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A REVISION OF THE INDO-MALAYAN SPECIES OF *VISCUM* LINN.*

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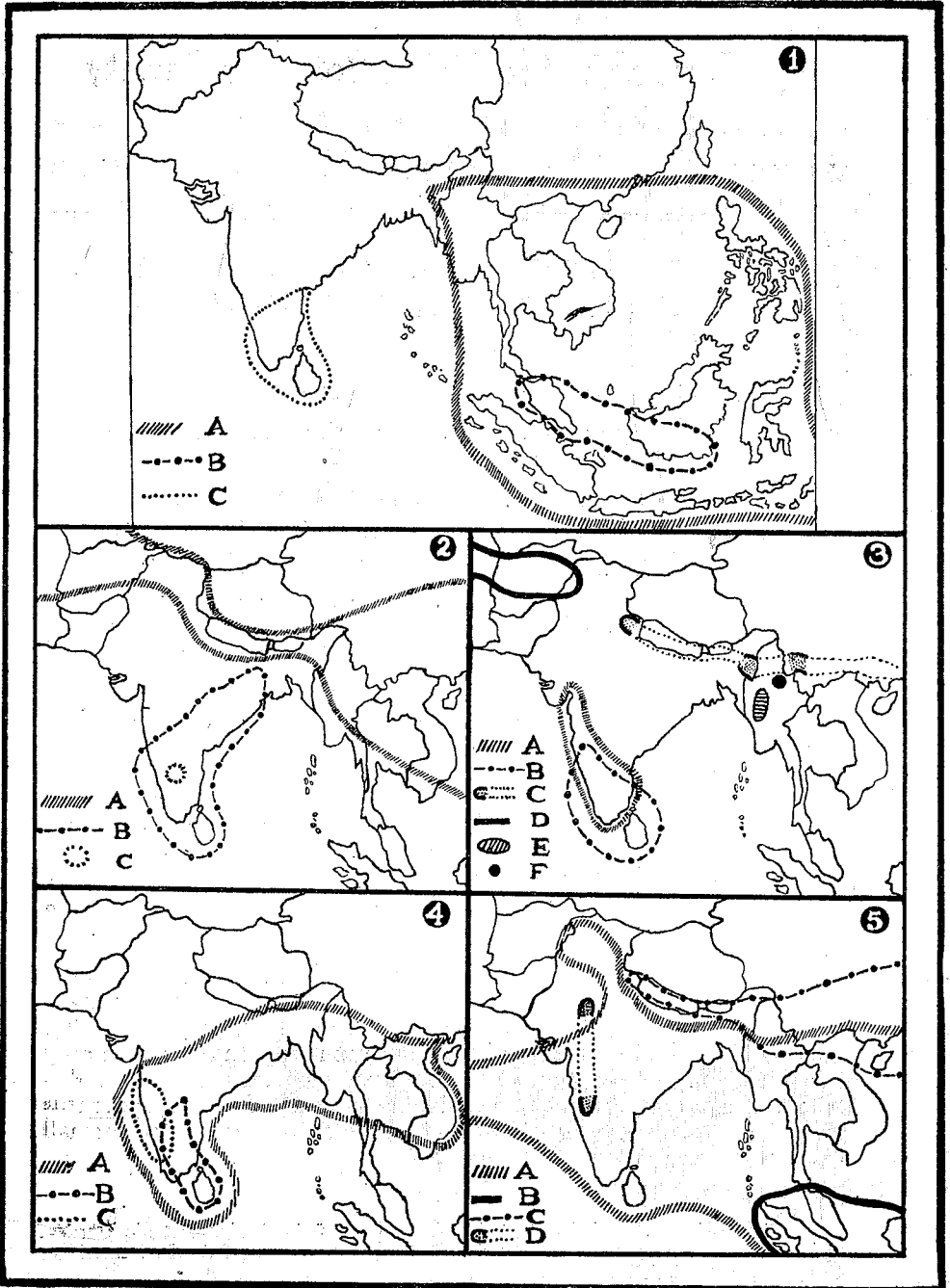
INTRODUCTION

DURING the study of the sheets of *Viscum* L. of the Calcutta Herbarium, the writer met with several species and varieties not recorded from various places of India and Burma by Danser in his revision of the British Indian species of *Viscum* in 1941 [*Blumea*, 4 (2)] as he could not consult the Calcutta Herbarium sheets for his revision. Further, the specific status of certain species is not fully justified. As such, the present revision as an extension of Danser's has become necessary.

This revision has considerably augmented the number of species and varieties known for India and Burma and further enlarged areas of distribution of many species. Danser in his paper (*loc. cit.*) mentions 17 species for the area. Of these, the writer has merged 2 species with the original species, giving a varietal status to one of them. This reduces the total number of species for the area under study to 15. A new variety has been described. A few species and varieties have also been newly recorded for the various regions in India and the neighbouring areas.

For the sake of brevity, the various synonyms given in different works pertaining to the floras of the Indo-Malayan region only, have been given. References to other works were given by Danser (*loc. cit.*). Descriptions based on the Calcutta Herbarium specimens and partly adopted from Danser (*loc. cit.*) have been included. Notes on distribution and various points of doubts regarding certain specimens raised by Danser (*loc. cit.*) have also been added, together with small distribution maps and illustrations of the 15 species.

* The work was carried out at the Herbarium of the Indian Botanic Garden, Calcutta, and the paper was read at the Forty-second Session of the Indian Science Congress, Baroda, 1955.



Maps of India and Farther East showing the distribution of the Indo-Malayan Species of *Viscum* Linn.

- MAP 1. A—*Viscum ovalifolium* A.P. de Cand.
 B—*Viscum wrayi* Gamble.
 C—*Viscum heyneanum* A.P. de Cand.
- MAP 2. A—*Viscum album* Linn.
 B—*Viscum orientale* Willd.
 C—*Viscum mysorensense* Gamble.
- MAP 3. A—*Viscum angulatum* Heyne ex de Cand.
 B—*Viscum capitellatum* Smith.
 C—*Viscum loranthi* Elmer (Discontinuous distribution).
 D—*Viscum cruciatum* Boiss.
 E—*Viscum acaciæ* Danser.
 F—*Viscum acaciæ* var. *obovalifolium* Sesh.
- MAP 4. A—*Viscum monoicum* Roxb. ex A.P. de Cand.
 B—*Viscum ramosissimum* Wt. & Arn.
 C—*Viscum trilobatum* Talbot.
- MAP 5. A—*Viscum articulatum* Burm.
 B—*Viscum articulatum* var. *flexuosum* (Gamb.) Danser.
 C—*Viscum articulatum* var. *liquidambaricolum* (Hayata) Sesh.
 D—*Viscum articulatum* var. *trilocarpum* (Danser) Sesh. (Discontinuous distribution).

HISTORY OF THE EARLY WORK ON THE GENUS

Linneaus in his first edition of "Species Plantarum" (1753) recognised the genera, *Scurrula*, *Loranthus* and *Viscum* which are now considered under Loranthaceæ. In 1754 they were validly published in the 5th edition of *Genera Plantarum*. Since then, *Viscum* L. has always been used in the right sense.

Korthals¹ in 1839 made the first attempt to classify *Viscum*, dividing it into 4 sections—(1) *Viscum verum*, (2) *Ploionuxia*, (3) *Aspidixia*, (4) *Baratostachys*. The knowledge of Korthals at that time was limited to only European *Viscum album* and a few species of Asia and of America, the latter having now been removed to other genera. Later in 1896, Van Tieghem² followed another method subdividing *Viscum* into two genera, (1) *Viscum* and (2) *Aspidixia*, the latter being based on Korthals' section, *Aspidixia*. Though Van Tieghem rightly preferred to base his distinctions of genera and sections upon the structure of inflorescence rather than the development of leaves, he did this in a wrong way. Later in 1897, Engler³ rightly uniting *Aspidixia* with *Viscum*, subdivided the genus on the basis of the structure of inflorescence but erroneously followed Van Tieghem in many details. In 1941, Danser (*loc. cit.*) proposed an arrangement distinguishing the genus into more natural groups on the basis of the structure of inflorescence. Discussing the merits and demerits of the early classifications in this paper may be superfluous as they had been well discussed by Danser (*loc. cit.*).

¹ *Verhand. Batav Genootsch.*, 17: 235-36, 1839.

² *Bull. Soc. Bot. France*, 43: 187-93, 1896.

³ *Engl. and Pr., Nat. Pfl. fam.*, 1: 1897, 139.

DISTRIBUTION

The genus is mainly distributed in the tropical zones though very few species occur in the temperate regions. Africa claims the largest number of species, as many as 50, particularly in the Central and Southern zones which seem to be the centre of richest development, Madagascar about 40 species, India 14 species, Burma 7, East Indies 6, Indo-China and Siam 8, Philippines 3, China and Formosa 9, Tropical Australia 3, New Zealand 1 and Japan 1 species. *Viscum album* Linn. and *V. cruciatum* Seib. et Boiss. appear to be the only two species occurring in temperate regions like Europe. On the basis of the available data, it appears that the line of distribution might have proceeded from Africa to India through Madagascar and gradually extended further East as far as Japan on one side and tropical Australia on the other.

KEY TO THE SPECIES

The arrangement of the species given below is chiefly based upon Danser's with the necessary alterations to bring out a suitable key for the Indo-Malayan species of *Viscum*.

I. No adventitious flowers in the cymes.

A. Flowers in usually 1-5 flowered spikes with terminal flower which, if female, usually with a bracteal cup of its own.

1. Flowering part of the plant with terminal inflorescences on the apex of all internodes. Lateral inflorescences present or absent. Dioecious species.

(a) Leafy. (All species.)

(i) Leaves very commonly large, female cymes 3-5 flowered, the lateral flowers in 1-2 decussate pairs; male flowers smaller, roundish in bud with tepals 2 mm. long; fruits sessile..... **V. ALBUM 1**

(ii) Leaves very commonly smaller, female cymes with not more than 3 flowers; male flowers larger, oblong-ovate in bud with tepals 6-8 mm. long; fruits stalked..... **V. CRUCIATUM 2**

2. Flowering part of the plant usually with numerous lateral inflorescences only and exceptionally with terminal inflorescences at the tips of weak branches. Monoecious species.

(a) Leafy.

(i) Leaves partly normally developed and partly reduced to scales, yellow when dry; central flower of each cyme subtended by a bracteal cup of its own; fruits sessile..... **V. MYSORENSE 3**

(b) Leafless or leaves scaly and very indistinct.

- (i) Flowering stems with distinctly flattened internodes of varying breadth 2-10 mm., broadening gradually from base to top, decussate but twisted near the base to appear as in one plane, much longitudinally grooved; fruits globose or oblong, usually large..... **V. ARTICULATUM 4**
- (ii) Flowering stems with distinctly 4-angular internodes; fruits globose or ovate, always smaller..... **V. ANGULATUM 5**
- (iii) Flowering stems with distinctly round internodes often terete or grooved; (leaves invariably absent though recorded in rare cases); fruits sub-globose always very small **V. RAMOSISSIMUM 6**
- (iv) Flowering stems stiff, divaricately branched, internodes round with a granular dull-shimmering surface, slightly wrinkled or grooved; inflorescences much crowded all round the nodes appearing as verticillaster; fruits smaller, oval with persistent tepals..... **V. LORANTHI 7**

B. Spikes reduced to triads with the middle flower female, the lateral flowers male.

(a) Leafy. (All species.)

- (i) Flowering stems with internodes round and slightly grooved; leaves larger usually ovate rarely lanceolate and falcate, venation usually distinct; mature fruits distinctly warty, almost sessile..... **V. OVALIFOLIUM 8**
- (ii) Flowering stems with internodes gradually flattened from base upwards; leaves distinctly obovate with broad rotund apex and smooth glossy surface, venation indistinct; mature fruits smooth, shortly stalked..... **V. WRAYI 9**
- (iii) Flowering stems with internodes very slender, terete, not flattened at any region; leaves invariably lanceolate to spatulate with 3 nearly distinct longitudinal nerves; fruits smooth, prominently stalked..... **V. ACACIAE 10**

II. Inflorescence enlarged by the development of adventitious flowers.

A. Middle flower of the cymes female.

(a) Leafy. (All species.)

(i) Leaves mostly ovate with obtuse or rounded apex; fruits mostly ovoid, contracted at the apex, dull by minute granular dots but never warty.....

.....V. **ORIENTALE** 11

(ii) Leaves mostly ovate with obtuse or acute apex; unripe fruits oblong, attenuate at both ends, warty, nearly smooth when ripened, tepals usually persistent.....

.....V. **HEYNEANUM** 12

(iii) Leaves mostly lanceolate, slightly falcate with acute or somewhat acuminate apex; fruits oblong, somewhat truncate but never attenuate nor contracted at the apex, smooth.....

.....V. **MONOICUM** 13

B. Middle flower of the cymes male.

(a) Leafy. (All species.)

(i) Leaves larger, rotund to cuneate, broadly rounded to truncate, sometimes with two small depressions at the apex, 1.5-4.5 cm. long, 1-4 cm. broad; peduncles of cymes absent or usually not more than 2 mm. long.....

.....V. **TRILOBATUM** 14

(ii) Leaves much smaller, roundish—obovate with obtuse apex, always curled upwards, not more than 2 cm. long; peduncles of cymes prominent, 3-15 mm. long.....

.....V. **CAPITELLATUM** 15

ENUMERATION OF SPECIES

Besides the references to literature, synonymy and detailed descriptions of the species as given by Danser (*loc. cit.*), several points bearing on the collections of the Calcutta Herbarium and other Indian Herbaria which have not been properly discussed by Danser, are dealt with under each species.

1. **Viscum album** Linn., *Sp. Pl.* (ed. 1), 2: 1023, 1753; Brandis, *For. Fl. N.-W. & Centr. India*, 392, 1874; Kurz, *For. Fl. Burma*, 2: 323, 1877; Boissier, *Fl. Orient.*, 4: 1065, 1879; Aitchison in *Jour. Linn. Soc., Bot.*, 18: 92, 1880 pro parte;

Bentham et Hooker, *Gen. Pl.*, 3: 213, 1880; Hooker, f., *Fl. Br. Ind.* 5: 223, 1886; Engler in *Nat. Pflanzenfam.*, 140, 1897; Gamble, *Ind. Timb.*, 583, 1902; Collet, *Fl. Simlensis*, 440, 1902; Brandis, *Ind. Trees*, 552, 1906; Parker, *Forest Fl. Punjab*, 441, 1924; Fischer in *Rec. Bot. Surv. Ind.*, 11: 160, 1926; Osmaston, *Forest Fl. Kumaon*, 465, 1927; Engler et Krause in *Nat. Pflanzenfam.* (ed. 2), 16b: 199, 1935; Danser in *Blumea*, 2: 55, 1936; Danser in *Bull. Jard. Bot. Buitenzorg* (ser. 3), 16: 58, 1938; Danser in *Blumea*, 4: 268, 1941; *Viscum dichotomum* Giliberg, *Exercit.*, 2: 394, 1792; *Viscum stellatum* D. Don., *Prodr. Fl. Nepal*, 142, 1825; *Viscum album* var. *karensum* Kurz, *For. Fl. Burma*, 2: 323, 1877; *Viscum aitchisoni* Van Tieghem in *Bull. Soc. Bot. Fr.*, 43: 190, 1896 (nom. nud., pro parte); *Viscum costatum* Gamble in *Kew Bull.*, 1913: 46, 1913; *Viscum coloratum* Nakai in *Mori Enum. Pl. Korean.*, 128, 1922. *Viscum album* var. *meridianum* Danser in *Blumea*, 4: 274, 1941.

Plants dioecious. *Stems* dichotomously or umbellately branched from the base, number of branches at each node usually 2-6, rarely upto 13; internodes cylindrical, swollen at the nodes, green when fresh, wrinkled when dried, each internode with two scaly leaves (prophylls) on either side of its base and with two, vary rarely three normal leaves at its apex. *Leaves* lanceolate or elliptic to obovate-lanceolate or obovate or sometimes broadly obovate-cuneate, usually oblique with one side straight and another with slight curvature, obtuse, or rounded, entire, abruptly narrowed towards the base, sessile or subsessile, 2.5-10 cm. long, 0.5-3.7 cm. broad, thin or coriaceous, curvinervous or flabellinervous with 3-9 indistinct or distinct longitudinal nerves connected by indistinct reticulate veins. *Inflorescences* terminal on the top of each internode between the two normal leaves and in the bifurcations of the stems, sometimes on small internodes which in such cases are reduced to pedunculate cymes. Male inflorescence nearly always 3-flowered, the central subtended by a pair of small bracts decussate with the normal leaves each of which bearing the lateral flower in its axils, peduncle 0-4 mm. long. Female inflorescence usually 3-5 flowered, the lateral (lower) flowers produced in one or two decussate pairs of bracts one in each of its axil, the central (terminal) flowers subtended (perhaps not always) by a pair of bracts, peduncle 0-2 mm. long; bracts short and round or longer and triangular. *Male flowers* nearly 2 mm. long with 4 valvate tepals and a very short tube. *Female flowers* considerably smaller than the male ones with a short cylindrical ovary crowned by 4 thick triangular sepals and a short nipple-shaped style. *Fruits* sessile, globose or roundish-elliptical, 4-8 mm. long, sometimes up to 13 mm., 4-7 mm. in diameter, sometimes upto 9 mm. probably larger in fresh condition. (Description from the Indian Plants of Calcutta and Shillong Herbaria and partly adapted from Danser, *loc. cit.*). (Fig. 1.)

It is very interesting to note that the species exhibits extreme polymorphy, showing variability in different parts of the plant, namely,

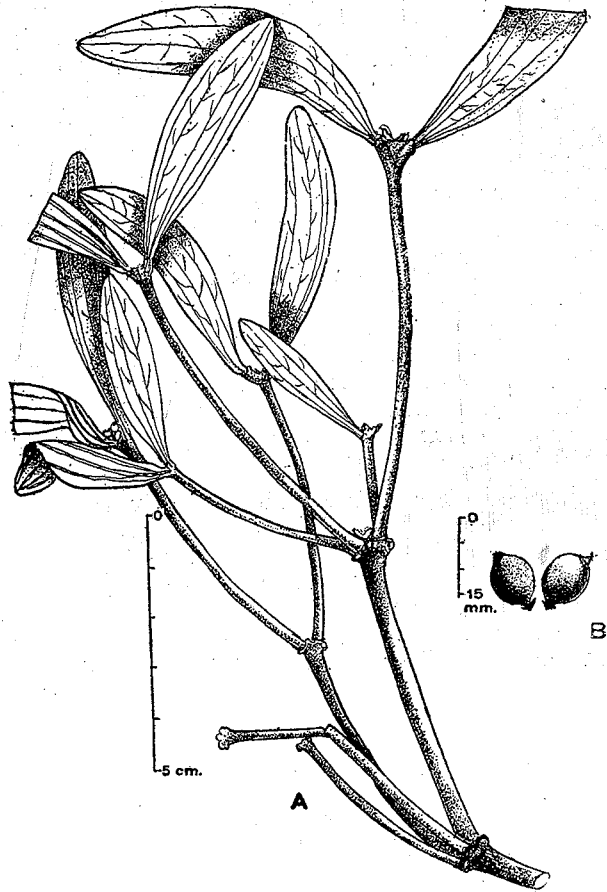


FIG. 1. *Viscum album* Linn. A. Shoot; B. Fruits.

the size of the plant itself, dimensions (2.5–10 cm. in length and 0.5–3.7 cm. in width), shape (from obovate-lanceolate to broadly obovate-cuneate with various intermediate shapes), texture and venation (3–9 longitudinal nerves) of the leaves and structure of inflorescence. In certain cases, the variability is so great that we may be tempted to form new species or varieties but the variation is not consistent and there are many intermediates connecting these variations. Danser also states “*V. album* is remarkably polymorphous. It seems, however, impossible to distinguish among the Himalayan forms any distinct varieties. Though we often meet with remarkable forms which are sufficiently different to be considered even as species, these forms are connected by so many intermediates, and their geographic distribution is so little characteristic, that even their distinction as varieties seems useless.”

