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A REVISION OF THE GENUS TEPHROSIA (LEGUMINOSAE-PAPILIONOIDEAE) IN MALESIA

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CONTENTS

SUMMARY

In Malesia the genus *Tephrosia* is represented by 20 species, native or introduced and naturalized, including 6 subspecies and 5 varieties; 4 species are restricted to Malesia. Two of these species are newly described: *T. barbatala* and *T. elliptica*; the former includes one new variety (var. *glabra*). Two new subspecies and one new variety are distinguished: *T. filipes* subsp. *longifolia*, *T. purpurea* subsp. *barbigera*, and *T. maculata* var. *elongata*. Two taxa are given a new status: *T. maculata* var. *appressepilosa* and *T. pumila* subsp. *aldabrensis*. Four species, *T. dichotoma*, *T. repentina*, *T. coarctata*, and *Kiesera sumatrana* are for the first time sunk into synonymy. A key to the taxa, synonymy, and full descriptions with plates and distribution maps are given.

HISTORY

Tephrosia (nom. cons.) started its nomenclatural life as *Cracca* Linnaeus 1753, which contained six species, all of which belong to present *Tephrosia*.

In 1756 Hill misinterpreted Linnaeus' *Cracca* and accounted several invalid (pluronomial) species, all belonging to *Vicia* L.; *Cracca* Hill is thus a later heterotypic homonym of *Cracca* L. and a synonym of *Vicia* L.

In 1759 Linnaeus reduced in a footnote his entire genus *Cracca* to *Galega* L. 1753, which became during the following decennia a sort of 'reservoir-genus' of herbaceous to shrubby Papilionoids with 5 or more pinnately arranged leaflets and a 'normal' dry pod. All six species of his *Cracca* were transferred to *Galega* in the second edition of his Species Plantarum (1763).

Medikus published a third genus *Cracca*, reviving the pre-Linnean *Cracca* of Rivinius, also representing *Vicia* L., and thus a later homonym of *Cracca* L. Both *Cracca* Hill and Medikus have never been typified.

Persoon (1807) established *Tephrosia* for a part of *Galega* L., including the six original species of *Cracca* L., but also some species which were later transferred to again entirely different genera. *Tephrosia* Persoon was superfluous when published (containing *Cracca* L.) but was conserved in 1906 (Congr. Vienna 1905). *Cracca* L. is not mentioned in the modern lists of nomina rejicenda because of homonymy with *Cracca* Benth. (nom. cons.) on account of Art. 14.2 (ICBN). Bentham (1853) removed the last discordant species from *Tephrosia* into a new *Cracca* Bentham (properly cited as *Cracca* Bentham in Bentham & Oersted), probably assuming that *Cracca* L. was safely taken up in *Tephrosia, Cracca* Hill and *Cracca* Medikus in *Vicia* L.

Matters complicated when Alefeld (1861), independently from Medikus, accepted the pre-Linnean *Cracca* of Rivinius for some species of *Vicia.* He correctly considered *Cracca* L. a synonym of *Tephrosia* Persoon, and one year later he established *Benthamantha* for *Cracca* Benth.

Finally Kuntze transferred all species of *Tephrosia* he could find to *Cracca* L. and proposed *Brittonamra* for *Cracca* Bentham, unaware of *Benthamantha* Alefeld.

SYSTEMATIC POSITION OF TEPHROSIA

In the traditional systems (Bentham, 1865; Taubert, 1894) *Tephrosia* is placed in the tribe Galegeae on account of the leaflets more than three per leaf and pinnately arranged, combined with the pods dehiscent by two slightly woody valves. Hutchinson (1964) gave tribal status to Bentham's subtribes, restricted Galegeae to *Galega* exclusively, defined Tephrosieae as herbs to subshrubs with the characters mentioned above, and added what can be abstracted as 'moderately specialized' flower structure. Polhill (1981) combined Hutchinson's monotypic Galegeae with Coluteae and Astragaleae because of similar flower structure and vegetative characters as exemplified by the hitherto underestimated studies by Dormer (1945, 1946). Polhill (1981) transferred *Peteria* and *Sphinctospermum* to Robinieae, *Ptychosema* to Bossiaeeae. As *Papilionopsis* was already reduced to *Desmodium*, Hutchinson's *Tephrosia*-'group' became restricted to a few closely related genera, some of which later were further reduced to *Tephrosia*. Together with the genera around *Derris/Millettia* they form the tribe Tephrosieae in a new circumscription (Geesink, 1981).

