are also in their composition.

The use of the word " manna " for any particular substance appears to be purely arbitrary, although it seems to be based essentially on the idea that manna is a " gift from God ". The term has therefore been applied to diverse substances which apparently " came from Heaven ", in the

sense that they were found on the ground or on trees, shrubs or herbs, as though they had simply fallen out of the sky. This conception of a Heavenly gift has centred around Biblical countries, most mannas having been found in Asia Minor.

Biblical Manna.

The earliest references to manna occur in the Old Testament and have therefore long been known to both Jew and Gentile ; whilst for the followers of the Prophet, the Koran also contains a brief narrative.

" And when the dew that lay was gone up, behold, upon the face of the wilderness there lay a small round thing, as small as the hoar frost on the ground . . . . And when they did mete it with an o'mer, he that gathered much had nothing over, and he that gathered little had no lack . . . . . And Moses said, Let no man leave it till the morning . . . . but some of them left it until the morning, and it bred worms and stank . . . . . And they gathered it every morning . . . . and when the sun waned hot, it melted . . . . And the house of Israel called the name thereof Manna : and it was like coriander seed, white ; and the taste of it was like wafers made with honey " (Exodus XVI. 14–36).

" And the manna was a coriander seed, and the colour thereof as the colour of bdellium " (Numbers XI. 7–9).

" And we caused clouds to overshadow them, and sent down upon them the manna and the quails————" The Koran, Sura vii–Al Araf.

These descriptions are vague and may be too inaccurate to afford any real clue to the identity of the substance in question.

An organism which at one time was generally accepted as being the Biblical manna is the Lichen, *Lecanora esculenta* Evers, found on rocks and stones in the lands between Asia Minor and the northern Sahara, along with *L. esculenta* var. *jussufii*. At certain times these lichens may be broken up by drought and winds into small particles, which lodge in cracks in the ground, or accumulate in the lee of bushes as detritus, following violent winds or rain.

It has been pointed out that the lichens do not " appear with the dew, breed worms, nor melt in the sun ", all of which are characters descriptive of many of the fungi, *sensu stricta*, rather than of the lichens.

Hence a theory has been held that the manna of the Children of Israel was actually a fungus (12). A substance which apparently answers to the original description was noted on the plateau between Lakes Tanganyika and Nyasa, where it was gathered by the Amamburi tribe who called it " the Food of God ". It was white, very similar to porridge, and had to be gathered before sunrise as it melted in the sun and became full of worms if kept overnight. It was sweet to the taste and resembled coriander seed. It is unfortunate that this traveller's tale is not known to have been substantiated by the production of a specimen of the substance, but it has led one author to assume that it might be a "mushroom spawn ", without suggesting any possible genus. Arguments were put forward to show that it was not at all improbable that this Central African " manna " might also occur in Arabia.

In 1927 an expedition from Jerusalem University set out to demonstrate the identity of manna by a sojourn in the desert on the Sinai Peninsula. After some weeks of observation and experiment they concluded that Biblical manna was a phenomenon familiar in other countries as honey dew, a sweet excretion produced by Aphids and Coccids, liquid at first but later solidifying. The two coccids mainly responsible for manna in the Sinai Peninsula are stated to be *Trabutina mannipara* Ehrenb. and *Najacoccus serpentinus* var. *minor* Green, both on *Tamarix nilotica* var. *mannifera* Ehr. No manna was observed on other species of *Tamarix*. The expedition showed that fluid is ingested from the phloem vessels by the insects and excreted as a clear liquid, crystallizing in the dry desert climate and covering the branches or falling to the ground as the white grains of Bibilical manna. Other species of *Tamarix* are recorded as producers of manna, but production is often confined to certain areas, which would explain the failure of the Jerusalem University Expedition to find manna on more than the one species in the Sinai Peninsula.

One argument against *Tamarisk* manna being that of the Scripture is that substances which are used today as either drugs or sweetmeats would hardly suffice as the staple food of a people for any length of time. This argument would apply similarly to any of the other modern mannas. Possibly the miracle of the Old Testament was the presence of a sweetmeat in sufficient quantities to form a welcome and nourishing addition to the diet of people having to exist on very frugal supplies of food. We all realize how necessary appetisers are in times of rationing, to make a monotonous diet more palatable.