Specimens collected from Assam and Burma exhibit cuneate-obovate leaves with broadly rotund apex appearing much different from the rest, without, however, any difference in the structure of inflorescence. On the basis of this variation which is purely a geographic one, a new variety, *Viscum album* var. *meridianum* has been formed by Danser (Fig. 2). But close scrutiny of the various sheets indicates the

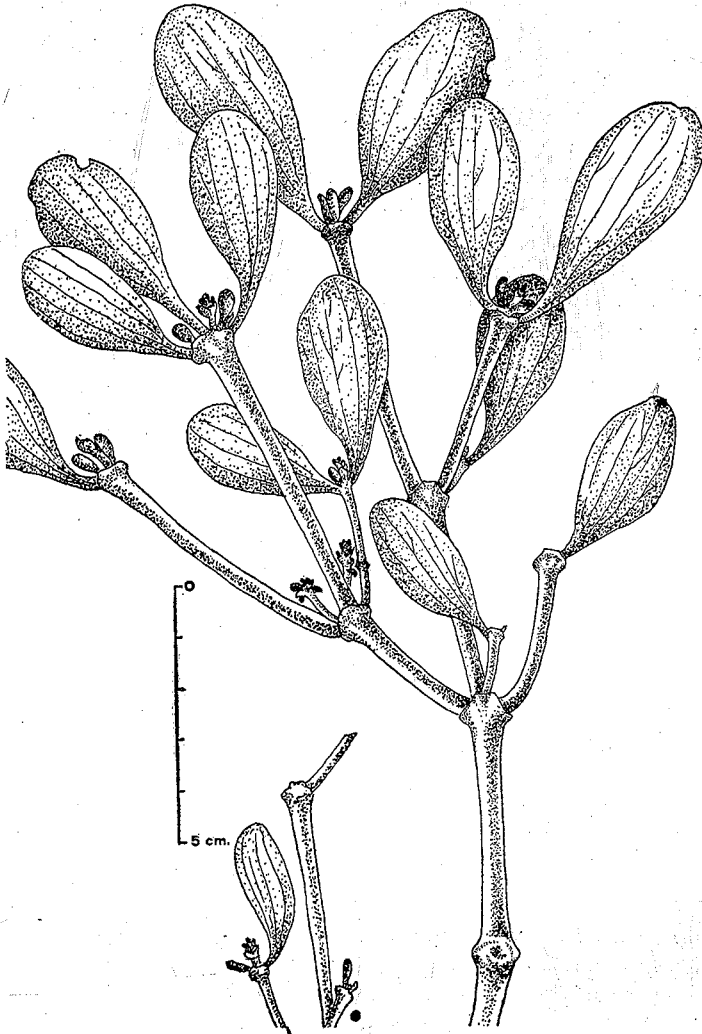


FIG. 2. *Viscum album* Linn. (Type of *V. album* var. *meridianum* Danser).

presence of both the normal and abnormal shapes of leaves on the same specimen and hence formation of a new variety on such an unstable character is not justified. Danser, while discussing about *V. album*

var. *karensium* Kurz, expresses his doubt whether it is a *Viscum* at all or may be his new variety *V. album* var. *meridianum* as he did not see Kurz's specimen. On examination of Kurz's sheet on which Kurz himself noted *V. album* var. *karensium* with a small diagram noting "invariably three tepals for all flowers," it is evident that it is quite similar to most of the specimens of *V. album* with much variation in the shape of the leaves. Further, the presence of three perianth lobes in *V. album* var. *karensium* as noted by Kurz could not be verified as there is no flower left with perianth on the sheet. However, it is evident on the basis of other characters that Kurz's variety is nothing but *V. album* proper.

The writer quite agrees with Danser as regards the structure and variation of inflorescence and the common occurrence of female plants among the Herbarium collections.

All the four sheets of *Viscum* of the Calcutta Herbarium collected by Aitchison from Kurram Valley in 1879 and received from the Kew Herbarium in 1881, bear two numbers 48 and 87. Of these only one contains 2 additional labels, one of which containing both the numbers 48 and 87 and the other which is the original label containing no. 87 only and also the notes "Loranthaceæ, mistletoe, from *Quercus ilex* grown near Turai village, profuse, 15-4-1879." This sheet contains 2 specimens, one *V. album* and the other *V. cruciatum*, the latter being attached to a small bit of host stem (probably Olive). The other 3 sheets having only one label, contain only one specimen on each which is distinctly *V. album*. These facts indicate that Aitchison's *V. album* is partly this species and partly *V. cruciatum* and the two numbers 48 and 87 together have been wrongly used for both the species *V. album* and *V. cruciatum*. Now, on the basis of the information given by Danser about Kew and Dehra Dun Herbarium sheets and that of the present sheet examined by the writer, it is clear that no. 48 indicated as a parasite on Olive on the Kew sheets, is *V. cruciatum* and that the no. 87 indicated as parasite on *Quercus* on the Calcutta sheet, is *V. album*.

Though the species has a very wide distribution in Europe and Western and Northern Asia, in India it is mostly confined to the Himalayan zone, that too, mostly in North-West Himalaya and quite rare in Nepal and Sikkim from where it might have spread to Assam and Burma, Yunnan (China), Tonkin (Indo-China) and Japan (Map. 2 A).

Specimens examined

Wall. Cat. no. 490 (Nepal).

INDIA: *E. Himalaya*: Sikkim, Rumul below Senchal, collected on 14-4-1857.

C. Himalaya: Nepal, *Maries*.

W. Himalaya: Dehra Dun, *Mackinon*; Chakrata, *Mackinon*, 25-1-1901; Tehri Gharwal, Lambataih 7,000 ft., *Gamble* 26736, 26737; Jaunsar Dn., Lambataih 8,000 ft., *Forster* 83; N.W. India, *Royle* s.n.; Pangee; *Dr. Stoliczka*; 5-7,000 ft.

Thompson, s.n.; Hazara about 4,000 ft., *Stewart* 172, on peaches; Jaunsar Dt., Katuran 7,000 ft., *Gamble* 24174; Jaunsar Dt., Kathyar 7-8,000 ft., *Duthie* 13012, on apricot trees; Bashahr Serahu 7,000 ft., *Lace* 167; Nathia, *Deane* s.n.; Laram 7,000 ft., Chitral Expedition, *Gatacre* 17526; Pahalgam, Kashmir 8,000 ft., *Meebold* 4061; Kumaon, coll. *King*, Herb. King; Kurrum Valley, near Turai village, *Aitchison*, 15-4-1879, from *Quercus ilex*, profuse.

BURMA: Chin Hills, *Dun* 59; Burma, *Nobis* s.n., on *Thespesia*.

AFGANISTAN: Afganistan, *Griffith*, Kew distribution No. 2736; Bharovul, *Griffith*, Herb. Lemaon, 1852.

CHINA: China, *Faber*, 1887 to 1891; Central China, Hupeh Prov., *Henry* 7883.

JAPAN: Japan, *Maries*, 17-10-1884.

ASIA, WEST OF INDIA: Southern Syria, Mt. Hennon, *Lowne*.

ASIA, NORTH OF INDIA: Amur Medius, *Korshinsky*, 1891; Eastern Turkistan, Yarkand, *Henderson*; Caucasus, *Tepoah* s.n.

EUROPE AND ENGLAND: Ex Herbario Triburgensi, *Romont* 775 m., coll. ?; Flora exsiccata Austro-Hungarica, *Borarlbergia*, *Schonach* 2570; Bedfordshire, intelligible s.n.; Vantrilas, Hertfordshire, common on apple trees; Mont. Morency, *Stephan*; Broomfield, Essex, *Christy*; Windsor Park, Thirsk, Yorkshire, *Baker* 563.

The following specimens from India and Burma which were considered as *V. album* var. *meridianum* by *Danser*, are now treated as *V. album* proper:

INDIA: *E. Himalaya*: Sikkim, Darjeeling 7,000 ft., *Gamble* 371 C; Assam, Japu, Naga Hills, *Watt* 11477; * Naga Hills, Japu Forest, *De* 17461, "Type of *V. album* var. *meridianum* *Danser*" (*Shillong* Herb.* examined co-type also).

BURMA: Southern Shan States, Kalaw protected area, *Rogers* 694, coll. *Wright*, on *Salix tetrasperma*; Pegu, Nattoung, *Kurz* 372, "*V. album* var. *karensium* *Kurz*"; Martaban, *Kurz* 372, *Forester's* Herb. "*V. album* var. *karensium* *Kurz*".

2. *Viscum cruciatum* *Boissier*, *Vaj. Bot. Esp.*, 2: 274, 1839-45; *Van Tieghem* in *Bull. Soc. Bot. Fr.*, 43: 189, 243, 1896; *Boissier*, *Fl. Orient.*, 4: 1068, 1897; *Engler* in *Nat. Pflanzenfam.*, 140, 1897; *Hooker* f. in *Bot. Mag. t.* 7828, 1902; *V. orientale* *Sprengel*, *Syst. Veg.*, 1: 488, 1825 pro parte (non *Willd.*); *A. P. de Candolle*, *Prodr.*, 4: 278, 1830, pro parte; *V. album* *Webb*, *It. hisp.*, 42, 1838 (non *Linn.*); *Aitchison* in *Jour. Linn. Soc. Bot.*, 18: 92, 1800 pro parte; *V. aitchisoni* *Van Tieghem* in *Bull. Soc. Bot. Fr.*, 43: 190, 1896 nomen, pro parte.

Plants diœcious. *Stems* once or twice branched in the basal region with decussate branches which are further branched dichotomously; internodes cylindrical, slightly swollen at the nodes, somewhat wrinkled in dried state, lower internodes usually 2.5–3.5 cm. long, 4–5 mm. in diameter, sometimes up to 5 cm. long, the upper ones gradually less thick with the topmost ones nearly flattened and reduced to 1 mm. in breadth; each branch subtended by 2 scaly leaves (prophylls) at its base. *Leaves* opposite, elliptic-lanceolate or somewhat obovate, rounded, entire, contracted at the base, almost sessile, usually 2–4 cm. long and 0.5–1.5 cm. broad, somewhat coriaceous, without visible nerves or with 3 longitudinal nerves visible on both sides. *Inflorescences* terminal in the bifurcations of stems and lateral on all the nodes, 2–4 together, shortly peduncled. Male inflorescences usually 3 flowered, flowers sessile, often reduced to the middle flower. Female inflorescences always 3 flowered with the middle flower rarely sessile with no bracts at its base but usually pedicelled and subtended by 2 small bracts, with the lateral sessile flowers placed in a naviculate cup formed of two opposite acute bracts. *Male flowers* oblong-ovate in bud, 6–8 mm. long, 4-angular towards the tip, later dividing into 4 lobes, anthers adnate on the innerside of tepals, dehiscence by many pores. *Female flowers* obovate, 1–2 mm. long, composed of a large inferior ovary and 4 triangular, minute, deciduous tepals and a small nipple-shaped persistent style. *Fruit* stalked, globose, up to 5 mm. in diameter. (Description from the specimens of N.-W. Frontier and Asia Minor in the Calcutta Herbarium and partly adapted from Danser *loc. cit.*) (Fig. 3).

Sieber first collected the species in Palestine and distributed it under the name of *Viscum cruciatum*. This was later erroneously identified and published by Sprengel and deCandolle as *Viscum orientale*. In 1839, Boissier rightly separated *Viscum cruciatum* from *V. orientale* validly published.

Though *V. cruciatum* appears to be quite distinct from *V. album*, it is sometimes difficult to distinguish both in all stages of development. The vegetative parts of young specimens of this species are comparatively smaller and particularly their twig generations are composed of more than one internode. The male plant is characterised by large 3-flowered inflorescence with the lateral flowers often reduced and the middle one much enlarged. In bud condition, the flowers are oblong-ovate. The female plant is clearly distinguished by the presence of a definite 3-sessile-flowered cyme with no separate bracts for the middle one but very often with the pedicellate middle flower with two small bracts. Danser remarks that the pedicellate character of the middle flower is rather rare. The fruits are definitely smaller and are never grouped more than three in one boat-shaped bracteal cup.

As regards Aitchison's collection of *V. cruciatum* from Kurram Valley, see the discussion under *V. album*.

This species is mostly confined to North-West Frontier, Afghanistan, Kurram Valley and different regions of Asia Minor-like Palestine

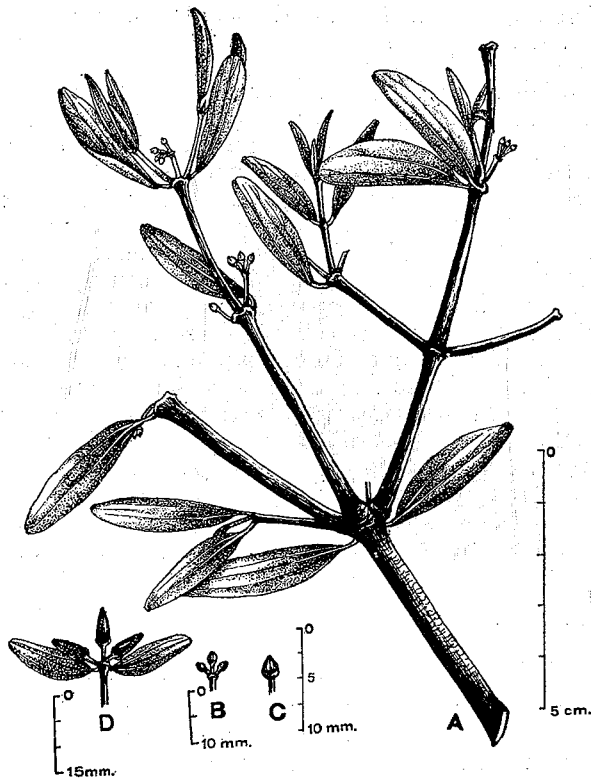


FIG. 3. *Viscum cruciatum* Boiss. A. Shoot of female plant (Lowne); B & C. Female flowers; D. Male flowers from another twig (Lowne).

and Syria. A specimen collected from Spain appears to be the same species (Map 3 D).

Specimens examined

INDIA: North-West Frontier, Tarah expedition, Masture, 4,500 ft. *Inayat* 20934, female plant; Samana Range, *Hare* s.n., female plant; Kurram Valley, *Aitchison* 48 (mixed with *V. album*, *Aitchison* 87).

ASIA MINOR: Southern Syria, Nablous, *Lowne* s.n., male and female plants; Palestine, *Pinard* s.n., female plant; Palestine, *Boissier*, female plant;

EUROPE: Spain, Jaew Blancó, on *Pinus pinaster*.

3. *Viscum mysorensense* Gamble in *Kew Bull.*, 1925: 329, 1925; Gamble in *Fl. Madras*, 7: 1257, 1259, 1925; Danser in *Blumea*, 4: 279, 1941.

The following is the detailed description of species as given by Danser (*loc. cit.*).

All parts with a golden yellow colour. Only *stem* available, slender, over 50 cm. long, at nearly all the nodes di- or trichotomous, its basal portion terete, 5-6 cm. long, up to 3 mm. in diameter, longitudinally wrinkled, hardly striped, slightly thickened at the nodes, young internodes usually 2.5-4 cm. long, distinctly longitudinally striped with shallow grooves, nearly terete or slightly flattened near the base, 1-1.5 mm. broad, strongly alternately flattened and double-edged towards the apex, 2-3 mm. broad. *Leaves* normally developed only on a part of the nodes, the largest obtusely lanceolate to spatulate, up to 4 cm. long by 10 mm. broad, often smaller, rounded at the apex, tapering into a short petiole that is rounded beneath, flat or slightly canaliculate above, the lamina rather thick-coriaceous, with 3 longitudinal nerves, somewhat distinct above than beneath, connected by indistinct veins. Leaves scale-like on most of the nodes, nearly 0.5 mm. long, acute; also 2 scales (prophylls) at the base of all ramifications. *Inflorescences* rarely terminal, usually axillary or at both sides of the axillary ones, sessile or shortly pedunculate 1-3 flowered cymes; peduncle flattened, up to 1 mm. long and broad, bearing at its apex 2 opposite acute bracts forming together a naviculate cup up to 2 mm. long, each bearing one sessile flower in their axil devoid of a bracteal cup and usually male, rarely female, nearly 1 mm. long and compressed between the bract and the middle flower; a middle flower, female, rarely sessile and without bracteal cup, usually very shortly pedicellate and surrounded by a cup of two small bracts alternating with those of the lower pair. *Fruit* unknown. (Description from the type specimen in the Kew Herbarium.) (Fig. 4.)

The writer could not see the specimen as, it appears, there are only two specimens, one at Kew and another at Berlin-Dahlem, the former being the type of the species. On the basis of the description, it appears that the structure of the inflorescence is very characteristic of this species. It would be quite interesting if this species is again collected from Mysore region.

The species has so far been collected only from Arsikere, 2000 ft., Mysore by Meebold (Meebold 8207). It may be too premature to discuss about the distribution of this species at this stage (Map 2 C).

4. *Viscum articulatum* Burmannus, *Fl. Ind.*, 211, 1768; Kurz in *Jour. As. Soc. Beng.*, 40 (Pt. 2): 64, 1871; Kurz, *For. Fl. Burma*, 2: 325, 1877 (incl. var. *dichotoma*); Hook. f. in *Fl. Br. Ind.*, 5: 226, 1886 (incl. var. *dichotoma*); Brandis, *Ind. Trees*, 552 and 716, 1906; Gamble in *Jour. As. Soc. Beng.*, 75 (Pt. 2): 389, 1914; Gamble, *Manual Ind. Timbers*, 584, 1902; Cooke, *Fl. Bombay*, 2: 553, 1906 (incl. var. *dichotoma*); Talbot, *For. Fl. Bomb.*, 2: 423, 1906, t. 482; Duthie, *Fl. Upp. Gang. Pl.*, 3: 65, 1915; Haines, *Bot. Bihar and Orissa*, 5: 804, 1924; Parker, *For. Fl. Punjab*, 441,

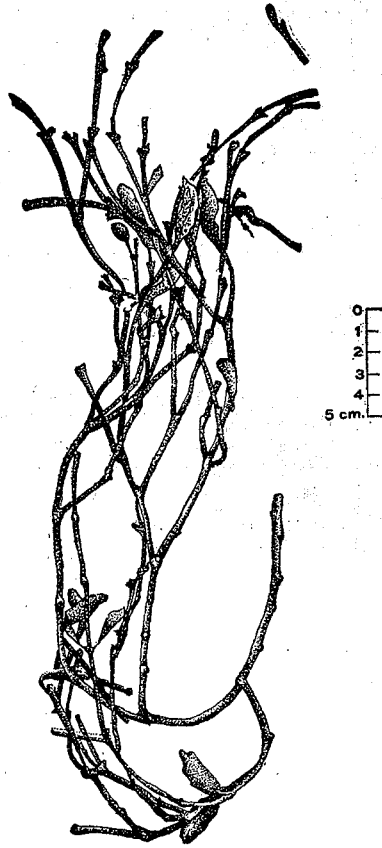


FIG. 4. *Viscum mysorensis* Gamble (drawn from the photo of *Type* specimen).

1924; Gamble, *Fl. Madras*, 7: 1258, 1259, 1925 (incl. var. *dichotoma*); Fischer, in *Rec. Bot. Surv. Ind.*, 11: 161, 181, 1926 (incl. var. *dichotoma*); Osmaston, *For. Fl. Kumaon*, 465, 1927; Kanjilal, *For. Fl. Philibit etc.*, 319, 1933; Kanjilal, De and Das, *Fl. Assam*, 4: 119, 1940; Danser in *Blumea*, 4: 280, 1941; *Viscum flexuosum* Gamble in *Kew Bull.*, 1913: 47, 1913; Gamble in *Jour. As. Soc. Beng.*, 75 (Pt. 2): 389, 1914; Ridley, *Fl. Mal. Pen.*, 3: 165, 1924; *Viscum nepalense* Sprengel, *Syst. Veg.*, 47, 1827; Danser in *Blumea*, 4: 283, 1941; Santapau in *Rec. Bot. Sur. Ind.*, 16: 268, 1953 (excl. var. *thelocarpum*); *Viscum dichotomum* D. Don, *Prodr. Fl. Nepal*, 142, 1825 (non Gilbert 1792 and non Sprengel 1825); Gamble in *Jour. As. Soc. Beng.*, 75 (Pt. 2): 389, 1914; Ridley, *Fl. Mal. Pen.*, 3: 165, 1924; *Viscum attenuatum* A.P. de Candolle, *Prodr.*, 4: 284, 1830; Wight and Arnott, *Prodr. Pen. Ind. Or.*, 380, 1834; Thwaites,

Erum. Pl. Zeylan., 136, 1859; Brandis, *For. Fl. N.-W. & Centr. India*, 394, 1874 pro parte; Trimen, *Syst. Catal. Ceyl. Pl.*, 77, 1885; Engler in *Nat. Pflanzenfam.*, 140, 1897; *Viscum opuntoides* Roxb. *Fl. Ind.* (ed. 2), 764, 1832 and (ed. 3), 715, 1874; *Viscum liquidambaricolum* Hayata, *Ic. Pl. Formos.*, 5: 194, t. 71, 72, 1915; Danser in *Blumea*, 4: 289, 1941.