Because of the closely parallel nervation and the peculiar dorso-ventrally flattened style it is tempting to separate *Tephrosia* from the woody group around *Millettia.*

The genera closely related to *Tephrosia*, e.g. *Ptycholobium, Requienia*, and to a lesser extent *Mundulea*, do not show this combination of characters; neither chemical

(Gomes et al., 1981) nor cytological (Goldblatt, 1981) studies support such an eventual tribal distinction. A more detailed discussion about these characters will be presented by Geesink (in preparation).

Tephrosia thus still forms the nomenclatural base of the tribe Tephrosieae.

TAXONOMY

Tephrosia has in various ways been divided into sections and subgenera. The earlier attempts by De Candolle (1825), Wight and Arnott (1834), Bentham (1865), Baker (1876), and Taubert (1891) were mainly based on the leaves being simple or pinnate, the length of the calyx teeth, the indumentum, the pubescence of the style, and the connection of the vexillary filament to the other filaments.

Wood (1949) was the first author who made a sharp division in the New World between species with a glabrous style and the barbistyled ones. Later Gillett (1959) brought forward some arguments for the same division in the African *Tephrosias*. Brummitt (1981) recently thought it desirable to give the two groups formal taxonomic recognition and divided the genus into two subgenera. Subgenus *Tephrosia* is characterized by the glabrous style and the penicillate stigma while the species under subgenus *Barbistyla* have a bearded style and a glabrous stigma.

In the present revision for the Malesian area a subdivision of *Tephrosia* on the base of the pubescence of the style (or on any other character) seems not appropriate because of the following reasons: In the area under study 5 species with a bearded style are recognized. Two of these, both native of Africa (*T. nana, T. vogelii*) have a penicillate stigma while in the other three species (*T. candida, T. senticosa, T. vestita*) the stigma is glabrous. Thus three species cannot simply be placed under one of the subgenera installed by Brummitt.

Furthermore it appeared to be impossible to correlate the pubescence of the style with any other character, except that the barbistyled species tend to have larger flowers (but see e.g. the glabrous styled *T. astragaloides*). Other characters than the pubescence of the style seem to be of equal importance and could therefore just as well be used for infrageneric subdivision (e.g. the pubescence of the staminal tube or sheath and of the vexillary filament, and the connection of this filament with the other filaments). However, also these characters do not show any correlation with each other or with other characters. For these reasons it is to our opinion more feasible to abstain from formal infrageneric subdivision awaiting a world-wide monograph.

Some species recognized in this revision are divided in subspecies and/or varieties. The status of subspecies is given if a group of specimens differs from the rest of the species in a character which is constant and obvious in closely related species, or if a group of specimens, which is geographically separated from the rest of the species, can be distinguished by a small set of characters.

Specimens of one species which differ from other specimens of that species in some correlated minor characters, but not correlated with a distribution pattern, are considered to belong to a variety.