The nomadic people of many parts of Asia Minor live very similarly today, subsisting mainly on their flocks and herds and regarding "natural" additions to their diet, such as fungi, lichens and mannas, as " Gifts from God ". It is possible that the manna of the Bible was actually more than one substance, the description being of a conspicuous type and symbolic of the whole. Fossil stumps have been found which indicate that at the time of the Exodus the Sinai Peninsula was a wilderness of Tamarisk trees and bushes and not a bare desert.

A LIST OF SPECIES RECORDED AS PRODUCERS OF MANNA.

Cryptogams.

Fungi.

Certain fungi have been associated with manna on the grounds that they contain the sugar, trehalose, which is the chief sugar of trehala manna (see *Echinops* p. 408). Trehalose has been found, for example, in *Boletus edulis* Bull. ex Fr. (*Polyporaceae*) and in *Lactarius piperatus* (Scop. ex Fr.) Fr. (*Agaricaceae*).

In addition to the larger fungi, instances are recorded of the occurrence of this sugar in the *Mucorales* and Yeasts, (also in *Myxomycetes*).

Lichens.

Certain species growing in Asia Minor, notably *Lecanora esculenta* Evers and *Lecanora affinis* Evers, have been supposed to be the manna of the Scriptures. In some parts of the world today lichens are still collected for human consumption and are regarded as manna, in the biblical sense. A specimen of *L. esculenta* in the Museum collection at Kew is

stated to be found on the sides of the mountains in Persia (Iran), and largely eaten by the poor in times of famine. This specimen consists of irregular, wrinkled, slightly flattened pellets, averaging about 10 mm. in two planes and about 6 mm. in the third. Although the outer surfaces of the pellets are now pinkish-grey it is probable that this is due to ageing, the inside being still pinkish white. A specimen of *L. affinis* in the same collection is generally about half the size of the previous species, darker on the outside with a whitish core, and with small white-tipped protuberances in addition to folds and wrinkles. This particular specimen came from Anatolia, where the natives called it " manna " and used it to make a kind of bread. Apparently it can only be obtained after a heavy fall of dew, which governs the local belief that it actually fell with the dew.

Moghadan (18) mentions *Chlorangium jussufii* Rabh., which is a synonym of *Lecanora esculenta* var. *jussufii* Stur. (*Parmelia esculenta* Sprol., *Lecanora desertorum* Krumphr. and *Lichen esculentus* Pallas are other synonyms of *Lecanora esculenta* Evers, which are to be found in literature on the subject). Moghadan states that *Chlorangium jussufii* is collected in the deserts of Persia and made into a type of bread, which is sold in the bazaars of Teheran and elsewhere as " Schirsad " and is supposed to encourage lactation.

Gymnosperms.

Coniferae.

Larix. So far as is known the only family in this group which produces manna is the *Pinaceae*, the most important species being larch, *Larix decidua* Mill., the course of Briancon manna, which contains the sugar melezitose. The earliest mention of Briancon manna appears to be in 1542, when it was listed in the Paris Customs Tariff as Manna Brianzona or Manna Brigantiaca. Briancon (France) remained the only source of supply until 1919, when larch manna was discovered in Switzerland. It is evidently secreted by aphids, as are the honeydews of lime and poplar trees, which also contain melezitose, and is in fact the undigested residue of carbohydrates from the sap sucked out of the foliage by the insect, in this instance probably by the aphid *Lachnus laricis* Walk.

In one of the Kew Museums there is a specimen dated 1864, obtained by Daniel Hanbury near Chantemerle in the Hautes Alpes, Dauphiny. It consists of amorphous crumbs, brown in colour, no doubt with age. A more recent specimen, still fairly white in colour, is that obtained by Prof. A. Henry in Switzerland in 1923 (10). Here the crumbs are preserved *in situ* where they have been deposited on the foliage of the larch. Larch manna is rare and costly. It was at one time used as a mild purgative. It has also been used as a culture medium in bacteriology.

Manna has also been found on Western larch, *Larix occidentalis* Nutt., for example, in the year 1898 in British Columbia. These two species of larch appear to be the only members of the genus from which manna has been recorded.