Plants monoecious. *Stems* dull green, slender, much branched, hanging to 100 cm. or even more, branches generally decussate but often more or less than two at each node; lower internodes of older plants terete, of younger plants slightly flattened, 2–5 cm. long, internodes broadening gradually from base to top, twisted near the base, longitudinally grooved, slightly thickened at nodes, internodes towards the apex more flattened, 1–6 cm. long, 2–10 mm. broad with truncate or rounded apex. *Leaves* scaly, hardly 1 mm. long, usually indistinct. *Inflorescences* lateral at the nodes in small, sessile, cymose clusters, 2 mm. long and 2 mm. broad at maturity, usually 1–3, rarely 5-flowered, first developing one terminal female flower subtended by two small scaly bracts united into a cup, then a pair of lateral usually male flowers, one on either side below the upper bracteal cup and partly in the axils of another pair of lower, decussately developed bracts, without being subtended by this lower pair; rarely another pair of male flowers and a pair of bracts decussate to the second pair in similar arrangement may be developed; often later (usually after falling off of male flowers) two new flowers normally reduced to one female flower may develop at the base of inflorescence; bracts of flowers about .75 mm. long. *Fruits* somewhat globose, and green when young and during maturity shape varying from globose to slightly oval or even oblong and colour changing to light yellow, usually 3–4 mm. in diameter, fruit-wall nearly smooth when fresh and much wrinkled after drying, rarely warty when young, pulp highly viscous, whitish. (Description from specimens in Calcutta and Shillong Herbaria and fresh specimens with fruits from Khasia hills and partly adapted from Danser (*loc. cit.*) (Fig. 5).

Danser (1941) distinguished *V. nepalense* and *V. liquidambaricolum* from *V. articulatum* on the basis of the breadth of the internodes and the size and shape of the fruit and thus treated them as distinct species. Yet, he remarks that the size of the internode is not a dependable character and there is some variation in the size and shape of the fruit. On critical examination of the various sheets of this species available at the Calcutta Herbarium which were not examined by Danser (probably not available at Kew), it appears there is much variability in the size of internode and in the shape and size of fruit as it matures. Further, there are quite a good number of specimens not examined by Danser even from other Herbaria, which show intermediate characters between *V. articulatum* and *V. nepalense*, and *V. nepalense* and *V. liquidambaricolum*.

Danser (*loc. cit.*, p. 281) points out that "the real *V. articulatum* has rather narrow or very narrow or more rarely rather broad, usually

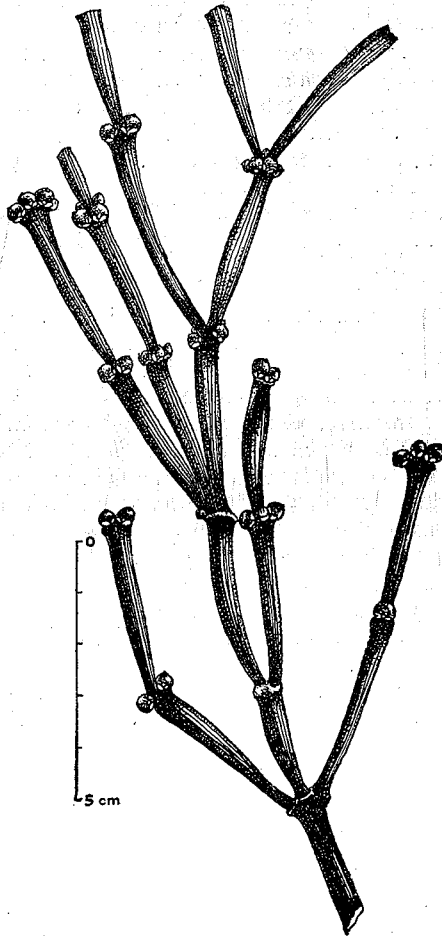


FIG. 5. *Viscum articulatum* Burm. (Kew distr. No. 1248, *Herb. Wight*).

strongly flattened, internodes and small, globose, usually white or light yellowish fruits; it is usually parasitic on Loranthaceæ. The other leafless British Indian *Visca* are sometimes as narrow as *V. articulatum*, sometimes distinctly broader and have larger and darker coloured fruits; those fruits are either globose or more oblong and their exact colour, rarely indicated on the herbarium labels, seems to be yellow or brownish. They rarely seem to grow on Loranthaceæ."

In contrast to this, Danser admits that the width of internodes to distinguish the three species, is not at all dependable and the distinction among the three species is very difficult due to inadequate state of the herbarium materials with no notes and no flowers and fruits or sometimes with only shrivelled fruits which do not show real size

and colour. Still, on the basis of such material which exhibits such a variability, Danser, expressing some doubts about the specific rank of *V. nepalense* and *V. liquidambaricolum*, keeps them as two separate species to draw more attention to this question, suggesting more thorough study of the living plants of all these species from Assam to Perak where they occur together. Gamble in his earlier work distinguished *V. nepalense* Sprengel as *V. articulatum* var. *dichotomum* and later raised this variety to a specific rank as *V. dichotomum* on the basis of the breadth of internodes and diameter of fruit. But as this name is a later homonym and hence invalid, *V. nepalense* Spreng. was considered by Danser to be valid for this species.

From the close examination of the specimens collected from Peninsular India, Ceylon, Chota Nagpur and Central India, it appears that the distinction brought out by Gamble and Danser between *V. articulatum* and *V. nepalense* is not of stable nature and there is quite a good variation. Further, some specimens like Gamble 9210, Hooper and Ramaswami 39392, Ramaswami 1473, 1285 and many others, the characters of both *V. articulatum* and *V. nepalense* are present on the same plant, i.e., the lower internodes are wider, thick, tuff and wrinkled and the upper and topmost internodes are narrower, thin, flattened and finely grooved with longitudinal lines. As regards flower cluster and the fruit size, there is no appreciable difference. As such, it becomes practically impossible to distinguish one from the other. Danser also expresses the same opinion on examining a few Peninsular India and Ceylon specimens like Wight 1228, Wight, Kew distribution No. 1248, Wallich 496 and Bourne 864. Many more such specimens not seen by Danser and which are exactly like *V. articulatum*, have been examined by the writer. There are also many specimens, such as Rama Rao 1581 and Madras Herb. 13142 which show fine and delicate internodes like those of the Assam specimens which are named by Danser as true *V. articulatum*.

There is an interesting specimen collected by Ridley from Garden, Singapore and another from Queensland by Bailey which contain round, 4-angular and also flattened internodes and which appear as more akin to *V. angulatum*. However, as *V. angulatum* has not been so far reported anywhere outside Peninsular India, the specimens may at present be considered as the non-flattened forms of *V. articulatum*.

Danser notes that *V. articulatum* is usually parasitic on members of Loranthaceæ but on the basis of collections from South India, there appears to be no such restriction in the selection of host. This species has been reported by Fischer (1926) to be parasitic on a variety of hosts.

As regards the differentiation between *V. nepalense* and *V. liquidambaricolum* Danser points out that the only real difference seems to be in the ripe fruits which are nearly globose in *V. nepalense* and more oblong in *V. liquidambaricolum* and the difference in width of the internodes, the former having broader internodes than the latter species, is not at all a dependable character. Doubting whether *V. nepalense*

and *V. liquidambaricum* are distinct species or geographical varieties of one species, he finally expresses that he is much inclined to accept the latter supposition because it is remarkable that if the form of the fruit is taken as a criterion, *V. nepalense* in its further characters shows a distinct approach towards *V. liquidambaricum* as the area of distribution of the latter is gradually approached. As has been pointed out by Danser, Calcutta Herbarium specimens of this group collected from the Himalayan zone, show mixed characters of both the species such as wider and rough internodes and oblong fruits on the same specimen, i.e., *Butler* 27205. In some, for example *Hamilton* (Nepalia in 1802), *Craib*. 341, there is much variety in shape of the fruits from clearly globose to oval and nearly oblong on the same shoot as shown in Fig. 8. Danser, questioning one *Hamilton's* specimen from Nepal which could not be seen by him in any Herbarium and which was described by D. Don, suggests that it may be *V. nepalense*. The sheet of this specimen quoted above is available in the Calcutta Herbarium. Interestingly enough, this specimen combines the characters of both the species exhibiting wide and rough internodes at the lower part and delicate and narrow internodes at the upper region and oval to oblong fruits all over the specimen. These various specimens mentioned above may be considered as intermediate forms connecting the two species. Further, these plants with oblong fruits which are called as *V. liquidambaricum* appear to be not restricted to any specific host whereas *V. liquidambaricum* is said to be mostly parasitic on *Quercus* and *Liquidambar* in China and Formosa. Further, the specimen collected from Formosa shows narrow and slender internodes and typically oblong fruits and such specimens have been reported to be common more to the east towards China where specimens with broader and tough internodes and nearly globose fruits are hardly found any more. All these data give the impression that the Indian *V. articulatum* and the so-called *V. nepalense* with broad and coarse internodes and globose fruits gradually merge into the so-called East Asiatic *V. liquidambaricum* with narrower and slender internodes and more oblong fruits.

Therefore, it may be concluded that as *V. nepalense* can be merged into *V. articulatum* as they are one and the same species with practically no distinction except the degree of difference in the size of internodes and fruits in accordance with the maturity of plants, the Chinese form *V. liquidambaricum* may at best be considered as a variety of *V. articulatum* on the basis of distinct oblong fruits.

As regards *V. articulatum* var. *flexuosum* (Gamble) Danser, the writer agrees with Danser in maintaining it as a variety common in Malayan Peninsula. Though Gamble in his 'Revision of Loranthaceæ of the Malayan Peninsula' distinguished this as a distinct species, *V. flexuosum* on the basis of very narrow internodes and small fruits and though the species appears to differ more strikingly from *V. articulatum* at first sight, on critical examination it appears to be a very narrow variety of *V. articulatum*, the narrow forms of which are quite common in Malayan Peninsula. In fact, the specimens collected from the Khasia

Hills (Coll. ? 1014, *G. Mann* 98, *Sharma* 10521, *Kanjilal* 5852), Singapore (Coll. ? 8054) combine both the characters of *V. articulatum* and *V. flexuosum* in the size of internodes and may be considered as intermediate forms. Probably, the juvenile forms with branches 2-3 mm. broad as recorded by Santapau (1953) from Khandala (Bombay State) may belong to this group of intermediate forms. If this is possible in such a farther region of Western India, it would be a really interesting record.

A few interesting specimens with very fine internodes have also been collected from Sumatra (*Forbes* 2506), Philippines and North Australia. Though Danser placed these under *V. articulatum* and though Philippine and Australian specimens have been identified as *V. angulatum*, it is very evident that they have striking similarity with the variety *flexuosum* particularly in their fine internodes. Merrill also has noted for one of the Philippine specimens (Species Blancae No. 695) that it might prove to be a form of *V. articulatum* Burm.f. with very narrow branches.

As regards *V. nepalense* var. *thelocarpum* Danser which is purely based on the verruculose or warty condition of immature fruits, it is interesting to note that the warty character on the immatured fruits has been consistently present on different specimens collected from different areas like Concan, Canara and Ajmere though the plant resembles *V. articulatum* in all other aspects. It is really a point for further consideration whether a stage in the development of fruit may be considered as a character for a variety. Further, a few of the many specimens of *V. articulatum* collected from various places in the Bombay State such as *Santapau* 3897, 13.15, 10719 show slight warty condition in their very young fruits, probably on the basis of which Santapau (1953) has merged var. *thelocarpum* into the main species. This echinulate character found in these specimens is comparatively of much lesser degree than that of the Ajmere and Concan specimens. Even in these Bombay specimens there is considerable variation in the intensity of the development of warts on different young fruits of the same specimen and there are even some young fruits without warts at all on some of these specimens. In view of these findings, it appears that the Bombay specimens represent the intermediate stages to connect *V. articulatum* proper without warty young fruits with those specimens representing the so-called true variety *thelocarpum* where all the young fruits show definite warty character, which conclusion may lead to the merging of this variety into the species proper. However, on the basis of the available material which may be considered as insufficient, the writer would at present prefer to keep it as a variety of *V. articulatum*.

So, on the basis of the above discussion, the following may be considered as the varieties of *V. articulatum* Burm.

- (i) *V. articulatum* var. *flexuosum* (King ex Gamble) Danser in *Blumea*, 4: 283, 1941; *V. flexuosum* King ex Gamble in *Kew Bull.*, 1913: 47, 1913.

(Internodes uniformly 2 mm. broad; fruit nearly 2.5 mm. broad.)
(Fig. 6).

(ii) **V. articulatum** var. **liquidambaricolum** (Hayata) Seshagiri
Rao *nov. var.*; *V. liquidambaricolum* Hayata, *Ic. Pl. Formos.*
5: 194, 1915; Danser in *Blumea*, 4: 289, 1941.

(Fruits typically oblong.) (Figs. 7, 8.)

(iii) **V. articulatum** var. **thelocarpum** (Danser) Seshagiri Rao
nov. comb.; *V. nepalense* var. *thelocarpum* Danser, *loc.*
cit., 289.

(Young fruits distinctly warty.) (Fig. 9.)

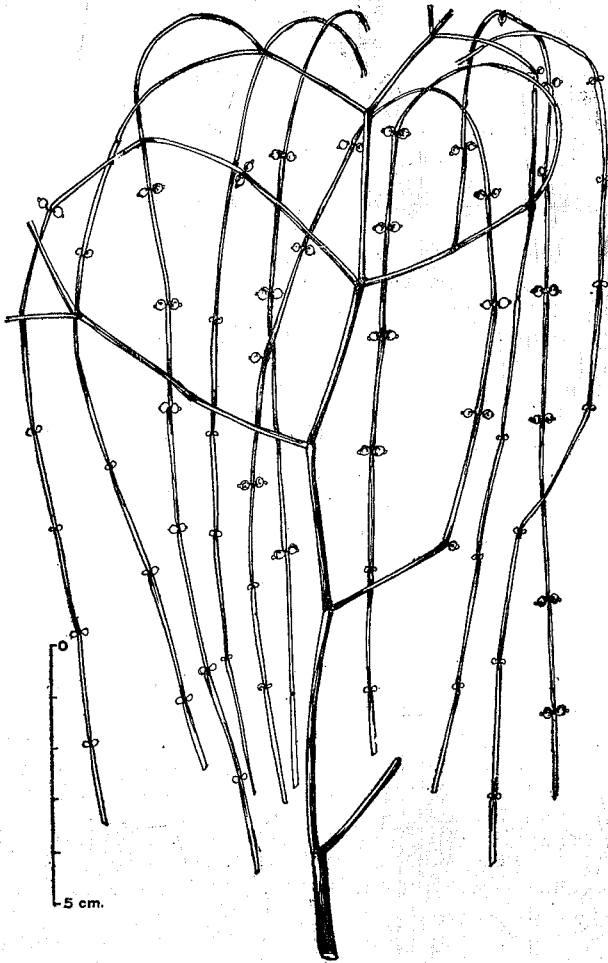


FIG. 6. *Viscum articulatum* Burm. var. *flexuosum* (Gamb.) Danser (*Kunstler* 1187).

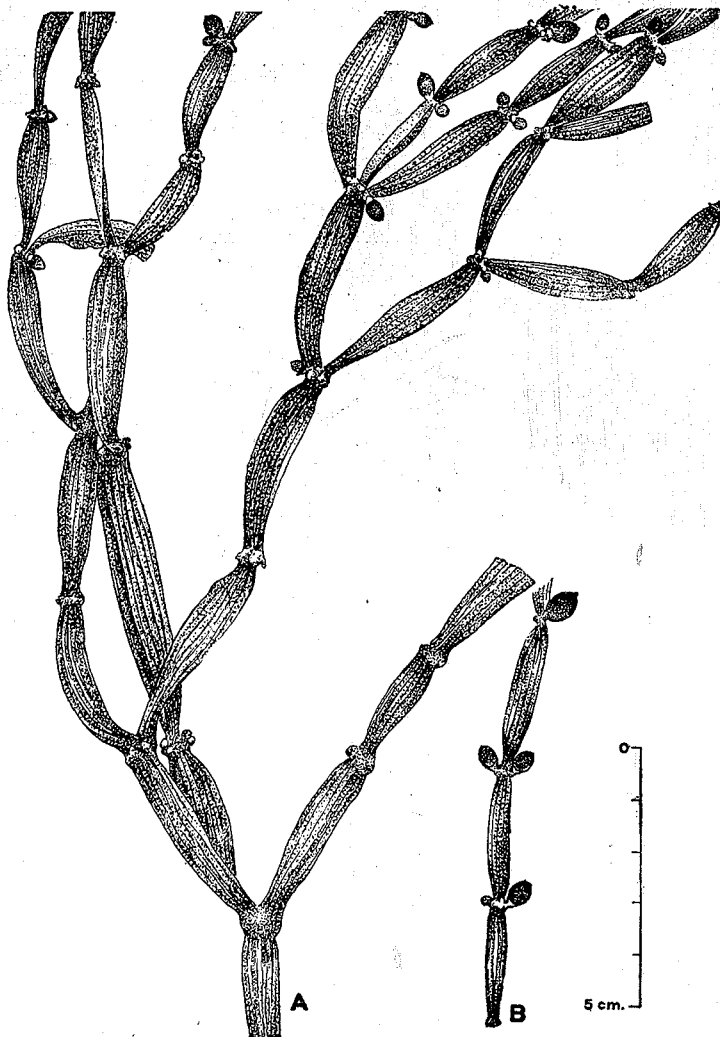


FIG. 7. *Viscum articulatum* Burm. var. *liquidambaricum* (Hayata) Seshagiri Rao. A. Shoot with oval fruits (*Deka* 23499); B. Small twig with fruits (*Kanjilal* 9517).

As per Danser's differentiation of species, the distribution of *V. articulatum* is limited to South of Brahmaputra River on the North-West side, China on the Eastern side and North Australia on the Southern side, that of *V. nepalense* extends throughout India and Ceylon and as far as Burma and Malaya Peninsula and doubtfully to China and that of *V. liquidambaricum* is restricted to the Himalayan zone and Assam and to China, Formosa, Indo-China and Java. Now when

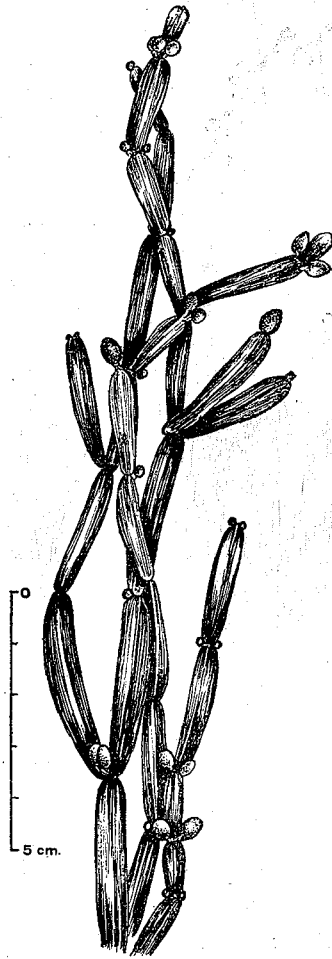


FIG. 8. *Viscum articulatum* Burm. var. *liquidambaricolum* (Hayata) Seshagiri Rao. Shoot having round, oval and oblong fruits (Hamilton in 1802).

all the three species are merged into one; the distribution of *V. articulatum* may be considered to be very extensive from India with the Himalayas as the Northern limit to as far as China on the Eastern side and North Australia on the Southern side including all the intervening regions like Burma, Malaya Peninsula, Siam, East Indies and Philippines. Peculiarly enough, the distribution of *V. articulatum* var. *flexuosum* hitherto appearing to be restricted to only Malayan Peninsula and that too round about Singapore now extends to Sumatra, North Australia and Philippines though they had been so far sparsely collected. But, the other variety *liquidambaricolum* appears to be distributed from the North-West Himalayas to as far as China and Formosa through Assam. The third variety *thelocarpum* is, however, not well represented

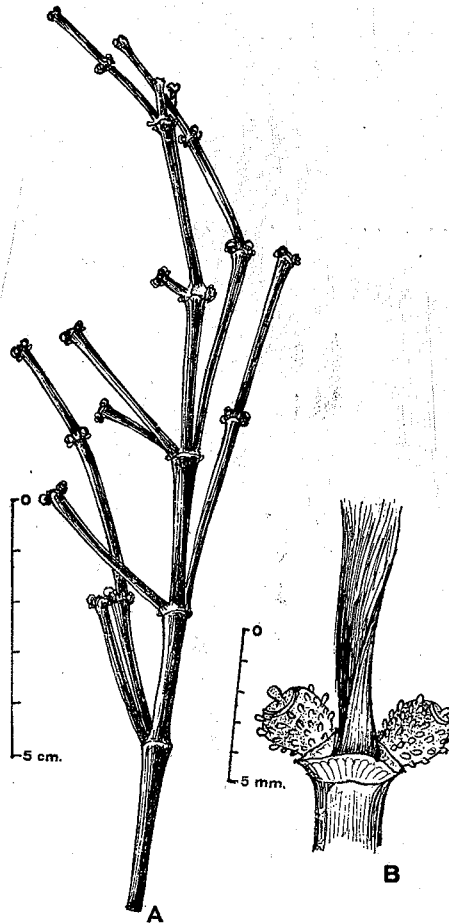


FIG. 9. *Viscum articulatum* Burm. var. *thelocarpum* (Danser) Seshagiri Rao. A. Shoot with fruits (Ajmere, Type specimen); B. Node with warty fruits enlarged.

and appears for the present to be located on the West Coast and Ajmere only (Map 5, A, B, C, D).