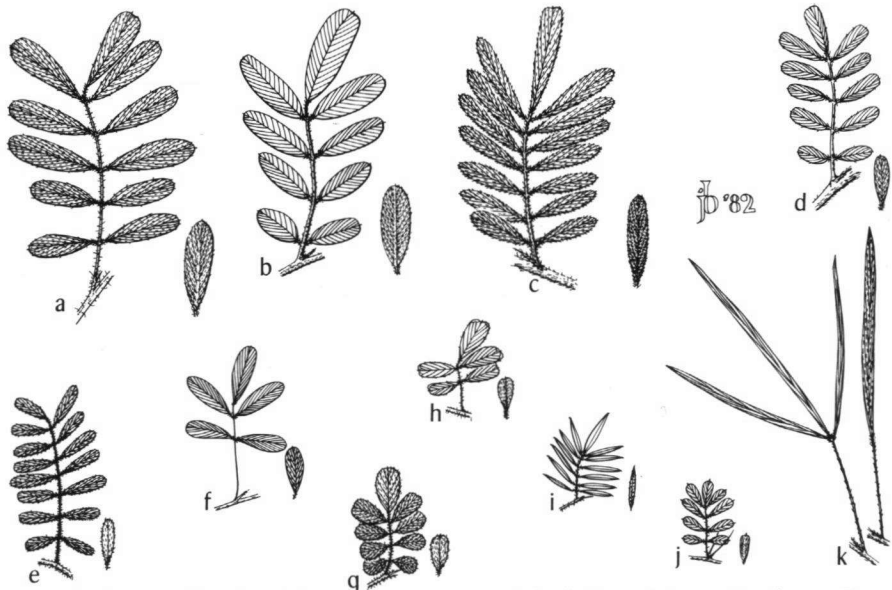


Fig. 1. Leaves of *Tephrosia* from above, the separate leaflet from below. All x ½. – a. *T. purpurea* subsp. *purpurea (NGF 10590, Henty)*; b. *T. senticosa (van Royen s.n., H.L.B. 908.122-638)*; c. *T. astragaloides (Darbyshire 680)*; d. *T. villosa (Backer 35097)*; e. *T. luzoniensis (Merrill 369)*; f. *T. rigida (Spanoghe s.n., H.L.B. 908.122-633)*; g. *T. pumila* subsp. *pumila (van Steenis 19627)*; h. *T. obovata (BS 11764, Merrill)*; i. *T. filipes* subsp. *filipes (Dockrill 351)*; j. *T. spinosa (Backer 36293)*; k. *T. leptoclada (Brass 8395)*.

MORPHOLOGY

Vegetative parts

The species of *Tephrosia* are recorded to be herbs, shrubs or small trees, the herbs being often woody at base. To our impression they can better be called smaller or larger shrubs, although e.g. *T. leptoclada* may be exclusively herbaceous.

In Malesia, the *leaves* are imparipinnate, bearing up to 18 pairs of leaflets. The number of leaflets varies within definite limits in each species and can thus be used as a diagnostic character. In *T. leptoclada* unifoliolate leaves occur in between pinnately compound leaves. The rachis of the leaves always includes an infrajugal part with a pulvinus at the base. In some species this infrajugal part is much longer than the interjugal parts (*T. barbatala, T. obovata, T. rigida*), whereas in *T. senticosa* it is much shorter. In most other species, however, the relative length of the infrajugal part is rather variable. The ultrajugal part can be present or absent and is also variable in relative length; it thus does not seem to be of diagnostic value.

The *stipules* are triangular to linear triangular and only in one species, *T. spinosa*, clearly spinose. Stipellae are absent. The leaflets are symmetric and have different shapes (obovate, ovate, elliptic, orbicular, etc.), only *T. filipes* and *T. leptoclada* possess exclusively linear leaflets. In *T. leptoclada* and *T. filipes* subsp. *longifolia* the ter-