Pinus. The Bhutan pine, *Pinus wallichiana* A. B. Jacks, syn. *P. excelsa* Wall. and the Chir pine, *P. roxburghii* Sarg., syn. *P. longifolia* Roxb., in the Himalayas, produce manna which is collected and eaten or used to

adulterate honey. It has been stated that the production of manna is usually quite small and large exudations only occur once in 20 or 30 years. Watt (19) notes that exudations from *P. wallichiana* occur from the tips of the twigs and cement the needles into clotted masses, which, melting in the sun, encrust leaves, twigs and stones around the trees with a varnish like covering. It seems probable that it is of aphid origin.

Pinus lambertiana Dougl. is mentioned by Moghadan. This is the Sugar Pine of N. America, the popular name being a reference to a sugary secretion from the trunk, which is not known to have been termed manna. The pine mannas have not been extensively examined and no chemical analysis of them is known to be available.

Pseudotsuga. Douglas Fir manna was first discovered in 1914 in British Columbia, where it is confined to dry alpine valleys and is only produced in hot summers. It resembles larch manna in appearance and also contains a high percentage of melezitose. Prof. A. Henry notes that this is of interest, in view of the close affinity between *Larix* and *Pseudotsuga*. A specimen of sugar deposits on twigs of *Pseudotsuga taxifolia* (Poir.) Rehd. (*P. douglasii* Carr.), which was obtained in British Columbia, was received at Kew in 1929. This particular specimen has not, however, been analysed.

Cedrus. The Cedar of Lebanon is mentioned by both Moghadan (18) and Watt (19), but the latter probably confused it with *C. deodara* Loud. Manna from Cedar of Lebanon has been described as bitter and unpleasant, which may indicate that the substance referred to was partly of a resinous or terebinthine nature. The National Standard Dispensatory of 1905 referred to Lebanon manna as " small sweet grains obtained from *Cedrus libanotica* Link. ", but no recent accounts or records of Cedar manna have been found.

Angiosperms.

1. *Tamaricaceae.*

Tamarix. Tamarisk manna has long been known in Iran and Armenia, where it is collected for use in native sweetmeats and as a drug. Hooper ennumerated the manna yielding species of *Tamarix* in 1909 and recorded details of native names and the uses to which the mannas had been put (14). From the records available it is not always easy to ascertain the exact species to which particular statements apply. It seems clear however that mannas are produced by at least four species and probably one or two others about which the records are less precise. Tamarisk manna is produced in Arabia, Iran, Baluchistan, Afghanistan and parts of Central Asia. It is exported to certain Moslem countries, e.g. to India, formerly, probably now to Pakistan, for use as a drug, considered to be a mild laxative.

In Iran, sweets called " gazangabin " are prepared from manna or " gez ", mixed with rosewater, flour and pistachio nuts. The word gazangabin has also been applied to products prepared from *Cotoneaster*, *Alhagi* and *Salsola* mannas. Production of Tamarisk mannas appears to be somewhat local. For instance, that of *T. aphylla* (L) Karst. (*T. articulata* Vahl.) is only recorded from Baluchistan, Afghanistan, Arabia, and Iran, although the species is said to be widely distributed in the Punjab, Egypt, Somaliland and Western Asia. A specimen of Gazangabin from this species is in one of the Kew museums. Originally it was

in the India Museum. Unfortunately the place of origin of this specimen cannot be ascertained.

References to *Tamarix gallica* L. are somewhat confused. It has been stated that a variety, *T. gallica* var. *mannifera* Ehr. is a source of manna only in south eastern Iran. It is the chief producer of the "Gaz" used in the manufacture of Gazangabin and is exported from Iran in considerable quantities. It is believed that this manna is the result of punctures formed by *Coccus manniparus* which attacks this species in Iran, Arabia, Afghanistan and Egypt. Manna from this species of *Tamarix* has not been reported in many parts of its range, which includes India and China. It is not certain whether this is due to the absence of the Coccid from these areas or whether it may indicate that the species is represented there by a different variety which for some reason does not enable Coccids to produce manna.

T. pentandra Pall. (*T. pallasii* Desv.) is widely distributed in Baluchistan where it yields a sweet gum which is sometimes classed as a manna (15). A specimen of this, which is in a collection of Persian Drugs at Kew, is a sweet amorphous mass, resembling glue or brown treacle in colour and of the consistency of a stiff dough.