Specimens examined

***V. articulatum* Burm.**

Wall. Cat. no. 498 (Tavoy, Burma); 496 B (Permacoir); 496 C (Courtallam, South India); 496 A (South India); 495 A (Mt. Syllet, Assam).

INDIA: Bengal, Bihar, Chotanagpur and Orissa: Pachet Village, Kurz, on *Diospyros*; Bihar, 1,000 ft., Hook. f. and Thomson; Manbhum, Bal; Singhum, Jorsa 500 ft., Clarke 34398, plentiful on

Diospyros; Hotsprings, Boraro River, *Prain*; Chakulia, Dhalbhum, *Gamble* 9210; Mohulpahari, Rampur Hat, E.I.R., Coll. ? 13, 26th May 1903; Kumandi Reserve, Palamaw Chotanagpur, *Gamble* 8810; Partab, Puri Dist., Orissa, *Lace* 2510.

Assam: Khasia, Coll. ?; Mt. Khasia 3-5,000 ft., *Hook. f. and Thomson*; Khasia, Visci Sh. 1014, Pendulous from trees; Khasi Hills and Bhramputra plains, *Herb. Kurz*; Jawai, 4,000 ft., Khasi Hills, *Robertson*, Nov. 1890; Khasia Hills 5,000 ft., *Mann*. 835, May 1878; Sirohifurer 6,000 ft., Manipur, *Watt*, 6484; Singoih 6,800 ft., Daphla Hills, *Lister* 316; *Khasia Hills 3-4,000 ft., Forest Herb. *Mann*. 98, June 1877; *Nongbri forest, K. & J. Hills, *Kanjilal* 5852, 19-9-1915 (used by countrymen as specific for pains); *Peak forest, K. & J. Hills, *Sharma* 10521, 16-1-1933 (*Forms intermediate between *V. articulatum* and *V. articulatum* var. *flexuosum* from Shillong Herb.) (other Assam specimens probably approach var. *liquidambaricolum*).

E. Himalaya: Darjeeling 7,000 ft., *Gamble* 370 C, on Mapple; Sikkim 2-5,000 ft., *Hooker*, Herb. H. f. & T.T.; Lachung Valley, Sikkim 7,000 ft., *Gammie* 1203.

C. Himalaya: Nepal, *Wallich* ex Herb. Brown.

N.W. Himalaya: Bhimtal 4,000 ft., *Meebold* 4059; Loc. N.-W. India, Herb. *Royle*; N.-W. Frontier, Loc. ? *King*, Sept. 1868.

Upper Gangetic Plain: Nepal Frontier, *Inayat* 23818.

C. India: Sagar and Mathura near Heerapoor, Coll. ? 422/1; Padunarlu C.P., *Duthie* 10549; Chanda District, C.P., *Duthie* 9727, on *Diospyros*; Saugor, C.P., Coll. ?; Central Provinces, Loc. ?, *Hole* 98.

Peninsular India: Khaliyaguda 1,000 ft., Ganjam Dist., *Gamble* 14096; Boragudem, Rampa country, Godavari Dist., *Narayan-swami* 281, on *Zizyphus*; Chodavaram, Godavari Dist., *Ramaswami* 1473; Murremkonda, Nellore Dist., *Ramaswami* 1285; Balapadugu 3,000 ft., Coimbatore Dist., *Fischer* 701; Bailur 3,600 ft., Coimbatore Dist., *Fischer*; Coonoor Ghat 1,850 ft. Nilgiri Dist., *Fischer* 2078; Culhatty 4,000 ft., Nilgiris, *Clarke* 11266; Mt. Nilgiri and Coorg, Herb. *Hook. f. and Thomson*; Kodaikanal Ghat, Pulney Dist., *Bourne* 1164; Pen. Ind. Orient., Kew Distr. No. 1248, Herb. *Wight*; Mahendragiri, Tinnevely Dist., Madras Herb. no. 13142; Mundandurai to Kannikatti 2,000 ft., Tinnevely Dist., *Hooper and Ramaswami* 39392; Near Mekarai, Travancore State, *Calder and Ramaswami* 564; Makara, Travancore, *Rama Rao* 1581; Arianhami 1,000 ft., Travancore, *Bourdillon* 693; Attapadi Valley, near Gopivari 1,600 ft., South Malabar, *Fischer* 1764; Kumsi 2-3,000 ft.,

Mysore State, *Meebold* 10152; Dwitiope, North Kanara, *Talbot*, 1142, on *Diospyros melanoxylon*; *Monkey Hill, flat at foot of Behram's plateau, Khandala, *Santapau* 4457, 3897 (on *Terminalia* sp., young fruits almost achinate); Monkey Hill plateau, Khandala, *Santapau* 8892, 8893; Pattanmal plateau, near reversing station, *Santapau* 4341, 4342 (on *Terminalia tomentosa*); Khandala, *Santapau* 67 A (on *Eugenia jambolana*), 10719; Top of Behram's plateau, Khandala, *Santapau* 9990, 9991, 9992, 9993; Borivikavery caves, Salsette, *Santapau* 2314 (on *Grewia tiliæfolia*); Moroshi, Salsette islands, *Santapau* 1799 (on *Grewia tiliæfolia*), *d'Almeida* 1627, 1628; Salsette islands, *Santapau* 13·39 (on *Grewia* sp.) Makal caves, Salsette, *Santapau* 6763; Makal caves, Andheri, *Santapau* 679, 12822 (on *Grewia tiliæfolia*); Elephanta, *Santapau* 1323, 1324, 1325 (on *Grewia*); Nhava island, Bombay, *Santapau* 1357 (on *Grewia* sp.); Caves one mile North of Andheri, Kurtu rol., Salsette, *Santapau* 547 (host—a leafless tree, possibly teak); Elephanta island, *Santapau* 17530 (very abundant on *Grewia tiliæfolia*); Mumbra, Thana, *Santapau* 8136; Trombay, *Acland* 1068, 1069; Parsik Hill 1,000 ft., *Acland* 1067; Uran, *Santapau* 13·15 (on *Grewia*); Unai, South to S.-E. Hills, Dangs, *Santapau* 17173 (on *Diospyros melanoxylon* in dense forest); Kileshwar, Kathiadijar, Navanagar State, *Santapau* 7911; Palachury, Ghogri, C.P., *Bole* 43 (on *Albizzia lebbek*); Chauri, Chindwara Dist., C.P., *Bole* 79 (on *Pallas* ?) (*Specimens started from this mark are from Blatter Herbarium, St. Xavier's College, Bombay).

CEYLON: Loc. ?, C.P. 479.

BURMA: Maul Main, *Falconer*, 19th March 1849; Rangoon, Coll. ?, March 1854; Chin Hills, Upper Burma, *C.R. Dun* 107; Ruby Mines, Upper Burma, *Huk* 171; Pegu, *Kurz* 1978; Yomah, Pegu, *Kurz* 377; Tongla, Upper Burma, *Huk*, 2; Palse 4,000 ft. Chin Hill, Minbu dist., *Mokim* 1150.

MALAYAN PENINSULA: Simpang, Perak, *Wray Jr.* 2023; *Chau Chu Kang, Singapore, Coll. ? 8054; Mandai Forest, Singapore, *Burkill*, 277; *Fresh-water Isles, Singapore, Coll. ?; *Penang 2,000-2,500 ft. *Kunstler* 1686; Malacca, Kew Distr. No. 697, Herb. *Main-gay*; Penang Hill, Scott s.n. on *Loranthus pentandrus*; Larut, Perak, within 300 ft., *King's Coll.* 4191; Malacca, Harvey s.n.; Garden, Singapore, *Ridley*, Aug. 1889. (Sheets marked with * show very fine internodes intermediate between *V. articulatum* and *V. articulatum* var. *flexuosum*.)

MALAYAN ARCHIPELAGO: Java, *Winckel* 1841 B; Usukan to Khota balud, North Borneo, *Clemens* 9755; Buitenzorg, Java, *Dihen* s.n.; Buitenzorg, Java, *Kurz* ? 176; Java, Herb. Horsfield.

SIAM: Chiengmai, *Kerr* 1301; Siam, *Jeysmanu* s.n., Herb. *Kurz*.

PHILIPPINES: San Francisco del Monte, Rizal Prov., Luzon, *Merrill* 792; Mt. Pulog, Benguet Prov., Luzon, Forestry Bureau No. 16243; Todaya, Davao Dist.; Mindanao island, Elmer Distr. No. 11963; Luzon, *Loher* 4482; on *Erythrina caffra*.

CHINA: Hupeh Prov., Central China, *Henry* 3206 (may be var. *liquidambaricolum* but the fruits are not present).

AUSTRALIA: Nerungcreets, South Queensland, *Bailey*.

(i) *V. articulatum* Burm. var. *flexuosum* (King ex Gamble) Danser.

MALAYA PENINSULA: Tomghon, Singapore, *Ridley* 6018; Botanic Garden, Singapore, *Ridley* 8902; Singapore Island, *Kings Coll.* 1187.

MALAYAN ARCHIPELAGO: Sumatra, *Forbes* 2506.

PHILIPPINES: Burgos, Ilocos Norte Prov., Luzon, Coll. *Ramos*, Bureau of Science No. 27255; Calumpit, Bulaccan Prov., Luzon, *Merrill* 695 (Merrill writes that these may prove to be merely a form of *V. articulatum* Burm. with very narrow branchlets. This form is rare in the Philippines and has only been found in 2 or 3 localities).

AUSTRALIA: South Coen River, Queensland, Coll?, Von Mueller, Phytologic Museum of Melbourne; Sources of South Coen River, Queensland, Johnson s.n. in 1891, Von Mueller, Phytologic Museum of Melbourne; Belluiden River, range tropical, Queensland, *Bailey*; Tambourine, Queensland, *Scortechini*.

(ii) *V. articulatum* Burm. var. *liquidambaricolum* (Hayata) Seshagiri Rao *nov. comb.*

INDIA: Assam: Konoma, Naga Hills, *Watt* 11750; Pulmalodge, Naga Hills, *Prain* s.n.; Kigonma edge 7,500 ft., Naga Hills, *Clarke* 41888; Mawphlang 5,600 ft., Khasia Hills, *Clarke* 44243; *Lao-soh mynkhar, K. & J Hills, *Kanjilal* 5935, 28-9-1915 (on *Castanopsis hystrix*, Khasia name—Tyrphin); Soharim, K. & J. Hills, *Kanjilal* 9517, 19-9-1931; *Deka* 20347, 1-5-1941 (on *Quercus dealbata*); Lawlyngdoh, K. & J. Hills, *Deka* 30-6-1937, *Deka* 23499, 9-6-1956 (on *Quercus dealbata*, stem yellowish-green, young fruit green, ripe fruit yellowish-green). Naga Hills, *Bor.* 17671; Kanglatunglei, Manipur, *De*, 22-2-1939 (*Specimens beginning from this asterisk mark are from Shillong Herbarium); +Sepramaina 2,800 ft., Manipur, *Deb* 1381 (on *Quercus semiserrata*, tender shoot with oblong fruits, 20-12-1953); Loc.?, Manipur, *Deb* 809 (on *Quercus serrata* var. *roxburghii*); *Deb* 929 (on *Quercus serrata*, young shoots, no fruits) (+Specimens beginning from this mark are from Deb, probably deposited in the D.M. College Herb., Imphal. All form new records for Manipur Hills).

E. Himalaya: Birch Hill 7,000 ft., Sikkim Himalaya, King 5102; Munsong 4,000 ft., Sikkim, Craib 341 (fruits of various shapes—round, oval and oblong).

C. Himalaya: Nepalia, Hamilton in 1802.

N.W. Himalaya: Mussorie, Mackinnon s.n. (on *Curpinus viminea*); Kullu, Brandis 3474; Glen 6,000 ft., Simla, Gamble 6233 F; Ranikhet 6,000 ft., Kumaon, Butler 27205, Coll. Inayatkhan (on *Loranthus vistitus* which is on *Quercus incana*); Simla 8,000 ft., Meebold 5096.

FORMOSA: Bankinsing, Henry 59.

(iii) *V. articulatum* Burm. var. *thelocarpum* (Danser) Seshagiri Rao nov. comb.

INDIA: *Peninsular India*: Oshele, Canara, Ritchie 333; Malawar, Concan, etc., Herb. Ind. Or. Hook. f. & Thom., *Stocks, Law*, etc. *C. India*: Ajmere, Coll. ? (Typus II, Danser s.n., loan from Dehra Dun Herb.).

5. *Viscum angulatum* Heyne ex A.P. de Candolle, *Prodr.*, 4: 283, 1830; Wight and Arnott, *Prodr. Fl. Pen. Ind. Or.*, 380, 1834; Dalzell and Gibson, *Bombay Fl.*, 110, 1861; Hooker f., *Fl. Br. Ind.*, 5: 225, 1886; Engler in *Engl. and Pr. Nat. Pflanzenfam.*, 3: 195, 1889 pro parte; Gamble, *Ind. Timb.*, 584, 1902; Brandis, *Ind. Trees*, 552, 1906; Cooke, *Fl. Bombay*, 2: 553, 1906; Talbot, *For. Fl. Bombay*, 2: 422, 481, 1911; Gamble, *Fl. Madras*, 7: 1257, 1259, 1925; Fischer in *Rec. Bot. Surv. Ind.*, 11: 181, 1926; Engler and Krause in *Engl. Nat. Pflanzenfam.* (ed. 2), 16 b, 203, 1935; Danser in *Blumea*, 4: 292, 1941; Santapau in *Rec. Bot. Surv. Ind.*, 16: 267, 1953; Santapau, *Plants of Sugurashtra*, 34, 1953; *V. ramosissimum* Wight, *Ic. Pl.*, 3: t. 1017 tantum, 1845.

Plants monœcious. *Stems* slender, somewhat hanging, branches numerous, decussate or more than two at each node, lower internodes terete or with two opposite ribs, 2–5 cm. long, up to 4 mm. in diameter, usually less thick; internodes of middle region of plant distinctly 4-angular, sometimes with less prominent ribs in between the four main ones, hardly flattened towards the apical part, apical internodes 1–4 cm. long, 1–2 mm. in diameter, tender ones somewhat flattened towards their apices. *Leaves* scaly, almost invisible, 0.5 mm. long or even less, also small scales (prophylls) at bases of branches. *Inflorescences* usually sessile, lateral, rarely terminal, very slightly peduncled, 1–3 flowered, if one-flowered with one female flower subtended by two bracts connate at base, if 3-flowered one central female flower as above and two lateral male flowers usually in the axils of another pair of bracts decussate to the upper connate ones; sometimes two more 1–3 flowered inflorescences one on either side of the first one; very rarely further branches of inflorescence with crowded flowers, 2–2.5 mm. long and broad. *Fruits* nearly globose at maturity, up to 4 mm. in diameter,

usually surrounded at base by two depressed bracteal cups. (Description from specimens in the Calcutta Herbarium and partly adapted from Danser, *loc. cit.*) (Fig. 10).

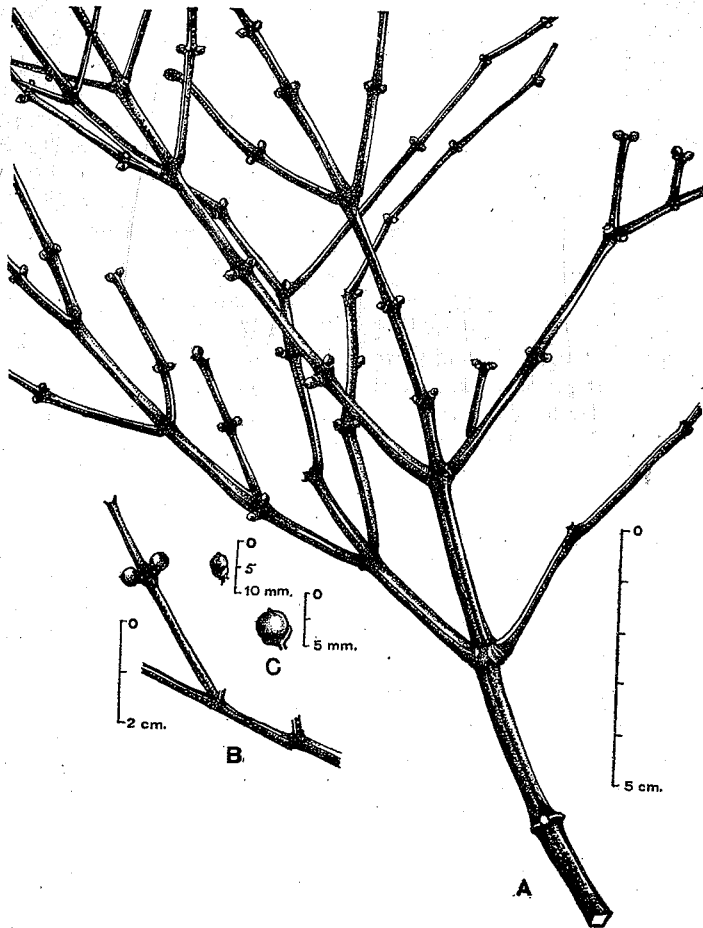


FIG. 10. *Viscum angulatum* Heyne ex de Cand. A. Shoot with very young fruits (*Wight 52*); B. Small twig with fruits; C. Fruits enlarged.

Viscum angulatum with its characteristic quadrangular internodes of the medium part of the plant is sharply delimited from *V. articulatum* and its varieties, though in the structure of inflorescence, flower and fruit, there is practically no difference at all.

With the data available, the distribution of this species in India appears to be very restricted to the Peninsular India and that too only in the far-south region below Madras on the Eastern side and from Saurashtra down the Western Ghats on the Western side (Map 3 A).

Specimens examined

Wall. Catno. Herb. Wight 497 B (no locality).