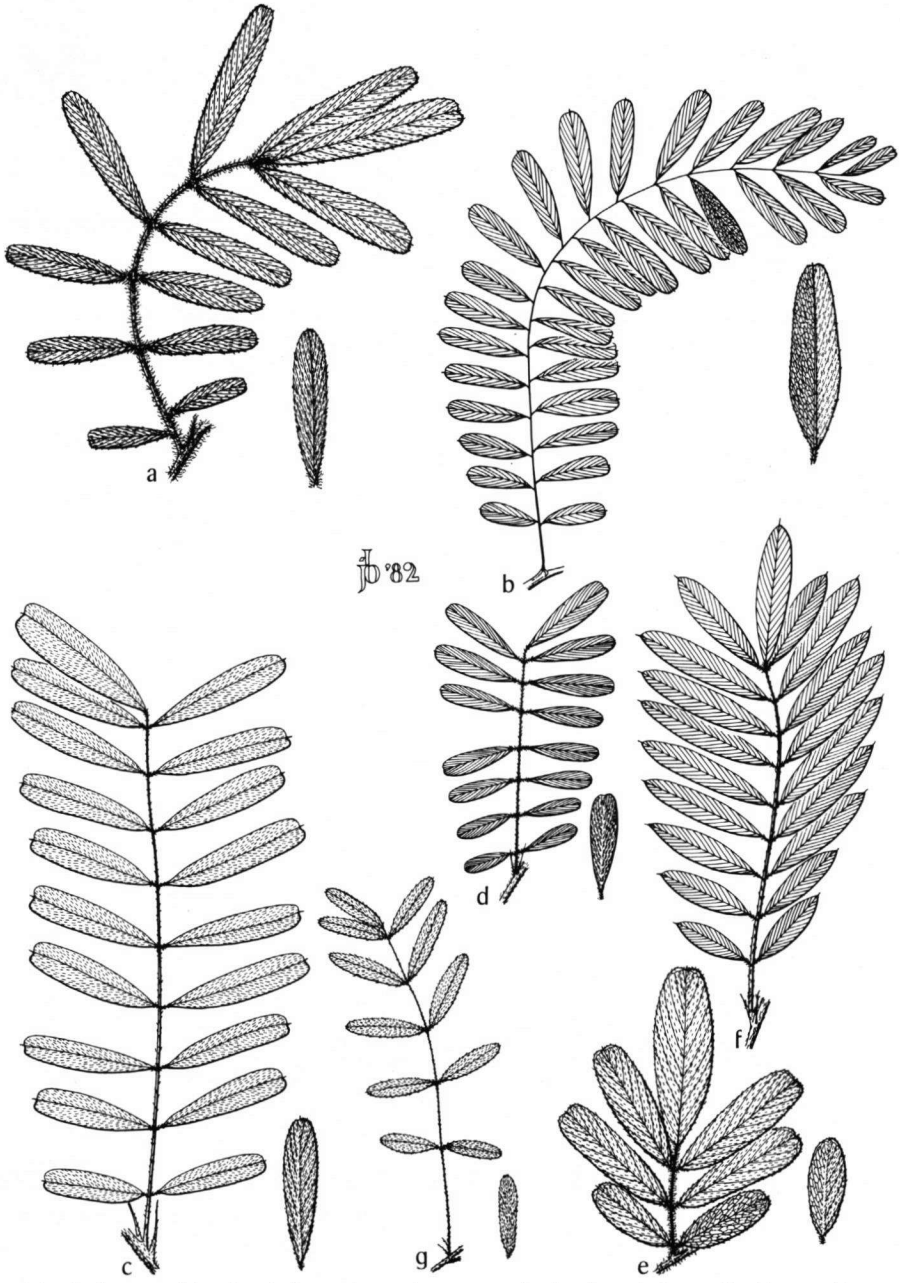


Fig. 2. Leaves of *Tephrosia* from above, the separate leaflet from below. All x ½. – a. *T. nana (Backer 37498)*; b. *T. zollingeri (Iboet 438)*; c. *T. noctiflora (van Ooststroom 13635)*; d. *T. noctiflora (Derry 1889)*; e. *T. maculata* subsp. *maculata (Heyligers 1168)*; f. *T. candida (Reinwardt s.n.*, type of *Kiesera sericea)*; g. *T. barbatala* var. *barbatala (NGF 49806, Henty & Katik).*