T. macrocarpa Ehr. ex Bunge is said to occasionally bear a "saline incrustation", which may actually be a manna.

An account of the manna of *Tamarix nilotica* Ehr. has already been given. It seems probable from the descriptions available that most, if not all, Tamarisk mannas are insect secretions of the honey-dew type. Hooper states that India Museum specimens were examined and found to contain a large percentage of reducing sugars but no mannite.

2. *Celastraceae.*

Gymnosporia. In 1913 a specimen of this genus, probably *G. deflexa* Sprague, was received at the Imperial Institute from north western Rhodesia, bearing a white incrustation of "manna". This was further examined and found to consist of 54% dulcitol, 6·4% dextrose sugar and 6·6% sucrose. Apparently the quantity of the residue was too small for further examination. (1). No repetition of the appearance of this manna has been noted.

3. *Leguminosae.*

Alhagi camelorum Fisch. (*A. persarum* Boiss. & Buhse), and *A. maurorum* Desv. (*Hedysarum alhagi* L.), are both known to yield manna but only the latter is represented in the Kew collection. There are two specimens; one is a dry brown dust, stated to be "A better and new variety received from Agra in 1876", the other consists of sticky, glistening brown tears, ranging in colour from light brown to almost black. The latter was collected in Afghanistan and presented by Dr. Aitchison in 1886. The uses of *Alhagi* manna are similar to those of Tamarisk, chiefly in the manufacture of sweets and as a mild laxative. According to Moghadan it is called Tarandjabine in Iran, where it is largely used in popular medicines. It is collected by shaking twigs over a cloth. Alhagi mannas have been discussed also by Chevalier (2).

Astragalus. It has been stated that two species of this genus were a source of supply of manna collected in the mountain districts of Chahar-Mahal and Faraidan (9), but no other records have been found.

Indigofera semitrijuga Forsk has been mentioned as a manna producing plant (2).

4. *Rosaceae.*

Cotoneaster nummularia F. & M. is the source of Shirkhist, a manna which is often confused with the Gaz of *Tamarix* and is used, like the latter, in the preparation of the sweet, gazangabin, in Iran. Shirkhist manna collected by Dr. Aitchison in Afghanistan is in the form of rough whitish brown cakes, about 2 in.–3 in. across, whilst another specimen of Shirkhist more nearly resembles Gazangabin in form, colour and consistency. There appears to have been some confusion between the raw material and the sweetmeats which are prepared from the manna.

5. *Combretaceae.*

Madagascar manna has been stated to be the secretion of a cricket, *Phremnia rubra* Signoret, which lives on bushes of the family *Combretaceae* (6).

6. *Myrtaceae.*

The mannas of this family, although not of great economic importance, have been the subject of a number of studies by Maiden and others in Australia.

The following have been recorded as producers of manna.

Leptospermum scoparium Forst. " Tea tree ". A small quantity of " manna " was reported on a twig in 1895, but was not analysed.

Eucalyptus. Manna, in varying quantities, has been reported from a considerable number of species, not all confirmed. *E. cinerea* F. v. M., *E. cinerea* var *nova-anglica* Maiden, *E. corymbosa* Sm., *E. eximia* Schau., *E. foecunda* Schau., *E. gomphocephala* D.C., *E. gunnii* Hook., *E. mannifera* Mudie, *E. multiflora* Rich., *E. oleosa* F. Muell., *E. punctata* D.C., *E. resinifera* Sm., *E. rubida* Deane et Maiden, *E. stuartiana* F. Muell., *E. terminalis* F. Muell., *E. viminalis* Labill. (syn. *mannifera* A. Cunn.).

From the specimens available in the Kew collections it is evident that *Eucalyptus* mannas are of at least two distinct types. Specimens from *E. gunnii* and *E. multiflora* consist of whitish brown tears, resembling larch manna in appearance. It seems that this type is produced in times of drought through rupture of the cortical vessels of the tree. This is known to occur in *E. viminalis* and *E. rubida.* This type of manna dissolves readily in water and is stated by Maiden to be frequently taken as a pleasant purgative in some parts of Australia,—dose for a healthy adult 2½–3 tablespoons full. The action is claimed to be so mild that it may be administered to the smallest infant. The first manna to be noticed in Australia was that of *E. viminalis*, which has also been found in the Argentine (4). In the former country it was long confused with *E.rubida.* An entirely different type of manna is that produced on *E. oleosa.* which consists of flat wooly brown discs, about the size of a halfpenny, each composed of a number of flat cells in a honeycomb pattern, suggesting that each cell has been the home of one of the insects responsible for secreting the manna. This manna is termed " Lerp " and resembles that found on *E. rubida*, which is produced by a species of *Spondyliaspis* (*Psylla*), according to the paragraph on the zoology of mannas by Maiden (17).