INDIA: *Peninsular India*: Loc. ? *Ritchie* 334; Flora of Bombay, College of Science, Poona; Tegur, Dharwar—Belgaum Road about 2,000 ft., *Sedgwick* 5508; loc. ? *Herb. Wight* 52; Palamalai 3,500 ft., *Saulieres* 437, 734; Palamalai 3,000 ft., *Munch* 101; Near Huginium 3,400 ft., Coimbatore Dist., *Fischer* 175; Culhatty 4,000 ft., Nilgiris, *Clarke* 11312 B & C Sigur Ghat, 4,000 ft., Nilgiris Dist., *Gamble* 14508; Mt. Nilgiri and Kurg, *Thomson*, Herb. Hook. f. & Thom.; Middle Pulneys 4,000 ft., *Rodriguez* 2065; Seegor 3,000 ft., Mysore, *Clarke* 11254 (3 sheets); Satavari 3,000 ft., Kadur Dist., Mysore, *Talbot* s.n.; Tambacheri ghat, Wynad, *Barbar* 7,400. *Khandala, *Santapau* 13·6 H (on Jambul), 13·11, 13·20 (on *Oleadioica*), 24484, 24538, 24539; Echo plateau top, Khandala, *Santapau* 4214 (on *Carissa carandas*); Talao, Khandala, *Santapau* 8625; Echo point, Khandala, *Santapau* 4527, 28346 (on *Flacourtia*); Bhoma Hill, Khandala, *Santapau* 6959; Con. Home.—Khandala Hotel, Khandala, *Santapau* 1651 (on *Olea dioica*); Khandala, *Santapau* 659 (on *Olea dioica* together with *Loranthus cuneatus*); Khandala, *Santapau* 567 (on *Eugenia jambolana*); Paradise Hill and plateau, Purandhar, *Santapau* 6171, 6172; Paradise plateau, Purandhar, *Santapau* 8258; Round Purandhar Fort, Purandhar Hill, Poona Dist., *Santapau* 5682; Lingmala, Mahableswar, *Santapau* 12483 (on *Flacourtia*), *Bole* 378; Loc. ? *Patel* (Dr. D. K. Patel's Herb.).

6. ***Viscum ramosissimum*** Wight & Arnott, *Prodr. Fl. Pen. Ind. Or.*, 380, 1834; Wight, *Ic. Pl.*, 3: 13, 1845 (excl. t. 1017); Hooker f., *Fl. Br. Ind.*, 5: 225, 1886; Engler in *Engl. and Pr. Nat. Pflanzenfam.*, 3: 195, 1889 and 140, 1897; Trimen, *Fl. Ceylon*, 3: 472, 1895; Gamble, *Ind. Timb.*, 584, 1902; Brandis, *Ind. Trees*, 552, 1906; Cooke, *Fl. Bombay*, 2: 554, 1906; Gamble, *Fl. Madras*, 7: 1257 and 1258, 1925; Fischer in *Rec. Bot. Surv. Ind.*, 11: 161, 1926; Engler and Krause in *Engl. Nat. Pflanzenfam.* (ed. 2), 16b: 201, 1936; Danser in *Blumea*, 4: 294, 1941; *Aspidixia ramosissima* Van Tieghem in *Bull. Soc. Bot. Fr.*, 43: 193, 1896.

Plants monœcious. *Stems* slender, branches numerous, decussate or more than two at each node, lower internodes stout, smooth and distinctly terete or sometimes longitudinally grooved and round, usually 3–5 cm. long rarely even longer in extreme forms, up to 5 mm. in diameter, usually less thick towards apex, apical internodes 4–15 mm. long, 1–2 mm. in diameter, younger ones somewhat flattened towards their apices. *Leaves* absent on Herbarium specimens; the only leaf of *Wallich Cat.* 6876, according to Danser (*loc. cit.*), lanceolate-obovate, attenuate towards the base but not petiolate, apex rotund, 22 mm.

long, 5-5 mm. broad, thick, with 3 hardly prominent but distinct longitudinal nerves. *Inflorescences* usually lateral and same as *V. angulatum*. *Fruits* small, sub-globose in young stage, mature fruits not available on Herbarium specimens. (Description from specimens of the Calcutta Herbarium and partly adapted from Danser, *loc. cit.*) (Fig. 11).

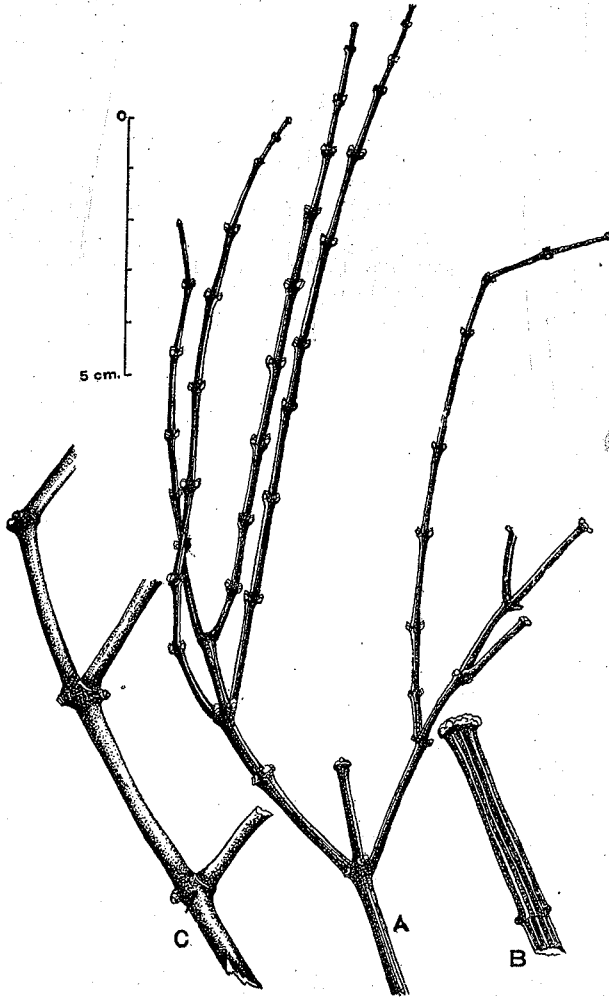


FIG. 11. *Viscum ramosissimum* Wt. & Arn. A. Apical part of shoot (Gamble 12115); B. Lower internode (Grooved); C. Lower internodes (Long and terete—Wall. cat. 6876).

V. ramosissimum resembles *V. angulatum* very closely in many characters except the shape of the internodes which are terete and sometimes longitudinally grooved in the former and quadrangular in the latter, both however having somewhat flattened young internodes

at the tip. Though Wight and Arnott mention that the species sometimes possesses a few leaves, the herbarium specimens examined are entirely leafless. Danser reports that only the specimen *Wallich Cat.* no. 6876 in the Kew Herbarium bears one leaf and opposite to this, a leaf scar. There is much variation in the size of the internodes and specimens like *Herb. Wight, Wallich Cat.* no. 6876 and *Ex. Herb. Wight 53*, exhibit extreme form with closely branched and very fine and long internodes.

Strangely enough, there is a specimen collected by J. Horne (*Horne 894*) in 1877-78 from Fiji islands which matches very well with *Wallich Cat.* no. 6876 and is certainly appearing to be *V. ramosissimum*. It is rather strange how this species which has been so far reported only from South India, can occur in such a remote island without any trace of it in the neighbouring zones. However, the writer doubts whether any wrong label was attached to this specimen.

Though *V. ramosissimum* was described as early as 1834, the plant is inadequately described and hence a thorough examination of this species in the living condition is worth studying.

This species also has a very restricted distribution mostly being confined to South India that too, only in the districts of Chittore, Coimbatore, Nilgiris, Tinnevely and also in Ceylon. The record of this species from Fiji islands, of course, if the label is correct, creates peculiar trend in the distribution of the species. Hence, more evidence on this subject is worth waiting for (Map 4 B).

Specimens examined

Wall. Cat. no. 6876 (Gingee Hill); *Herb. Wight 6876 B.*

INDIA: *Peninsular India*: Palmaner 2,500 ft., Chittoor Dist., *Fischer 4313*; Attumali 4,500 ft., Anamalai Hills, *Fischer 3418*; Palamalai, Coimbatore Dist., *Fischer 24*; Sholampalayam 1,400 ft., Coimbatore Dist., *Fischer 1734*; Black bridge 6,000 ft., Nilgiri Dist., *Gamble 12115*; Coonoor 6,000 ft., Nilgiris Dist., *Gamble 11693*; *loc.?* *Ex. Herb. Wight 53.*

And also probably

FIJI ISLANDS: Fiji islands, *J. Horne 894*, 1877-78, Recd. March 1879.

7. *Viscum loranthi* Elmer, *Leaflets Philipp. Bot.*, 8: 3089, 1919; Merrill, *Enum. Phil. Fl. Pl.*, 2: 113, 1923; Danser in *Bull. Jard. Bot. Buitenzorg* (ser. 3), 11: 464, t. 27 b, c, 1931; in *Philipp. Jour. Sc.*, 58: 142, 1935; in *Blumea*, 4: 295, 1941; *Viscum* sp., Osmaston, *For. Fl. Kumaon*, 465, 1927; *Viscum osmastonii* Raizada in *Ind. For.*, 60: 537, t. 55, 1934.

Plants monœcious. *Stems* slightly rigid, lower portion much branched, branches decussate; lower internodes somewhat slightly

longitudinally grooved, terete, 2-2.5 cm. long, 3-4 mm. in diameter, internodes becoming shorter gradually towards the apices, the top-most internode about 5-6 mm. only. *Leaves* absent. *Inflorescences* lateral forming a cluster of cymes at the apex of each internode just below the node, cyme 3-flowered, probably sessile, central female flower, lateral ones male, subsequent cymes on either side of the first cyme, later female flowers becoming prominent and closely adpressed together around the node. *Female flowers* ovate, 1 mm. long, tepals four, ovate, acute, ovary slightly verruculose, style very short with a small nipple-shaped stigma. *Male flowers* ovate, $\frac{3}{4}$ mm. long, tepals four nearly of same size, acute. *Fruits* immature ones subglobose, up to 4 mm. long, up to 3 mm. in diameter, slightly verruculose, four tepals persistent as crown (Fig. 12).

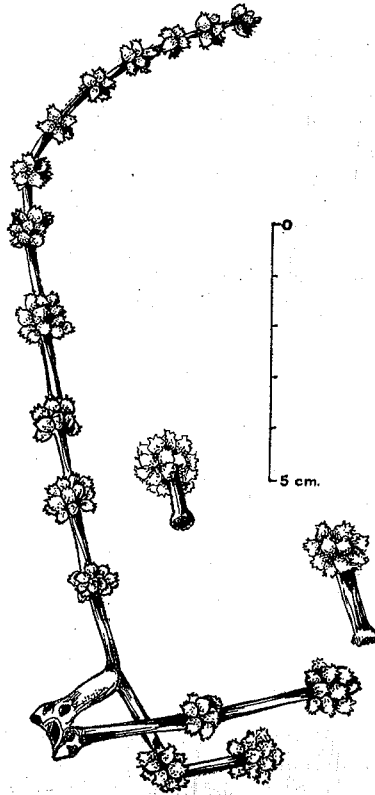


FIG. 12. *Viscum loranthe* Elmer. Shoot with fruits (Osmoston 1536).

The numerous buds and bracts in the inflorescences are very densely crowded and hence the morphological arrangement of bracts appears to be much disturbed by reciprocal pressure. Such an arrangement can be studied only from fresh specimens representing different stages in the development of inflorescence.

The writer agrees with Danser in reducing *V. osmastonii* Raizada to *V. loranthi* Elmer. This species is characteristically parasitic on closely allied genera of Loranthaceæ and Osmoston's specimens collected from the North-West Himalaya were found parasitic on *Taxillus vestitus* which in turn was parasitic on *Quercus dilatata*. The species has been reported to be parasitic also on *Scurrula cordifolia*, *Scurrula pulverulenta* and *Dendrophthoe falcata*, all of allied genera.

In India, this species has so far been reported only from the Western Himalayas. Now, it has been newly recorded from the Manipur hills also. It also occurs in Yunnan, Luzon and Sumatra. The presumption of Danser that "the discovery of *V. loranthi* in the Himalaya and Yunnan makes a larger distribution in the mountains of South-Eastern Asia probable", has been further strengthened now by the collection of this species by Deb from the Manipur Hills. So it is quite possible that this species may occur in the Eastern Himalayas, *North-East Frontier Agency and Burma also, so as to establish a continuity in the line of distribution (Map 3 C).

Specimens examined

INDIA: *Western Himalaya*: loc. ? 2,500 ft., Dehra Dun Dist., Mackinnon 23028; Nalia Reserve 6,000 ft., East Almora Division, *Osmoston* 1536 (parasitic on *Loranthus vestitus*, which was parasitic on *Quercus dilatata* Type of *Viscum osmastonii* Raizada) (Dehra Dun Herb.).

Assam: Kangpokpi 3,400 ft., Manipur, Deb 1714, on 10-2-1954 on *Quercus*? (*New Record*, D.M. College Herb., Imphal).

Assam: Kangpokpi 3,400 ft., Manipur, Deb 1714, on 10-2-1954 on *Quercus* (*New Record*, D.M. College Herb., Imphal).

PHILIPPINE ISLANDS: Los Banos (Mt. Maquiling), Prov. of Laguna, Luzon, Elmer Distr. No. 17777.

8. *Viscum ovalifolium* A.P. de Candolle, *Prodr.*, 4: 278, 1830; Hook. f. in *Fl. Br. Ind.*, 5: 225, 1886 pro parte; Gamble, *Ind. Timbers*, 584, 1902 pro parte; Brandis, *Ind. Trees*, 552, 1906 pro parte; Danser in *Blumea*, 4: 296, 1941; *V. orientale* Benth in *Hooker Lond. Jour. Bot.*, 2: 222, 1843; Brandis, *For. Fl. N.W. Cent. Ind.*, 393, 1874 pro parte; Brandis, *Ind. Trees*, 552, 1906 pro parte; Gamble in *Jour. As. Soc. Bengal*, 75 (2): 386, 1914 (cum var. *ovalifolio*); Danser in *Bull. Jard. Bot. Buitenzorg* (ser. 3), 11: 1931 pro parte; *V. ovalifolium* Danser in *Bull. Jard. Bot.*

*Fruiting specimens of *Viscum* species, closely resembling *Viscum loranthi* but rather appearing to be different, have been collected by the writer in November 1955 from the hills (6,000 ft.) above Apatanang Valley surrounding Zero, Headquarters of the Subansari Division of North-East Frontier Agency. They could not be matched with any available material at the Calcutta Herbarium. The species is parasitic on *Taxillus vestitus* which in turn is parasitic on another tree (unidentified).

Buitenzorg, (ser. 3) 16 (1): 48, 1938 pro parte; in *Blumea*, 3 (1): 34, 58, t.1, 1938 pro parte; in *Blumea*, 3 (3): 401, 1940 pro parte; *V. monoicum* Griffith, *Not. Pl. As.*, 4: 637, 1854; *Ic. Pl. As.*, 4: 631, 1854.

Plants dioecious. *Stems* somewhat slender, strongly branched, entirely glabrous, internodes terete, grooved or not, often somewhat flattened towards the apex, always more or less swollen at the nodes, those bearing full-grown leaves 3–6 mm. in diameter. *Leaves* opposite, lanceolate or ovate or oblong or slightly obovate, apex obtuse or somewhat acute, margin entire, coriaceous, dull on both sides, sometimes inequilateral, usually gradually attenuate towards base tapering into a very short petiole-like structure, 5–9 cm. long, 2–3.5 cm. broad, usually with 3 or 5 longitudinal nerves, more clear on upper side. *Inflorescences* usually lateral, at first single, sessile or shortly peduncled 3-flowered cyme with middle female and lateral male flowers, later many similar cymes on either side of the first one around the node, most of them usually lacking lateral male flowers, thereby developing a cluster of female flowers with male ones here and there; flowers in a navicular cup formed of 2 connate bracts, about 2 mm. long. *Female flower* oblong, 1.5–2 mm. long, tepals 4 short, triangular. *Male flowers* somewhat flattened by pressure, up to 1 mm. long, tepals 4, triangular. *Fruits* roundish-ellipsoidal, somewhat contracted at base, distinctly warty till almost ripeness, 5.6 mm. long, 4 mm. in diameter, crowned by slightly enlarged conical style. [Description from the Calcutta Herbarium specimens and partly adapted from Danser (1938).] (Fig. 13.)

Viscum ovalifolium has always been called *Viscum orientale* by all botanists writing on the Visca of Malayan Peninsula and Malayan Archipelago. By critical examination of Willdenow's type specimens of *V. orientale* by Danser, this point of confusion has been clarified. Willdenow's plant bears in each bracteal cup, 3–5 flowers of which probably always more than one, and usually 3, are female, whereas in *V. ovalifolium*, the inflorescence in the beginning bears 3 flowered cyme of which the middle flower is female and the lateral flowers male. Further, in *V. ovalifolium* the fruits with the exception of very young and entirely ripe ones, are warty whereas in *V. orientale*, the fruits are smooth and dull by minute granules but not at all warty.

V. ovalifolium was described by de Candolle (1830) under two names, *V. ovalifolium* and *V. obtusatum*. These two were later united by Hooker (1886) under *V. ovalifolium* and hence this name only is considered as valid.

In certain specimens from Tenasserim and Malaya, the leaves are unusually small and slightly curved indicating a variety of *V. ovalifolium* but the presence of such small leaves along with typical large leaves on same shoot of some other specimens, removes the possibility of formation of a variety. The Assam specimens collected by Deb are with young flower buds, presenting a characteristic inflorescence structure (*Gallatly* from Assam, *Deb* from Manipur hills).

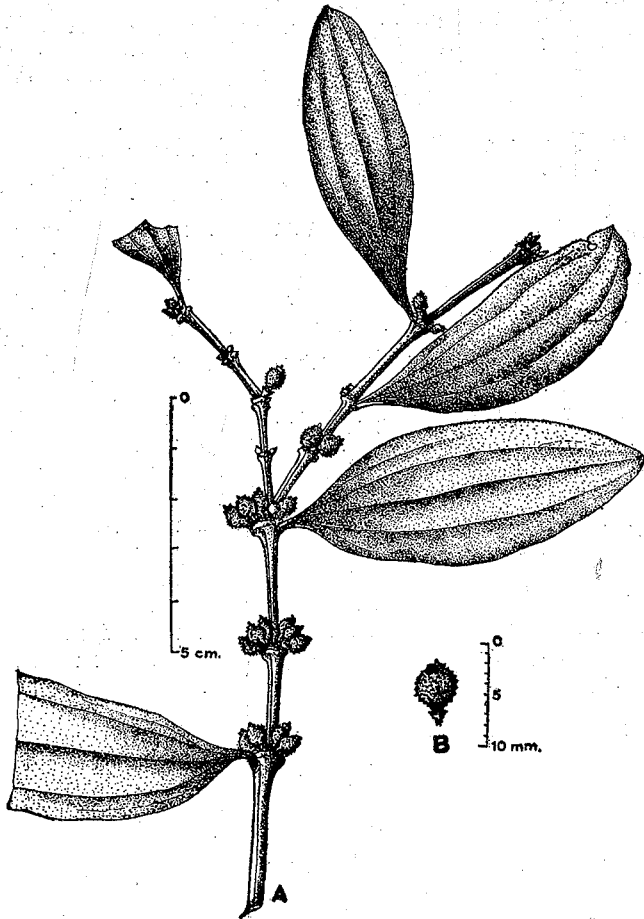


FIG. 13. *Viscum ovalifolium* A. P. de Cand. A. Shoot with fruits (Gallatly 469); B. Warty fruit enlarged.

The species is now for the first time recorded from Assam, which also forms a new record for India. By this, it appears to have a very characteristic and continuous area of distribution. It is commonly found in the Malayan Peninsula, the East Indies and the Philippines and reaches its Eastern limit as far as West New Guinea, its North-Western limit up to Assam through Indo-China, Siam and Burma. In China it appears to be restricted to Hainan and Hongkong and has not been so far recorded in Formosa. The recent collections by Deb (*Deb* 664, 1499, 1712) provide an interesting additional information that this species grows even at higher altitudes as far as 6,000 ft. in the Manipur hills of Assam (Map 1 A).

Specimens examined

Wall. Cat. no. 489; Penang (co-type of *Viscum ovalifolium*).

THE INDO-MALAYAN SPECIES OF VISCUM LINN. 149

INDIA: Assam: loc. ? Assam, *Gallatly* 469 on 3-3-1877 (new record); Koupro Hill 6,000 ft., Manipur, *Deb* 1499 on 19-12-1953; Kangpokpi 3,400 ft., Manipur, *Deb* 1712 on 10-2-1954, on *Quercus*; Tengapole 6,000 ft., near Manipur towards Burma border, *Deb* 664, on 21-1-1953; Maram 6,000 ft., Manipur, *Deb* no. ? (All Manipur specimens beginning with asterisk mark are new records and are probably deposited in D.M. College Herb., Imphal.)