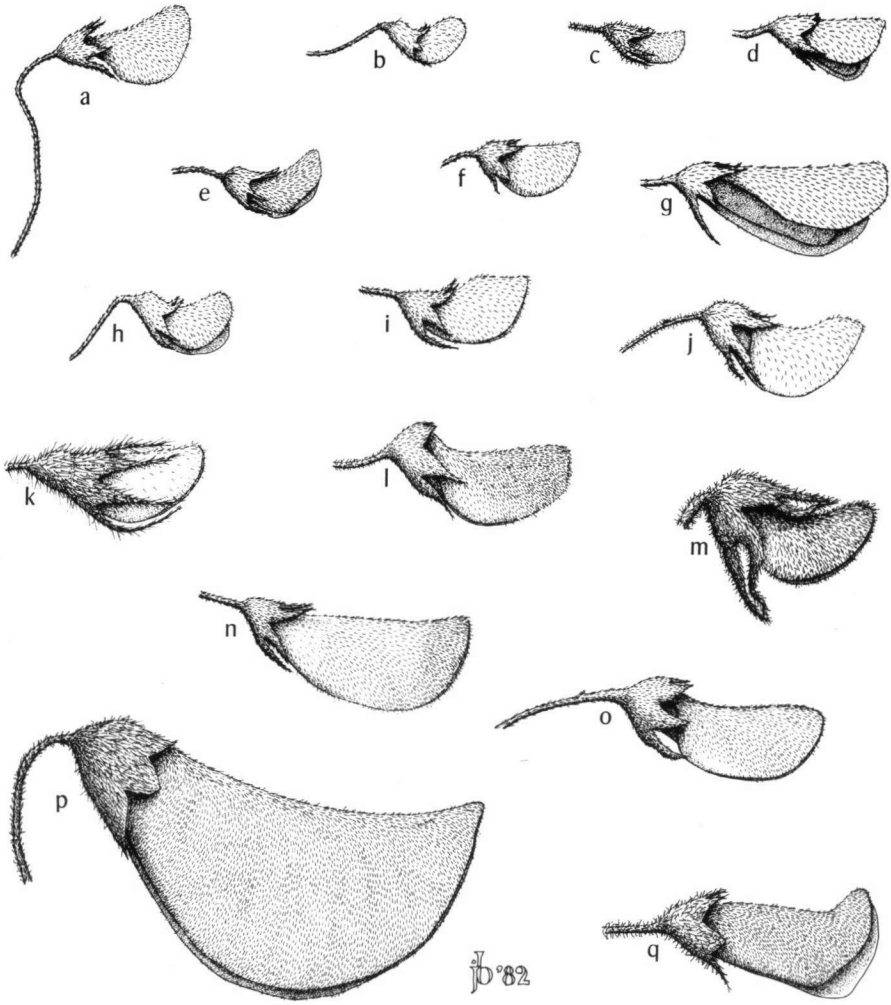


Fig. 3. Flowers of *Tephrosia*, in the stage just before reflection of the standard. All x 2½. – a. *T. obovata (FB 16939, Curran)*; b. *T. spinosa (Backer 36293)*; c. *T. luzoniensis (Merrill 369)*; d. *T. leptoclada (A.S. George 14500)*; e. *T. maculata* subsp. *appressepilosa (Brass 6546)*; f. *T. filipes* subsp. *filipes (Dockrill 351)*; g. *T. senticosa (van Royen s.n., H.L.B. 908.122-638)*; h. *T. zollingeri (Iboet 439)*; i. *T. barbatala* var. *glabra (NGF 39488, Streimann, type)*; j. *T. purpurea* subsp. *purpurea (NGF 10590, Henty)*; k. *T. pumila* subsp. *pumila (Iboet 121)*; l. *T. noctiflora (Derry 270)*; m. *T. villosa (Backer 35097)*; n. *T. astragaloides (Brass 8788)*; o. *T. rigida (Spanoghe s.n., H.L.B. 908.122-623)*; p. *T. candida (Roxburgh s.n., type)*; q. *T. nana (Backer 37498)*.

minal leaflet is always distinctly larger than the uppermost pair of lateral leaflets; in other species it can also be about as large as or slightly smaller than the lateral leaflets. The apex of the leaflets is mucronate and usually varies from obtuse to rounded and truncate to emarginate; some species also have acute apices (*T. candida, T. leptoclada, T. vestita*).