Ordinary *Eucalyptus* mannas, in addition to those caused by drought, have been attributed to various insects, including *Cicadidae*, *Cercopidae* (Froghoppers), and *Coleoptera*.

7. *Compositae*.

Trehala manna, in which the chief sugar is trehalose, is the cocoon of the beetle, *Larinus nidificans*, produced on *Echinops persicus* Stev, and probably other species. There are specimens from three different areas in the Kew Museum collections. One is of Trehala or " Tihan " from Baghdad ; the plant source of which is not noted. Another is " Shek Roukeh ", which is recorded as being produced by the larvae of a Rhynchophorus insect on the " Tucee plant ", *Echinops* sp., at Kirrind, Iran. The appearance of this sample is very similar to the specimen from Baghdad. The third specimen is " Shukkur Tigal " from the East Indies, which is recorded as being " cocoons on *Echinops* sp., having a sweet taste ". The biology, chemistry and history of Trehala manna and trehalose are treated in some detail by Moghadan (18).

8. *Ericaceae*.

Rhododendron arboreum Sm. has been stated to be the source of a manna, but this has not been confirmed (19).

9. *Oleaceae*.

Fraxinus manna is probably the best known of all commercial mannas. It is produced chiefly from the Manna Ash, *Fraxinus ornus* L., a native of southern Europe, which is cultivated for the production of manna, especially in Sicily. Commencing when the tree is about ten years old, the stem is tapped by making daily incisions in the bark, from which the liquid manna exudes, congealing on the trunk. In wet weather it remains liquid rather longer and often falls to the ground, being then considered to be of inferior quality, although it may be caught on the flat branches of *Opuntia* placed beneath the tree to prevent the manna from becoming soiled. Alternate sides of the tree are incised for three years, after which the exhausted stem is cut down and two or more new shoots are allowed to grow up from the stump, to be ready for tapping again in ten years time.

There are a number of samples of Sicilian manna in the Kew museum, in the form of lumps or rods of varying sizes and varying in colour from almost white to a medium brown. The better quality mannas are flaky in consistency, the inferior grades are more agglutinated and darker in colour. A specimen of manna from *F. ornus* var. *rotundifolia*, from Madras, is similar to the Sicilian manna in appearance. The " Shirkhist " from *F. floribunda* Wall., from Lahore, and a manna from a species of *Fraxinus* in Herat are both brown and crumbly compared with the European Ash mannas of comparable age.

Fraxinus ornus manna has long been known and used as a gentle laxative. It consists of from 40% to 60% mannite, 6% to 16% manninotriose and 12% to 16% manneotetrose (7).

The olive, *Olea europea* L., is capable of exuding a manna, according to Moghadan.

10. *Asclepiadaceae.*

Calotropis gigantea R. Br. is contained in Watt's list of manna producing plants in India. It is said to be the source of the manna called "Shukuri Tighal ".

Calotropis procera R. Br., as *Apocynum syriacum* S. G. Gmel., was noticed by Moghadan in a list of Persian herbs compiled by Schlimmer in 1874, but not verified as a manna producing species.

11. *Scrophulariaceae.*

Melampyrum nemorosum L. is referred to by Watt as being the source of " Madagascar manna ", but this has not been confirmed.

12. *Myoporaceae.*

Myoporum platycarpum R. Br. was first recorded as a source of manna in Australia in 1882 and was long known to be a food of the aborigines in the interior. In 1892 the exudate was regarded by Maiden to be a perfect substitute for European Ash manna, but it has remained neglected until quite recently, when investigations were commenced by the Council of Scientific and Industrial Research (Australia) with the intention of determining the potential value of the exudate as a source of mannitol for industry. It has been shown that 60% to 70% of the total solids in this manna consist of mannite, but unfortunately *M. platycarpum* cannot be made to exude manna by mechanical injury, as in the commercial production of Ash manna. In fact, the reason for the natural exudation remains a mystery, as it has been observed that manna production by this species is not always associated with the presence of insect bores. It has been suggested that the presence of a yeast and two species of bacteria may provide the key to the problem, but as yet no positive experimental results have been obtained (5).