BURMA: Laikaw, Southern Shan State, Upper Burma, *Abdul Khalil*; Mergui, Tenasserim, *Meebold* 14317.

MALAY PENINSULA: Malacca, *Griffith*, Kew Distr., no. 2739, 2740; Penang Hill, Pulau, Penang, *Ridley* 9373; L.W. Rest House, Perak, *Scortechini* 732; Lower Camp, Gunong Batu Pateh, Perak, *Wray Jr.*, 1074; Palau, Jellam, Pahang, *Ridley* 2250; Green, Jurong, Singapore, *Ridley* 1827; Merleman, Malacca, *Derry* 195; Chan Chu Kang, Singapore, *Ridley* 6816; Garden, Singapore, *Ridley* 10369; on *Ficus*; Bukit Madaida, Singapore, *Ridley* 3777.

MALAYAN ARCHIPELAGO: Sarawak, near Kuching, Borneo, *Haviland and Hose* 3092.

SIAM: Kohchang, *Schmidt* 139.

PHILIPPINES: Antipolo, Rizal province, Luzon, *Merrill*, Sp. Blancoanæ no. 888; Los Banos (Mount Maquiling), Laguna Prov., Luzon, *Elmer* Dist. no. 17916 and 17798.

CHINA: Hainan, *Henry* 8420.

9. *Viscum wrayi* Gamble in *Kew Bull.*, 1913: 47, 1913; in *Jour. As. Soc. Beng.*, 75: 387, 1914; *Ridley*, *Fl. Mal. Pen.*, 3: 164, 1924; *Danser* in *Bull. Jard. Bot. Buitenzorg* (ser. 3), 11: 470, 1931; in *Blumea*, 4: 297, 1941.

Plants monoecious. *Stems* strongly and densely branched, entirely glabrous, each internode somewhat terete at base, gradually flattened towards the apex, up to twice as broad as the base just below the node or sometimes slightly more 2-3 cm. long, 2-3 mm. thick at base, sometimes slightly wrinkled. *Leaves* opposite, roundish-obovate to spatulate, apex rotund, margin entire, coriaceous, smooth and dull, gradually attenuate towards base, rarely contracted into a very short petiole-like structure, 3.5-5 cm. long, rarely up to 6 cm., 1.5-2 cm. broad, rarely up to 3 cm., usually 3-nerved, sometimes up to 7 nerves, indistinctly visible. *Inflorescences* usually lateral, at first single in axils, sometimes later up to many, usually 3 flowers in a small navicular cup formed of two bracts on a short peduncle, the middle female, the lateral male. *Female flower* oblong, about 2 mm. long. *Male flower* smaller, somewhat compressed. *Fruits* globose, contracted at base forming 2-3 mm. long stalk, distinctly smooth, 6-7 mm. long excluding stalk, 4-6 mm. in diameter, crowned by prominent tepal-bearing margin and

slightly enlarged conical style. [Description from the specimens of the Calcutta Herbarium and partly adapted from Danser (1931).] (Fig. 14.)

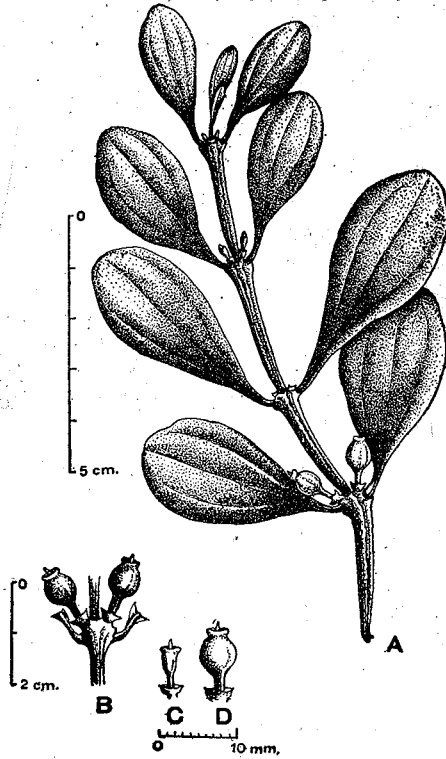


FIG. 14. *Viscum wrayi* Gamble. A. Shoot with fruits (Wray jr. 1111); B. Node with fruits; C & D. Young and mature fruits enlarged.

This is a good species and can be readily distinguished from all its allied species by means of the internodes gradually flattened towards the apex and by the nearly obovate leaves with perfectly round apex and smooth and indistinctly veined surface, normally developed at almost all the nodes, by the stalked fruits and by the central female flower of the triads devoid of its own bracteal cup.

This species appears to have a very restricted distribution only in Malay Peninsula and Southern Borneo (Map 1 B).

Specimens examined

MALAY PENINSULA: Lower camp, Gunong, Batu Pateh, Wray Jr., 1111 (co-types of *Viscum wrayi* King); 13½ mile Mawai-Jemulong Road, Johore, low alt., Corner, Singapore field no. 28992, on *Gomphia corymbosa*; Kedah Peak, Ridley 5847.

10. *Viscum acaciæ* Danser in *Blumea*, 4: 298, t.1. 1941.

Plants monœcious. *Stems* tender, wiry, branching dichotomous nearly at all nodes at the base, somewhat less towards the apices, branches usually opposite, rarely here and there single, adventitious; lower internodes slender, mostly smooth or somewhat longitudinally grooved, terete, not flattened at any region, 3-7 cm. long, 3-1 mm. in diameter in the central part, slightly compressed and nearly 5 mm. wide at nodes, internodes towards apices gradually more delicate, short, not grooved, 2-4 cm. long, 0.8 mm. in diameter, at nodes 2 mm. wide. *Leaves* lanceolate or sub-spathulate to spathulate, base of the leaf partly tapering into petiole of 2-5 mm. long, usually 3.5-7 cm. long, 7-20 mm. broad, rotund, coriaceous with 3 nearly distinct longitudinal nerves. *Inflorescences* single and terminal or a few lateral in the axils of opposite leaves, cyme 3-flowered, peduncled, central flower female, lateral ones male, peduncle short 1 mm. long in early stages, later 3-4 mm. long at maturity, 0.3-0.5 mm. in diameter, bracts two united into a naviculate structure, 1 mm. long in young stage, later 2 mm. long, apex acute. *Female flowers* oblong-clavate, 2-3 mm. long, 1 mm. diameter, 4 tepals. *Male flowers* in the axil of bract, 0.7 mm. long. *Fruits* single in each inflorescence, clavate or oval, upper part sub-globose, 6-8 mm. long, 4-5 mm. in diameter, base abruptly tapering into stalk, 2-3 mm. long, 0.6 mm. in diameter, remnant of style as a small nipple-shaped outgrowth at the tip, immature fruits in Herb. specimens superficially rugulose, somewhat smooth but never verruculose, nor granulose, but mature fruits superficially very slightly granulose. (Description from the specimens of the Calcutta Herbarium and partly adapted from Danser *loc. cit.*) (Fig. 15.)

The writer has examined the type from Dehra Dun Herbarium. This is a good species.

Only two sheets from Burma were examined by Danser whereas there are a few more Burma specimens of this species from other localities now found out in the Calcutta Herbarium. Hence, they form new records for those areas.

In general appearance and by its stalked fruit, this species shows a superficial resemblance to *Viscum ovalifolium* on one side and *Viscum multinerve* on the other. But it can be readily distinguished from the former by the presence of long and very thin internodes, very prominent fruit stalk and by the absence of warty fruit wall and from the latter by its obtuse, tri-nerved leaves and simple structure of the inflorescence. A Burma specimen of *V. ovalifolium* (Meebold 14317) resembles so close to this new species in the shape of the leaves and general appearance that it can be distinguished only by its distinctly warted fruit.

So far, this has been recorded only from Upper Burma that too on either side of Irrawaddy in Minbu and Magwe Districts (Map 3 E).
Specimens examined

BURMA: Ywamun-Shwetandaw 800 ft., Magwe Dt., Robertson 1823 (parasitic on *Acacia leucophlea*, Berries red, Type of the species) (Dehra Dun Herb.); Meiktila, Collett 1, in Oct. 1887;

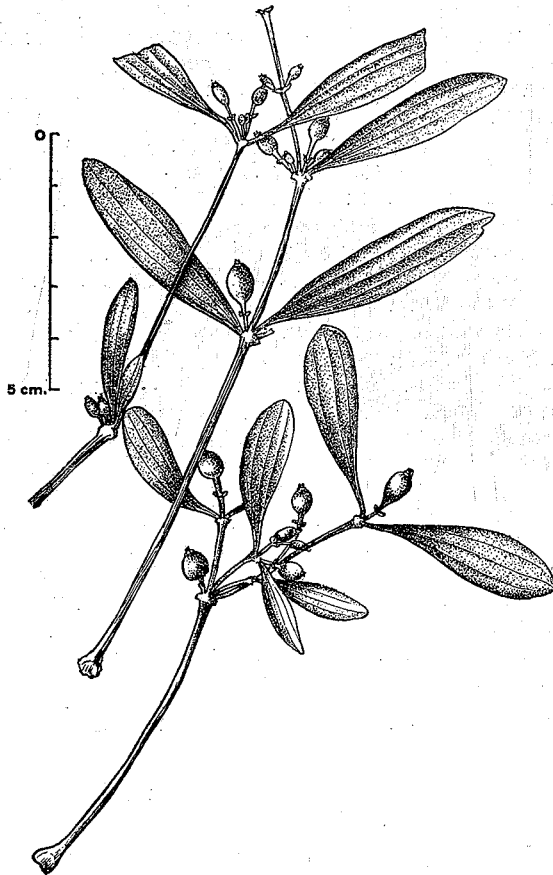


FIG. 15. *Viscum acaciæ* Danser. Shoot with fruits (Robertson 1823, Type specimen).

Upper Burma, *Collett* 15, in 1887; Upper Burma, *Huk*, in Jan. 1891 (new record); Gwingyin, Minbu Dist., Upper Burma, *Aubert and Gage*, on 18-3-1903 (parasitic on *Acacia leucophlœa* Willd.) (new record); Sagu Road side, Minbu, *Shaik Mokim* 416, in Oct. 1902 (new record).

(i) *Viscum acaciæ* Danser var. *obovalifolium* Seshagiri Rao var. nov.

Varietas hæc nova ad *v. acaciæ* accedit, in eo quod inflorescentia triflora monstrat florem femineum centalem et duos flores masculos laterales; differt vero sequentibus notis: folia sunt obovata, spatium internodale est breve, rotundatum, plus minusve læve in ramis infimis (Fig. 16).

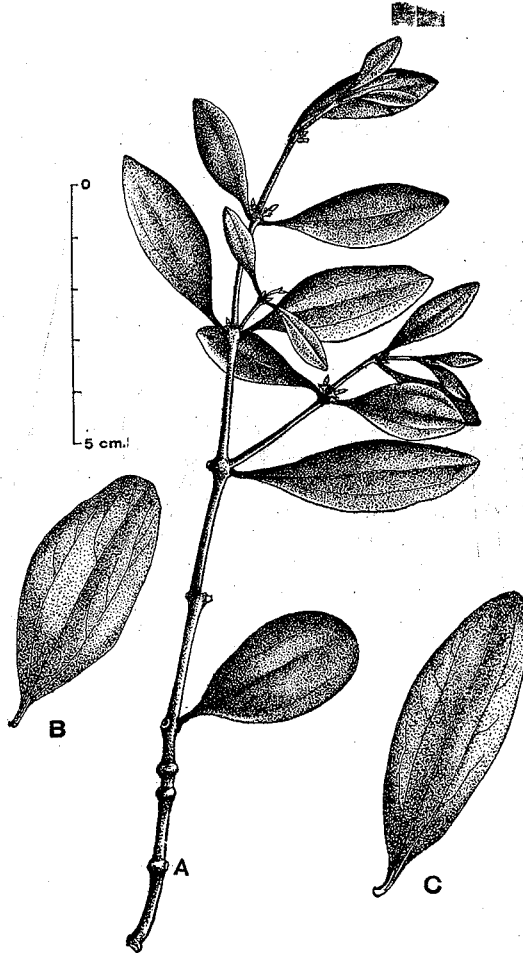


FIG. 16. *Viscum acaciæ* Danser var. *obovalifolium* Seshagiri Rao. A. Shoot (Huk 117); B & C. Different shapes of leaves.

This variety is based on the three specimens collected from Shan Hills (Huk 117) which are only in the young flowering stage. The three-flowered inflorescence is typically similar to that of *V. acaciæ*, having a central female flower and lateral male flowers. But the obovate-lanceolate leaves and the short, round, more or less smooth internodes in the lower branches of the plants are characteristically different from *V. acaciæ*. By general appearance, it may approach *V. wrayi* and *V. orientale* but can be readily distinguished from the former by the presence of round internodes right upto the apex and from the latter by the three-flowered inflorescence.

Until more collections of *V. acaciæ* are studied when there may be a possibility of finding out the intermediates between the species proper

and this variety, it has been considered to be appropriate to keep this as a distinct variety to draw further attention of other workers on this genus.

The variety has so far been recorded from the Shan Hills, upper Burma (Map 3 F).

Specimens examined

BURMA : Shan Hills, Upper Burma, *Huk* 117, in 1882 (Fl. white, *type* of the variety).

11. ***Viscum orientale*** Willdenow, *Sp. pl.*, 4 (2): 737, 1805; A. P. de Candolle, *Prodr.*, 4: 278, 1830 pro parte; Wight and Arnott, *Prodr.*, 379, 1834; Oliver in *Jour. Linn. Soc. Bot.*, 7: 103, 1864; Brandis, *For. Fl. N.-W. Centr. India*, 393, 1874; pro parte; Kurz, *For. Fl. Burma*, 2: 324, 1877 pro parte? Hooker f., *Fl. Br. Ind.*, 5: 224, 1886 pro parte; Engler in *Nat. Pflanzenfam.*, 3 (1): 195, 1889 pro parte; Trimen, *Fl. Ceylon*, 3: 471, 1895 pro parte?; Engler in *Nat. Pflanzenfam.*, 140, 1897 pro parte; Gamble, *Ind. Timbers*, 584, 1902 pro parte; Brandis, *Ind. Trees*, 552, 1906; Cooke, *Fl. Pres. Bombay*, 2 (3): 552, 1906; Talbot, *For. Fl. Bombay*, 2: 420, 1911 pro parte?; Haines, *Botany Bihar and Orissa*, 5: 803, 1924; Gamble, *Fl. Madras*, 7: 1257, 1258, 1925; Fischer in *Rec. Bot. Surv. India*, 11 (1): 161, t. 1, 2 and 4, 1926; Alston in *Trimen Fl. Ceylon*, 6: 250, 1931; Danser in *Bull. Jard. Bot. Buitenzorg* (ser. 3), 16: 53, 1938 pro parte, excl. synonym; Danser in *Blumea*, 4: 299, 1941; *V. verticillatum* Roxburgh, *Fl. Ind.* (ed. 2) 3: 764, 1832; (ed. 3), 715, 1874; *V. verruculosum* Talbot, *For. Fl. Bombay*, 2: 419, 1911, pro parte (non Wight and Arnott).

Plants monœcious. *Stems* up to 45 cm. long or even more, terete with swollen nodes, much branched, branches decussate or more than two, dichotomously or umbellately arranged towards the apices; oldest internodes up to 6 cm. long, 6 mm. in diameter, normally smooth, sometimes slightly striped; younger internodes gradually less thick, usually shorter, youngest 1–3 cm. long, up to 1 mm. in diameter, somewhat grooved, flattened, dilated nearly double their normal width at their apices just below the node. *Leaves* opposite, ovate or oblong or somewhat obovate, rarely lanceolate, apex obtuse or acute or rotund, margin entire, thinly coriaceous, sometimes inequilateral, somewhat contracted at base tapering into a narrow very short petiole-like structure, 2–6 cm. long, very rarely upto 7.5 cm., 0.6–3 cm. broad, very rarely upto 3.5 cm., normally with 3-longitudinal nerves, more distinct above. *Inflorescences* usually lateral, at first single in axils, later up to cymes at each node, rarely terminal on tips of weak twigs, peduncle 1–5 mm. long, slightly grooved, bearing on its apex navicular cup formed of 2 bracts connate at base, about 2 mm. long; usually 5 flowers in each cup, the middle 3 female, the lateral male; very rarely another pair of bracts above the lower pair with similar set of flowers. *Female*

flowers oblong, tepals small, triangular. *Male flowers* shorter and more strongly compressed. *Fruits* roundish to oblong-oval, contracted at apex, surface dull by minute granules, smooth, never warty, the largest fruit up to 6 mm. long, 5 mm. in diameter. (Description from the Calcutta Herbarium specimens and partly adapted from Danser, *loc. cit.*) (Fig. 17.)

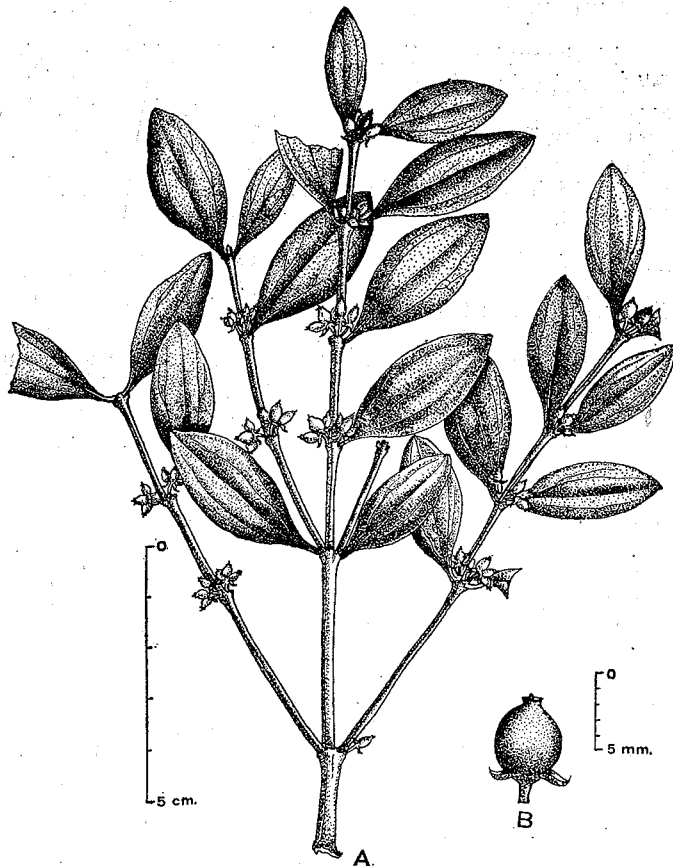


FIG. 17. *Viscum orientale* Willd. A. Shoot with fruits; B. Fruit enlarged.

Viscum orientale has been confused with many other species by several workers. The identification of Java specimens of *V. ovalifolium* as *V. orientale* by Blume dates back as early as 1823, and later, all the subsequent authors included the Malayan Archipelago specimens of *V. ovalifolium* under *V. orientale*. In Hooker's *Flora of British India*, the description under *V. orientale* is a mixture of the real *V. orientale* and also of *V. heyneanum*, *V. monoicum*, *V. ovalifolium* and the Australian *V. whitei*. *Viscum orientale* described by Benthham in his *Flora Australiensis* is nothing but *V. whitei* and that of his *Flora Hongkongensis* is *V. ovalifolium*.

In the specimens examined below, the leaves are more or less uniform but those in the *Wall. Cat.* 491 E, "*Viscum orientale?* var. *angustum*" and *Herb. Wight* 1219 are clearly lanceolate and narrow and thus, are quite distinct from the normal ovate or obovate leaves. However, the inflorescence and fruits are typical of *V. orientale*. In a South Indian specimen collected from Rampa Hills (*Narayanaswami* 565), the leaves are unusually big with 7.5 cm. of length and 3.5 cm. of width.

Now, with the understanding of *V. orientale* and its separation from *V. ovalifolium* and other close allies, the area of the distribution of this species appears to be rather restricted mostly in the Peninsular India and Ceylon, extending as far as Bihar and West Bengal as its North-Eastern limit. However, there is so far no record of its occurrence in Burma and Malayan zone where *V. ovalifolium* is commonly distributed (Map 2 B).