Tephrosia is usually easily distinguished from allied genera by its typical *nervation.* The secondary and intersecondary nerves are relatively numerous, parallel, rather straight (never S-shaped) and slightly curved upwards to the margin in which they usually end. They often form, however, marginal, secondary, and rarely tertiary arches towards the apex. In twelve species, the tertiary reticulate venation is more or less distinct.

The *indument* of the vegetative parts and the pod provides only some valuable characters on variety level. It varies from puberulous to pubescent, sericeous, and strigose and from velutinous to woolly. Even if these different types are simplified to 'appressed' or 'spreading', often both occur within one species. The upper surface of the leaflets and stipules can be glabrous, but even this character state is not constant within some species.

Inflorescence

The flowers usually are arranged in terminal, axillary, or leaf-opposed pseudoracemes, except in *T. spinosa* which has the flowers arranged in fascicles in the axils of the vegetative leaves. In most species the first three types are represented. In *T. barbatala, T. maculata, T. pumila, T. purpurea, T. rigida*, and *T. vogelii* only terminal or leaf-opposed pseudoracemes occur. In *T. astragaloides* only terminal pseudoracemes are represented.

In a *pseudoraceme* the flowers are arranged in *fascicles* and these in a *raceme.* A fascicle is generally considered a shortened flower-bearing branch, in which the flowers are each subtended by a bract. These bracts are rarely caducous. The fascicles are also accompanied by a bract which usually is larger than the bracts of the flowers, and both usually are triangular to narrowly triangular. In some species some lower fascicles are axillary to leaves resembling normal vegetative leaves, of which the number of leaflets can be reduced, eventually to a single leaflet still with stipules. At base of higher fascicles the leaf and stipules appear as a deeply three-cleft bract. Usually only a single bract is found.

Rarely a lowered fascicle has been found in the leaf axil next to a pseudoraceme (see note 2 on *T. senticosa*). The fascicles are usually equally distributed along the rachis of the inflorescence. Sometimes the fascicles are concentrated in the upper half of the inflorescence (*T. luzoniensis, T. senticosa*).

The number of fascicles per inflorescence is variable. Some species have lax inflorescences (e.g. *T. pumila*), others have very dense ones (e.g. *T. vogelii*). The length of the rachis also is variable. In some species the rachis is short in proportion to the large number of fascicles (e.g. *T. luzoniensis, T. maculata* subsp. *appressepilosa*).

The number of flowerbuds per fascicle is more or less constant within the species but this is only strictly constant in *T. vogelii* with 2 flowerbuds per fascicle.

Flower

The papilionate flowers of *Tephrosia* vary from 2.5 to c. 25 mm long. In the stage just before the standard reflexes the flower is more or less curved upwards.

Bracteoles are rarely present on the pedicel in *T. purpurea* and *T. spinosa* and usually present in *T. obovata* and *T. rigida*. In *T. vogelii* the calyx cup bears bracteoles.

The *calyx* is campanulate with four, usually triangular teeth. The length of these teeth is characteristic for some species, especially the carinal one compared to the length of the calyx cup. The vexillary tooth is two-topped and usually much broader than the other teeth. The inside of the teeth is usually puberulous or pubescent, but can be glabrous in *T. obovata, T. rigida*, and *T. spinosa*.

The *standard* is about orbicular and rounded to emarginate at its apex. The blade has always two basal callosities and sometimes it is also auricled at base. The outside of the blade is sericeous, the inside usually glabrous, except in *T. vogelii*.