13. *Chenopodiaceae.*

Salsola foetida Del.

Manna from this species is noted by Watt and was described by Aitchison in Iran (14).

14. *Polygonaceae.*

. *Atraphaxis spinosa* L. is the source of a manna called " Schirkhecht " in Iran (18). It is stated to be found in mountainous regions near Teheran in the form of white viscous grains about the size of peas and is used as a laxative and purgative in local medicine.

15. *Fagaceae.*

Quercus. Oak manna is known to occur on *Quercus incana* Roxb. and *Q. persica* Jaub et Spach, and may also occur on other species. It is collected in Iran and Irak, where it is used to make confectionery; in particular, a type of nougat is prepared by clarification of the manna and the addition of sugar, white of egg and nuts. This is sold in the form of small, flattened, round cakes of a light buff colour. The manna itself is marketed as dark greenish brown lumps flecked with buff coloured particles. The specimens in the museum at Kew include some which were collected in 1947. All are hard and brittle and similar in colour.

Manna from *Q. vallonia* is noted by Deerr (3) but in the absence of an authority it is uncertain whether the species referred to is actually *Q. aegilops* L. or *Q. cerris* L.

16. *Salicaceae.*

Salix. Moghadan notes the occurrence of mannas on *Salix fragilis* L., *S. persica* Boiss., and *S. tetrasperma* Roxb. The only specimen of *Salix* manna at Kew was collected from an unidentified willow at Quetta, Baluchistan, where the product is known as " Bed-khist ", probably derived from the Irani name " Bid-khecht ". In the environs of Teheran, manna is stated to form on the willow trunks in the form of viscous white globules, during the months of August and September. Production is variable and unreliable, and is believed to be independent of any insect interference. It is probably of the type initiated by the effect of the heat in summer. The manna is used chiefly in local medicine.

16. *Scitamineae.*

Ensete superbum (Roxb.) Cheesman (*Musa superba* Roxb.) is mentioned as a source of manna by Watt, but no details are available.

18. *Palmae.*

Again, Watt must be quoted. He simply tabulates " *Palmae*, various species ", in his list of manna plants, and no further details have been found.

19. *Gramineae.*

" Bamboo ". A bamboo manna was reported on the stems of *Dendrocalamus strictus* Nees in March 1899. It was in the form of short rods, white or light brown in colour, and was pleasantly sweet, the chief sugar being a saccharose, probably cane sugar. Its appearance was opportune, coming as it did at a time when India was in the throes of a serious famine, and the natives of those parts of the Central Provinces which were favoured by its presence were not slow to appreciate its palatability. It did not contain mannitol (13). A sugary exudation previously reported on *Bambusa arundinacea* Willd. and " *Bambusa verticellata* " has never been confirmed and may have been confused with " Tabashir ", a siliceous substance which is produced inside the stems of certain bamboos and has long been used in Indian medicine, as an aphrodisiac, stimulant, etc. It has been stated that manna from *B. arundinacea* is attributable to an aphid, *Oregma bambusae.* Further investigation would be desirable.

Dichanthium annulatum (Forsk.) Stapf (*Andropogon annulatus* Forsk.), an Australian Blue Grass, has produced a substance shown to consist principally of Mannite (17).

Phragmites communis Trin. is stated to have been the source of a manna collected by Indians in the State of California. No further details are known (8).

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International Rules of Botanical Nomenclature*.—In *Kew Bull.* **1948** (2), 172 (1948), we noticed the reprint of the International Rules, with the Amsterdam additions, issued by the Chronica Botanica Company in 1948. The same firm has now issued a report of the proceedings of the Symposium held at Utrecht in 1948, with the Amsterdam additions as a supplement. Two other supplements concern a proposed International Society of Plant Taxonomists, and the personnel of the International Commission for [Botanical] Nomenclature. The work is embellished with facsimiles of title-pages of earlier nomenclatural works, such as De Candolle's *Lois* (1867), and, though something of a " mixed bag ", will undoubtedly fulfil a useful purpose in connection with the Stockholm Congress.

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