Specimens examined

Wall. Cat. no. 491, 491 B, 491 C, 491 E.

INDIA: Bengal and Bihar: Singbhum, *Haines* 349; Kumarbera, Saranda, Chota-Nagpur, *Gamble* 9106; Base of mount Pareshnath, *Hooker*; Mutlah, Calcutta, *Clarke* 21652 C; Hazaribagh 2,000 ft.; Chota-Nagpur, *Meebold* 5024; Manbhum, *Campbell, Herb. Watt.* 9224.

C. India: Raipore, C.P., *Loemie* in 1910.

Peninsular India: Peninsular India orientalis, *Herb. Wight* 1219; *Herb. Wight*, Kew Distr., no. 1249; *Herb. Wight* 46; *Roxburgh* s.n. "*(Viscum verticillatum)*"; Kaliyaguda 1,500 ft., Ganjam Dt., *Gamble* 13837; Gunjugudem, Godavari Dt., *Ramaswamy* 1635; Ethakonda, Rampa country, Godavari Dt., *Narayana swami* 565; Gokavaram and Chodavaram, Godavari Dt., *Narayanaswamy* 6; Pulomamri 500 ft.; Godavari Dt., *Gamble* 15866; Jidikuppa, Krishna Dt., *Barber* 5337; Ramapatam, Nellore Dt., *Gamble* 12380; Thanakonda 1,000 ft., Cuddapah Dt., *Gamble* 21206; Martalli 1,300 ft., Coimbatore Dt., *Fischer* 116; Ramapuram 2,000 ft., Coimbatore Dt., *Fischer* 103; Druttupallam 1,500 ft., Bolam patti Valley, Coimbatore Dt., *Fischer* 1923; Mettupalayam, Coimbatore Dt., *Barber* 8549; Damanul, *Herb. Beckett* no. 1579; Lower Pulneys 3,000 ft., *Rodriguez* 1914; Somanathpur, Mysore State, *Barber* 6857 (b); Palghat 500 ft., South Malabar, *Fischer* 1707; Attapadi Valley 1,400 ft., near Gopivan, South Malabar, *Fischer* 1743; Mont. Nilgiri and Kurg, *Herb. H.f. & T.T.*; Gudalur 5,000 ft., Nilgiris, *Meebold* 11484; Bodimetta Ghat 1,000 ft., Madura Dt., *Meebold* 13731; Dedmune, North Kanara Dt., *Talbot* 3573, growing on *Garcinia xanthochymus*; Bangalore. *Santapau* on 6-1-1951, on *Helicteres isora*.

CEYLON: *Thwaites* C.P. 412.

12. *Viscum heyneanum* A. P. de Candolle, *Prodr.*, 4: 278, 1830; Danser in *Bull. Jard. Bot. Buitenzorg* (ser. 3), 16: 51, 1938; Danser in *Blumea*, 4: 301, 1941; *V. heyneanum* var. *liocarpum* Danser in *Blumea*, 4: 305, 1941; *Viscum verruculosum* Wight, Arnott, and *Prodr. Fl. Pen. Ind. Or.*, 379, 1834; Hooker f., *Fl. Br. Ind.*, 5: 224, 1886; Engler in *Nat. Pflanzenfam.*, 140, 1897; Gamble, *Ind. Timb.*, 584, 1902; Brandis, *Ind. Trees*, 552, 1906; Talbot in *For. Fl. Bombay*, 2: 419, 1911 (specimen wrongly quoted); Gamble, *Fl. Madras*, 7: 1257, 1258, 1925; Fischer in *Rec. Bot. Surv. India*, 11: 180, 1926; Alston in *Trimen Hand. Fl. Ceylon*, 6: 250, 1931; Engler and Krause in *Nat. Pflanzenfam.* (ed. 2), 16 b: 201, 1935; *V. orbiculatum* Wight, *Ic. Pl.*, 3: 13, t. 1016, 1845; Hooker f., *Fl. Br. Ind.*, 5: 224, 1886; Engler in *Nat. Pflanzenfam.*, 3 (1): 167, 1889; 140, 1897; Gamble, *Ind. Timb.*, 594, 1902; Brandis, *Ind. Trees*, 552, 1906; Gamble, *Fl. Madras*, 7: 1257, 1258, 1925; Fischer in *Rec. Bot. Surv. India*, 11: 181, 1926; Engler and Krause in *Nat. Pflanzenfam.* (ed. 2), 16 b: 201, 1935; *V. orientale* Thwaites, *Enum. Pl. zey.*, 136, 1859 (non Willd.); Brandis, *For. Fl. N.W. & C. Ind.*, 393, 1874 pro parte; Trimen, *Syst. Cat. Ceylon*, 77, 1885; Hooker f., *Fl., Br. Ind.*, 5: 224, 1886; Engler in *Nat. Pflanzenfam.*, 3 (1): 195, 1889; Trimen, *Hand. Fl. Ceylon*, 3: 471, 1895; Engler in *Nat. Pflanzenfam.*, 140, 1897 pro parte; *V. capitellatum* Lecomte, *Not. Syst.*, 3: 171, 1915; *Fl. Indo-China*, 5 (3): 209, 1915.

Plants monœcious. *Stems* 40 cm. or longer, much branched, lower portion with decussate branches or more than two, dichotomously or umbellately branched towards the apices; lower internodes terete, up to 5 cm. long, up to 5 mm. in diameter, thickened at nodes, upper internodes gradually less thick, shorter, 1-2 cm. long, grooved, slightly flattened or angular towards apices. *Leaves* opposite, shape very variable, roundish-ovate to obovate or nearly cuneate-obovate or elliptic to oblong lanceolate, apex acute to rotund, margin entire or slightly wavy or finely crisp, dull or somewhat more shining above, slightly coriaceous, slightly contracted towards base tapering into a narrow, very short petiole-like structure, lamina 1.5-5 cm. long, 0.6-2.5 cm. broad, with 3-5 longitudinal nerves, network of venation slightly more distinct above. *Inflorescences* usually lateral, axillary, up to 6 cymes at each node, peduncle, very short upto 2 mm. long, slightly grooved, bearing at its apex naviculate cup formed of 2 bracts connate at base, about 1.5-2 mm. long; usually 3-7 sessile flowers in each cup, outer ones usually male, others female. *Fruits* oblong, more attenuate towards both ends in young stage, less attenuate in mature fruits, dull, finely papillose or typically warty in young stages, less warty or entirely smooth in older stages often crowned by dry, persistent tepals, up to 5 mm. long, up to 2 mm. in diameter. (Description from the specimens of the Calcutta Herbarium and partly adapted from Danser, *loc. cit.*) (Fig. 18).

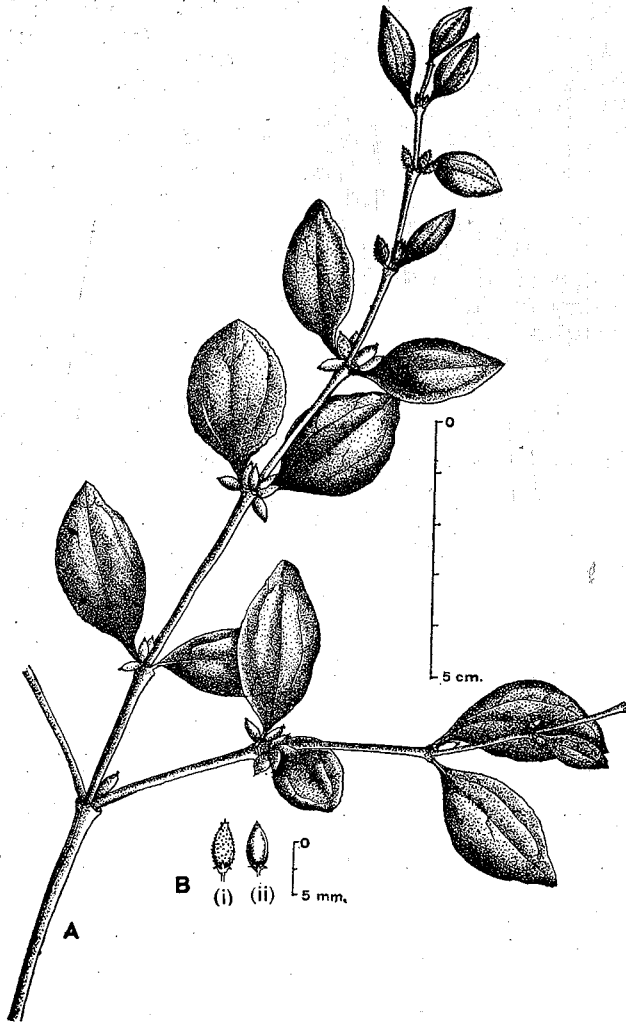


FIG. 18. *Viscum heyneanum* A.P. de Cand. A. Shoot with fruits (Bourne 258); B. Warty fruit (i) and smooth fruit (ii) enlarged.

In general appearance, *V. heyneanum* resembles *V. orientale* and also *V. monoicum*. But a close study reveals that *V. heyneanum* has more strongly and abruptly dilated apices of the stem than those of *V. orientale* and the structure of inflorescence though mostly similar in both, the former has mostly short peduncled or even sessile inflorescence with normally greater number of flowers whereas in the latter species, number of flowers are comparatively less. However, the young fruits of *V. heyneanum* with their oblong, tapering towards both ends, warty and usually persistent perianth characters, offer the most

distinctive diagnosis. But the number, development and the nature of warts on the fruits are variable and in the ripe fruits, they are less distinct or may even disappear making the fruit appear smooth. Certain ripe fruits on specimens, *Wight* 51 and 47 are nearly oval and smooth resembling those of *V. orientale* and some of them on *Wight* 51, 47, *Fischer* 805 and *Bourne* 258 are oblong, attenuate at both ends and smooth. The young fruits on these specimens are, however, warty. The presence of such numerous smooth fruits on certain specimens has probably led *Danser* to form a new variety *V. heyneanum* var. *liocarpum*. Though the writer has not seen the type of the variety, the specimen collected by *Bourne* from Sirumalais, Pulney District (*Bourne* 258 but *Danser* quotes *Bourne* 1767 from Kew Herbarium) has numerous smooth fruits mixed here and there with young warty fruits. As it has already been noted that warty nature is variable in different ages of the fruit and as the above specimens show the intermediate characters, namely, the combination of smooth and warty characters on their fruits, the formation of a new variety on the basis of entirely smooth fruits may not, however, be justified.

V. heyneanum can be critically distinguished from *V. monoicum* by the presence of usually three-nerved leaves and by the fruit which though smooth when ripe, is oblong and typically attenuate at both ends.

De Candolle, while describing *V. heyneanum* in his *Prodromus*, has not at all mentioned about the warty nature of the fruits and this has probably led *Hooker* to include *V. heyneanum* under *V. orientale*, thereby using *Wight* and *Arnott's* name, *V. verruculosum* for the plants with warty fruits. However, *Danser* has now clearly pointed out that *De Candolle's* type specimen preserved in Geneva Herbarium has strongly warted fruits and does not at all come under *V. orientale*.

V. orbiculatum has been accepted as a distinct species by *Hooker* and *Gamble*. Though *Gamble* points out that the smooth fruits and the presence of male flowers in the middle of the trials are the distinguishing characters of *V. orbiculatum* from *V. verruculosum*, it has also been found out that the specimens noted as *V. orbiculatum* by *Gamble* also show warty fruits with the characteristic shape without any difference in the structure of inflorescence from that of *V. heyneanum*. Hence, *V. verruculosum* and *V. orbiculatum* have been considered as synonyms to *V. heyneanum*.

Strangely enough, *V. heyneanum* which is so closely related to *V. orientale*, has a very restricted distribution in the Deccan peninsula and Ceylon, occurring only in various places south of Nellore. It appears to be very common in the Nilgiri and Travancore hills reaching as far as 7,000 ft. altitude. *Danser* records the occurrence of this species in Jafna, Pointe de Galles and a few other places in Ceylon. He has also recorded as very doubtful the occurrence of this species in French Indo-China on the basis of *Pierre's* specimen 3081 preserved in the Paris Herbarium. It appears rather doubtful whether the species of such a restricted distribution can occur at such a distant place as French Indo-China (Map 1 C).

Specimens examined

Wall. Cat. no. 491 A, Herb. Heyne; Wall. Cat. no. 6875, on trees about 2,500 ft. above the peak.

INDIA: *Peninsular India*: Horsleykonda 3,500 ft., Chittoor Dt., Fischer 4319; Shombaganur, S. India, Auglade 1871; Panachi 3,000 ft., Anamalai Hills, Fischer 3468; Dimbam 3,700 ft., Coimbatore Dt., Fischer 805; Black bridge 6,000 ft., Nilgiri Dt., Gamble 12114, on *Loranthus* on *Eugenia*; Bikkatti 5,000 ft., Nilgiri Dt., Gamble 20669; High wavy mountain 4,000–5,500 ft., S. India, Blatter and Hallberg 44; Travancore, Bourdillon 298, on *Helicteres isora*; Maluguttur 100 ft., Travancore, Bourdillon 650; Mundemurai, Travancore State, Calder and Ramaswamy 238; Thorai, Travancore, Rama Rao 1533; loc. ? Ex Herb. Wight 45, 47, 51; Sirumalais, Pulney District, Bourne 258.

13. *Viscum monoicum* Roxburgh ex A. P. de Candolle, *Prodr.*, 4: 278, 1830; Roxburgh, *Fl. Ind.* (ed. 2), 3: 763, 1832; Wight and Arnott, *Prodr. Fl. Pen. Ind. Or.*, 379, 1834; Roxburgh, *Fl. Ind.* (ed. 3), 715, 1874; Brandis, *For. Fl. N.-W. & Centr. Ind.*, 393, 1874; Kurz, *For. Fl. Burma*, 2: 324, 1877; Hooker f., *Fl. Br. Ind.*, 5: 224, 1886 (cum var. *edgeworthii*); Clarke in *Jour. Soc. Bot.*, 25: 64, 1889; Engler in *Nat. Pflanzenfam.*, 3 (1): 194, 1889; Trimen, *Handb. Fl. Ceylon*, 3: 471, 1895; Engler in *Nat. Pflanzenfam.*, 140, 1897; Gamble, *Ind. Timb.*, 584, 1902; Burkill in *Rec. Bot. Surv. India*, 4 (4): 77, 129, 1904; Cooke, *Fl. Bombay*, 2: 552, 1906 pro parte ?; Brandis, *Ind. Trees*, 552, 716, 1906; Gamble in *Jour. As. Soc. Beng.*, 75 (2): 386, 1914; Duthie, *Fl. Upp. Ganget. Plain*, 3 (1): 68, 1915; Lecomte, *Fl. Indo-Chine*, 5 (3), 208, 1915; Haines, *Bot. Bihar & Orissa*, 5: 803, 1924; Gamble, *Fl. Madras*, 7: 1257, 1258, 1925; Fischer in *Rec. Bot. Surv. India*, 11 (1): 161, 1926; Cowan in *Rec. Bot. Surv. Ind.*, 11 (2): 221, 1928; Kanjilal, *For. Fl. Pilibhit*, etc., 319, 1933; Engler and Krause in *Nat. Pflanzenfam.* (ed. 2), 16 b: 201, 1925; Kanjilal *et al.*, *Fl. Assam*, 4: 118, 1940; Danser in *Blumea*, 4: 305, 1941 (excl. syn. *V. verruculosum* Talb.); Santapau in *Rec. Bot. Surv. Ind.*, 16 (1): 268, 1953 (excl. syn.); *V. falcatum* A. P. de Cand., *Prodr.*, 4: 278, 1830; *V. confertum* Roxb., *Fl. Ind.* (ed. 2), 3: 764, 1832; (ed. 3) 715, 1874; *V. benghalensis* Roxb. ex Wt. & Ar., *Prodr.*, 379, 1834 in *synonymis*; *V. edgeworthii* Brandis, *Ind. Trees*, 552, 1906; *V. orientale* Talbot, *For. Fl. Bombay*, 2: 421, 1911 (non Willd.), pro parte; Danser in *Bull. Jard. Bot. Buitenzorg* (ser. 3), 16: 53, t. 1, ic. 3d–g, 1938 (non Willd.).

Plants monœcious. *Stems* yellowish, 40 cm. or longer, much branched, decussate in lower parts, dichotomous towards apices, a pair of scales (prophylls) at the base of every branching, usually indistinct; internodes terete, thickened at nodes, oldest ones 2–7 cm. long, up to 10 mm. in diameter, smooth or longitudinally wrinkled, youngest ones

1-3.5 cm. long, 0.5-1.5 mm. in diameter. *Leaves* opposite, elliptic to lanceolate, usually somewhat falcate, oblique, apex acute or somewhat acuminate, margin entire or somewhat wavy, surface dull or slightly shining, thinly coriaceous, attenuate at base tapering into a very short petiole-like structure, lamina 2.5-10 cm. long, 0.6-3 cm. broad, very rarely slightly longer and broader, with usually 5 very rarely 3 or 7 longitudinal nerves, network of venation slightly distinct above. *Inflorescences* usually lateral, at first single in axils, later up to 6 cymes at each node, peduncle absent or very short up to 2 mm. long, bearing at its base one or more pairs of scales, at its apex navicular cup formed of 2 connate bracts, cup up to 4 mm. long; usually 5, more rarely 3 or 7 sessile flowers in each cup, outer ones male, others female. *Female flowers* clavate or obovate, about 1.5 mm. long with 4 tepals. *Male flowers* oblong compressed, 1 mm. long. *Fruits* usually oblong, truncate at apex, attenuate to rounded at base, green, shining, distinctly smooth, sometimes wrinkled due to drying, up to 4-6 mm. long, 2-3 mm. in diameter. (Description from the specimens of the Calcutta and other herbaria and partly adapted from Danser, *loc. cit.*) (Fig. 19.)

Viscum monoicum has been confused with *V. orientale* by several workers. Talbot (1911) notes "*V. monoicum* Roxb. scarcely differs from *V. orientale* and should I think be united with it." But *V. monoicum* is a well-defined species with usually 5 or more rarely 3 or 7 longitudinally nerved leaves with acute tips and with characteristic oblong, almost truncate, fruits with entirely smooth and shining surface. This should not be confused with *V. orientale* having usually 3-nerved leaves with mostly obtuse tips and fruits which are roundish when mature, somewhat attenuate towards both ends and dull by fine granulation. Further, *V. orientale* has a restricted distribution not spreading beyond West Bengal which forms its North-Eastern limit. The other close allies of *V. monoicum* are *V. heyneanum* and *V. multinerve* where the leaves in the former are usually 3-nerved, more rarely 5-nerved (besides the characteristic verruculose fruit) and in the latter, a Chinese species, are multinerved.

Specimens collected particularly from Sundribans (*Prain, Heinig*) contain unusually narrow falcate leaves resembling phyllodes of *Acacia* and thus giving an appearance of a variety. But the presence of very narrow and the usual type of leaves on the same specimens from Nilgiris and Sitapahar (*Lister*) indicates that it is just a minor variation not worth to be a varietal character. The specimen from Shan States (*MacGregor 573*) with characteristic oblong fruits shows leaves with more than 5 nerves and appears as *Viscum multinerve*.

This species enjoys a very wide distribution starting from the Peninsular India and Ceylon and reaches its Northern limit up to 4,000 ft. alt. in the East Himalayas and its eastern limit as far as French Indo-China and Siam passing through Burma (Map 4 A).