The *wing* and *keel petals* are usually glabrous or with some scattered hairs at carinal side. *T. barbatala*, however, is recognized by a tuft of hairs which is always present at the auricles or at the lateral ribs of the wing petals. The keel petals are adherent to each other along the carinal margins from about halfway up to the apex. They are usually interlocked by the wing petals by means of lateral pockets which are often bulgy. The wing petals are about as large as the keel petals.

The ten *stamens* form in some species a tube in which the vexillary stamen is partly connate with the others. In other species, nine stamens form a gutter-like sheath with the vexillary one free. In both cases the stamens forming the tube or sheath are connate for only a part (about 2/3) of their total length. The filaments are alternately longer and shorter, but the vexillary one is as long as the two nearest (long) filaments. The vexillary filament and the vexillary side of the tube or sheath are auricled near the base, free from each other but accumbent and thus not forming basal fenestrae, usually glabrous, but in some species, in any case at the auricles, they are hairy. The anthers are uniform.

An annular *disk* is present at base of the ovary.

The sessile *ovary* bears 4–20 ovules, which number usually varies within definite limits in each species. The indument of the ovary is usually more dense at the vexillary and carinal margins than at the lateral sides. The upcurved style is dorso-ventrally flattened and often gutter-like at base. In some species it is more or less twisted. The apical half of the style is usually glabrous but in 5 species it is bearded at the vexillary or also at the carinal side. The capitate stigma is usually penicillate at base, but glabrous in *T. nana* and *T. vogelii*.

Fruit and seed

The two-valved *pod* is linear, often with an upward curvature at the apex and in *T. spinosa* and *T. villosa* retrofalcate. The size of the pod is sometimes useful as a diagnostic character. The pod is sessile and exserted from the dried calyx and bears a style remnant at the apex. In *T. vestita* the petals are often surrounding the apex of the pod. The margins are thickened. The ovules are evenly distributed along the vexillary margin. In some pods, not all of these ovules develop into seeds but this seems

not specific. In most species the pod is flat or slightly turgid and usually slightly convex around the seeds. The ripe pod is dehiscent with the valves spirally curved.

The *seeds* are orbicular to transversely elliptic or quadrangular to irregularly rectangular and about elliptic in cross-section. The seed coat is usually smooth but reticulately ridged in *T. noctiflora* and sometimes in *T. villosa*. The funicle is short and slightly expanded at hilar end.

Seedling

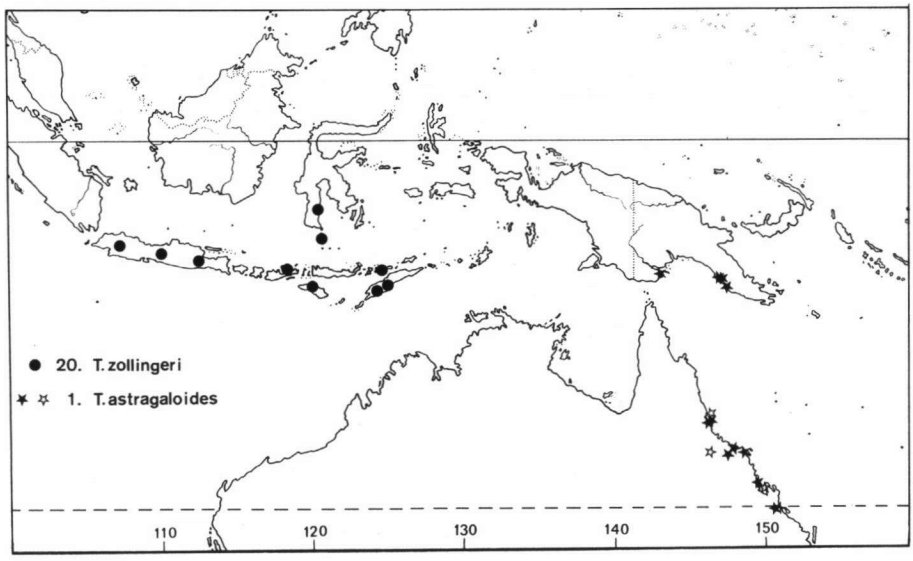
According to De Vogel (1979) the seedling of *Tephrosia* belongs to the *Macaranga* type.