Specimens examined

Wall. Cat. no. 492, Mt. Silet, Montes Pundua; *Wall. Cat.* no. 492, Silet et Mont. Pundua, *Wallich s.n.*, in 1829 (Originals of

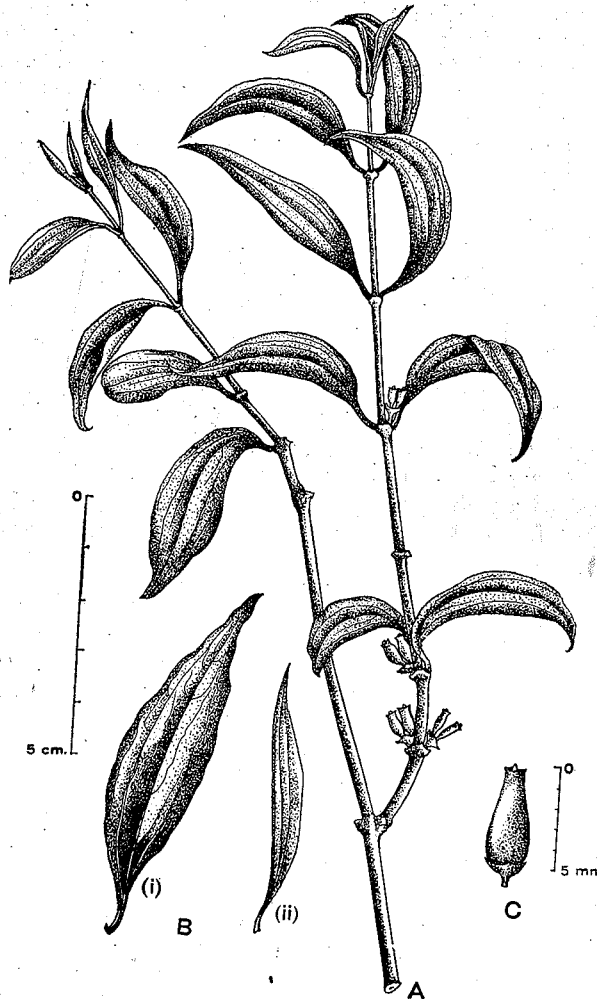


FIG. 19. *Viscum monoicum* Roxb. ex. A.P. de Cand. A. Shoot with fruits; B (i & ii). Different shapes of leaves; C. Fruit enlarged.

V. falcatum de Candolle); Wall. Cat. no. 493, Tavoy, 28-5-1827
(*V. obliquum* Wall.)

INDIA: Bengal, Bihar and Chota-Nagpur : Tipperah Hill 500-800 ft. ; Agartala, Deb Barman 511 ; Tipperah Hill 1,000 ft., Agartala, Deb Barman 271 ; old Agartala 500-800 ft., Deb Barman 570, 31-12-1914 ; Dakobie, Sutakhal, Sundribans, Prain s.n. ; Sundriban lot No. 226, Sundri forest, Baushanta Khod, Heinig s.n., 7-2-1895, on *Excoecaria agallocha* Linn. ; Sundribans, Heinig, Nov. 1894 ; Sundribans, lower Bengal, Herb. Sulp.

Kurz, coll. *Kurz*; Mymensingh, *Clarke* 17290 A, 12-7-1872; Tipperah, W. Bengal, *Biswas* 5021, 30-3-1941; Bhirbhoom Hill, coll. ?; Monghir, Bihar, *Kurz*, parasitic on trees; Rajmahal Hills, near Sahebganj, *Kurz*; Madhoban 1,000 ft., Hazaribagh, *Clarke* 34631 A, 9-4-1884; Hazaribagh, *Prain* s.n., 24-11-1891; Amjeria Tori 2,000 ft., Lohaodugga, *Gamble* 8711, on *Adina cordifolia*; Jona, Chota-Nagpur, Nov. 1891, coll. ?; Luneta, below 1,500 ft., Hazaribagh, *Wood* s.n., 18-2-1878.

Assam: Mont. Khasia 3,000 ft., *Hooker and Thomson* s.n.; Sibsagar, coll. ?, on *Butea frondosa*; Dawdobia nodu, Jabocka, near Naga Hills, *Prain's coll.* 742; Roopacherra, Cachar, Assam, *Gage*, 10-8-1903; *Pongtung, K. & J. Hills, *Sharma* 12130, on 29-8-1935; Barpani, K. & J. Hills, *Kanjilal* 6115, on 25-10-1915, on *Dalbergia tamarindifolia*; Dawki forest, K. & J. Hills, *De* 18599, on *Bauhinia purpurea* and others; Longai Reserve, Sylhet Dt., *De* 20214, on *Xanthoxylum budranga* and others; Bilaipur, Cachar Dt., *De* 20215, on *Grewia multiflora*; Ramprasadpur, Dholai, Cachar Dt., *De* 20789, on *Anthocephalus cadamba*; Bokajan, Sibsagar Dt., *De* 16632, on *Punica granatum*; Nowgong, Upper Assam, *Purkayastha* 8075; Kharling Duar Reserve, Darrang Dt., *Kanjilal* 5020, on *Randia dumetorum*. (* Specimens starting from this asterisk are from the Shillong Herbarium.)

E. Himalaya: Sikkim 2-4,000 ft., *Hooker* s.n.

Upper Gangetic Plain: Nepal Frontier, *Inayat* 23819, 27-2-1900.

Peninsular India and Ceylon: Rumpa Hills 2,000 ft., Godavari Dt., *Gamble* 16012; Mont. Nilgiri and Kurg, *Thomson* s.n.; Nilgiris, *Wight*, in 1847; Bombay, *Herb. Dalzell*; Samphand 1,600 ft., North Kanara, 200" rainfall, *Herb. Sedgwick and Bell* 6883; North Kanara, *Talbot* 780; Udumbansholai 5,000 ft., Travancore, *Meebold* 13034; *Slopes under Elphinstone point, Khandala, *Santapau* 3994, 3995, 3997 to 4005 (on *Mallotus philippinensis*), 6016, 6018, 6019, 6020, 6022, 6023, 6024, 8798, 8799, 8800; Banks of Paudri River, Londa, *Santapau* 10872, on *Vitex leucoxydon*; Patanmal plateau, Khandala, *Santapau* 8951 to 8958; Roadsides under St. Xavier's Khandala, *Santapau*, 4113, 4114, 4115; Fitzgerald Ghat, Mahabaleswar, *Santapau* 12543 (on *Mallotus philippinensis*), 12545, 12549.

Burma: Pagaye, Tenasserim, *Meebold* 15053; Tavoy, Tenasserim, *Meebold* 14964; Makhaye Hill, Shan State, Upper Burma, *King's coll.*; Sitapahar, Burma, *Lister*, in 1876; South Shan States, *MacGregor* 573; Amherest, *Falconer*, 4-4-1849.

14. *Viscum trilobatum* Talbot, *For. Fl. Bombay*, 2: 419, t. 479, 1911; Danser in *Blumea*, 4: 308, t. 3 A & B, 1941; *Viscum capitellatum* Hooker f., *Fl. Br. Ind.*, 5: 225, 1886 pro parte (non Smith); Cooke, *Fl. Bombay*, 2: 552, 1906 pro parte; *Gamble*, *Fl. Madras*, 7: 1257, 1258, 1925 pro parte.

Plants monœcious. *Stems* short, rigid, up to 25 cm. long or more, branching decussate in lower portion, dichotomous towards apices by development of terminal inflorescences; lower internodes terete, thickened at nodes, up to 6 cm. long, 5 mm. in diameter, middle ones sometimes slightly longer, gradually less thick, slightly angular or flattened towards the apices, upper ones 1.5-3.5 cm. long, 1.5-3.5 mm. in diameter. *Leaves* opposite, obovate to sub-orbicular or sometimes more cuneate and subtruncate, apex rotund to truncate or slightly retuse or rarely with a small acute tip with two depressions on either side of tip (so-called trilobate), margin entire, surface dull or slightly shining, coriaceous, abruptly or gradually contracted into narrow base sometimes ending in short petiole up to 3 mm. long, lamina 1.5-4.5 cm. long, rarely up to 5.5 cm., 1-4 cm. broad, with 3-5 longitudinal nerves, sometimes completely indistinct appearing as nerveless, network of venation indistinct. *Inflorescences* usually lateral in lower parts, single or up to 3 cymes in axils, terminal in apical parts, usually 3, peduncles absent or very short up to 2 mm. long, rarely slightly longer in terminal cymes, bearing at its tip naviculate cup formed of 2 connate bracts, cup up to 4 mm. long; usually 3 sessile flowers in each cup, lateral female, middle male, very rarely all female; rarely second internode of peduncle in place of middle flower bearing a bracteal cup with one male and two lateral female flowers. *Female flowers* oblong, with 4 tepals. *Male flowers* obovate, about 2 mm. long, 1 mm. broad, with 4 tepals. *Fruits* nearly round or somewhat ovate, slightly constricted just below the small disc-like tepal-bearing rim, smooth or wrinkled due to drying, up to 5 mm. long, 4.5 mm. in diameter. (Description from specimens of the Calcutta and Dehra Dun Herbaria and partly adapted from Danser, *loc. cit.*) (Fig. 20).

V. trilobatum has been included in *V. capitellatum* by all the authors except Talbot and Danser even though they knew the plant quite well with its broader leaves. No doubt, both the species are closely related but, by careful study, it can be observed that the leaves of *V. trilobatum* are distinctly bigger, measuring 1.5-4.5 cm. or rarely up to 5.5 cm. in length whereas in *V. capitellatum*, the leaves, if they do not fall off, are constantly small with their length not beyond 2.5 cm. Further, in *V. trilobatum*, the peduncle is usually absent and even if present, is only up to 2 mm. long whereas in *V. capitellatum*, a prominent peduncle of 3-15 mm. length is always present. After the scrutiny of the following specimens, it is clear that much importance should not be attached to the "trilobate" character of the leaf from which the specific name has been derived. In almost all the specimens examined, there are more leaves which are distinctly obovate with rotund tips, mixed up with sub-orbicular or cuneate and sub-truncate leaves rather than slightly trilobate leaves, indicating the former as the normal leaf shape. So, Talbot's choice of the specific name may not be quite characteristic but the species is clearly a distinct one.

Talbot (1911) quotes the typical specimens of his own new species collected from Siddapore, N. Kanara, under *Viscum verruculosum* Wt. & Arn., saying that his specimens were named like that in the Calcutta

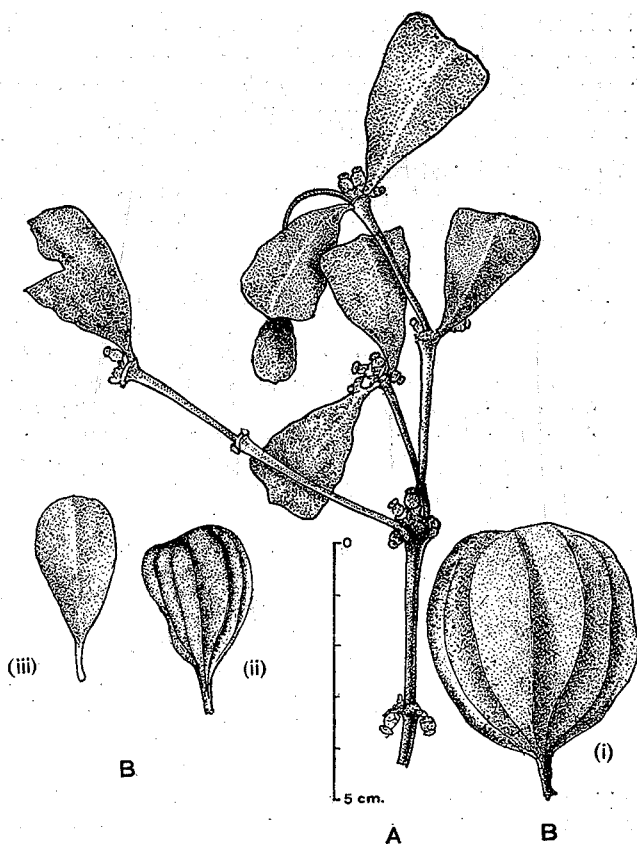


FIG. 20. *Viscum trilobatum* Talbot. A. Shoot with fruits (Talbot, 1-4-1889); B (i, ii & iii). Different shapes of leaves.

Herbarium. However, it is rather strange how he mistook them for *V. verruculosum*.

Talbot's specimen from Ioida, North Kanara, which was labelled as *V. capitellatum*, has been considered as the type of *V. trilobatum* by Danser because it resembles the drawing in Talbot's Forest Flora (*loc. cit.*) where it is noted that the species is available in "N. Kanara Dt. in monsoon and rain forests growing on different trees" without quoting any specific collections.

Though the species appears to be common in North Kanara it has also been collected from different parts of South India like Nilgiris and Malabar (Map 4 C).

Specimens examined

INDIA: *Peninsular India*: Ioida, North Kanara, Talbot, 1-4-1889 (considered to be *Type*) (Dehra Dun Herb.); Siddapore,

N. Kanara Dt., Talbot 3739, on *Loranthus trigonus* Wt.; Unmode, N. Kanara, Talbot 1619, on *Loranthus trigonus*; Chedleth 3,000 ft., Malabar, Fischer 329, on *Loranthus longiflorus* (Dehra Dun Herb.); Jirganhalli 3,000 ft., Coimbatore Dt., Fischer 1020; Sigui 3,000 ft., Nilgiris, Gamble 15693.

15. ***Viscum capitellatum*** Smith, in Rees, *Cyclopaedia*, 37: *Viscum* no. 18, 1817; A. P. de Candolle, *Prodr.*, 4: 279, 1830; Wight and Arnott, *Prodr. Fl. Pen. Ind. Or.*, 380, 1834; Thwaites, *Enum. Pl. Zeylan*, 136, 1859; Trimen, *Syst. Catal. Ceylon*, 77, 1885; Hooker f., *Fl. Br. Ind.*, 5: 225, 1886 pro parte; Engler in *Nat. Pflanzenfam.*, 3 (1): 195, 1889; Trimen, *Handb. Fl. Ceylon*, 3: 471, 1895; Engler in *Nat. Pflanzenfam.*, 140, 1897; Gamble, *Ind. Timbers*, 584, 1902; Brandis, *Ind. Trees*, 552, 1906; Cooke, *Fl. Bombay*, 2: 552, 1906 pro parte; Talbot, *For. Fl. Bombay*, 2: 421, t. 480, 1911; Gamble, *Fl. Madras*, 7: 1257, 1258, 1925 pro parte; Fischer in *Rec. Bot. Surv. India*, 11 (1): 171, 1926; Engler and Krause in *Nat. Pflanzenfam.* (ed. 2), 16 b: 201, 1935; Danser in *Blumea*, 4: 309, t. 2, 1941.

Plants monœcious. *Stems* rigid, up to 15 cm. long, rarely longer, usually shorter, much branched, decussate, divaricate in lower parts, more or less umbellately arranged in upper parts; internodes terete, thickened at nodes, up to 6 cm. long, up to 5 m.m. in diameter, smooth or wrinkled, younger ones at apices less thick, shorter, dilated and flattened at tips, 1-2 cm. long, 1-3 m.m. in diameter, usually wrinkled, sometimes grooved. *Leaves* normal, sometimes reduced to scales (particularly at bases of branches in lower and apical parts, indistinct or absent), sometimes falling off completely (presenting the plant as leafless), opposite, roundish-obovate, rarely somewhat cuneate, apex rotund, margin entire, usually curled upward, surface dull, somewhat coriaceous, abruptly contracted into narrow short base, sessile, lamina 1.5-2.5 cm. long, 5-10 mm. broad, often smaller, with usually 3 longitudinal nerves, often indistinct. *Inflorescences* usually lateral, up to 6 cymes in axils, very rarely terminal, peduncle very prominent 3-15 mm. long, bearing at its tip naviculate cup formed of two bracts connate at base, cup up to 4 m.m. long; usually at first one, later up to 5 flowers in each cup, lateral female, central male; rarely second internode of peduncle in place of middle flower bearing a bracteal cup with probably 5 flowers, the central being male, others female. *Female flowers* somewhat oblong, with 4 tepals. *Male flowers* obovate, about 2 mm. long, 1 mm. broad, with 4 tepals. *Fruits* roundish-ellipsoid or somewhat ovate, distinctly constricted just below the tepal-bearing rim, smooth shining, sometimes wrinkled by drying, up to 3.5 mm. long, 2.5 mm. in diameter. (Description from specimens of the Calcutta Herbarium and partly adapted from Danser, *loc. cit.*) (Fig. 21.)

This species has been correctly understood by most of the workers. From the material examined, it is evident that the young plants have normal leaves which are not more than 2.5 cm. long on most of the nodes but the older plants look almost leafless with their normal leaves

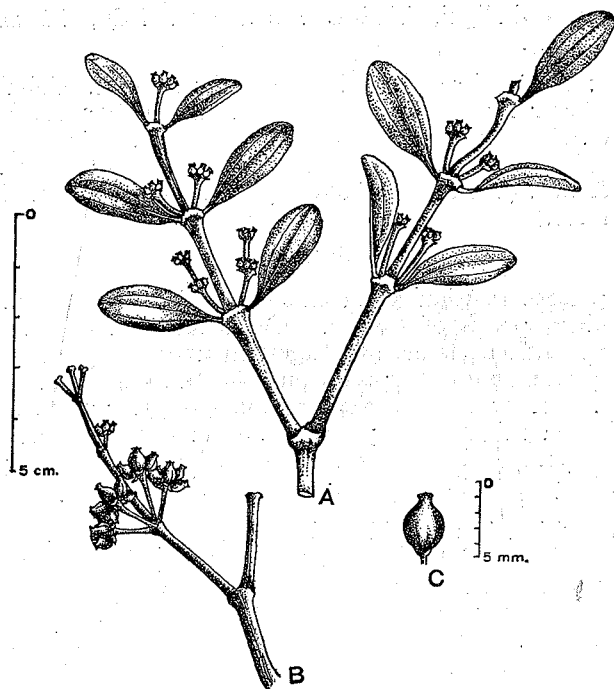


FIG. 21. *Viscum capitellatum* Smith. A. Shoot with young fruits (Fischer 24); B. Small twig with mature fruits (Fischer 4000); C. Fruit enlarged.

fallen off. This character might be responsible for Wight and Arnott's (1834) varieties *a* and *b* which, however, cannot stand. Sometimes the leaves are almost scale-like towards the base and apex of the plant. Apart from these minor variations, this is a true species and can be easily distinguished from its allies, *V. trilobatum* by their normal leaves, sessile, roundish, obovate, typically obtuse at the apex, thick, dull, usually not more than 2.5 cm. long and inflorescences with prominent peduncles, 3–15 mm. long.

The sheet with Wall. Cat. no. 6879, named *Viscum grossum* Wight, has been referred by Hooker f. (1886) and Danser (1941) under doubtful species as the specimen consists of nothing but small bits of branches resembling those of *V. album*. But as *V. album* does not occur in the Deccan Peninsula, Danser (1941) notes under '*Visca dubia*' that the remarks on the sheet by Gamble "Perhaps *V. capitellatum*" may be right.

This species appears to have a restricted distribution in the Deccan Peninsula, extending southwards as far as Ceylon (Map 3 B).

Specimens examined

Wall. Cat. no. 6878, Herb. Wight s.n. (Sheally on man, etc., *Viscum mangifera* Wall.); Wall. Cat. no. 6879, Herb. Wight

s.n. (Dindigul, Madras Prov., Dec. 1826, *Viscum grossum* Wight).

INDIA: *Peninsular India*: Near Ovatithu 3,500 ft., Coimbatore Dt., Fischer 24; Komattiyeri 2,350 ft., Javadi Hills, Fischer 4,000 ft., on *Albizia odoratissima* and *Loranthus longiflorus*; Maudurei 1,500 ft., N. Kanara, rainfall 150", Bell 6049, Herb. Sedgwick & Bell. (Collections from Ceylon are not available in Calcutta Herb.)

SUMMARY

The present revision is an extension of Danser's studies on the British Indian species of *Viscum*. The genus is mainly distributed in the tropics. Africa claims the largest number of species as many as 50, Madagascar about 40 species and the Indo-Malayan region only 15 species. On the basis of the available data, it appears that the line of distribution might have proceeded from Africa to India through Madagascar and gradually extended further East as far as Japan on one side and tropical Australia on the other.

This revision has considerably augmented the number of species and varieties known for India and Burma and further enlarged the areas of distribution of many species. *V. loranthi* Elmer which exhibits a peculiar discontinuous distribution occurring in China, Luzon, Sumatra and the Western Himalayas, has been newly recorded from the Manipur Hills, Assam. *V. ovalifolium* A. P. de Cand., a purely Malayan species reaching as far as Burma, has been now found out to occur in Assam as a new record for India. *V. articulatum* Burm. var. *liquidambaricolum* (Hayata) Seshagiri Rao, *nov. comb.*, *V. articulatum* Burm. var. *theolocarpum* (Danser) Seshagiri Rao, *nov. comb.* and *V. acacie* Danser var. *obovalifolium* Seshagiri Rao, *nov. var.* are the new varieties and combinations.

A detailed illustrated account of all the species and varieties of India, Burma and Malayan Archipelago with the nomenclatural changes and descriptions is given in the paper.

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