DISTRIBUTION

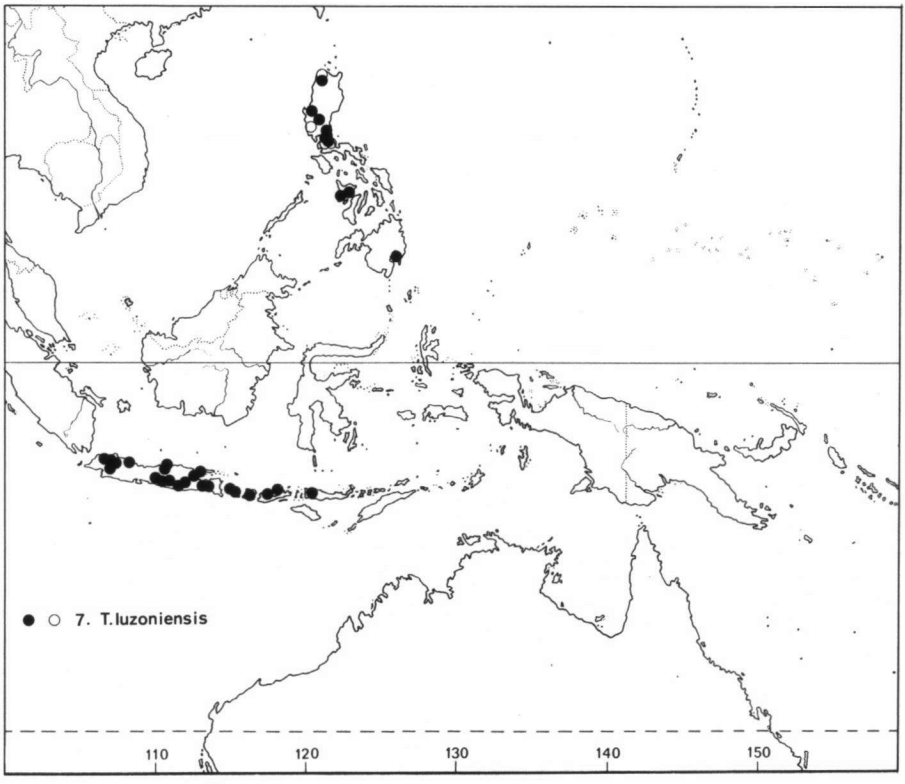
Tephrosia is a pantropical and subtropical genus with over 400 species (Geesink, 1981) with concentration of species richness in Africa and Australia. In Malesia 20 species are found, 10 of which are considered indigenous (wild). Whether a species is indigenous or not is very difficult to judge, and therefore the first dated record is mentioned under all recognized taxa. Only the introduced *T. candida* occurs in the whole area without evident preference for drier climates (in terms of drought classes, Van Steenis, 1961). The other species have a more restricted distribution within Malesia. Six species prefer a moderately dry monsoon climate (drought classes 2–4, Van Steenis, l.c.), viz. the indigenous species *T. luzoniensis, T. vestita, T. zollingeri* and the introduced species *T. noctiflora, T. pumila* subsp. *pumila*, and *T. purpurea*. Two taxa, the indigenous *T. spinosa* and the introduced *T. pumila* subsp. *aldabrensis* require an extreme dry monsoon climate (drought classes 5 and 6, Van Steenis, l.c.). Six indigenous species (*T. astragaloides, T. barbatala, T. elliptica, T. filipes, T. leptoclada, T. maculata*) occur in N. Australia and New Guinea (*T. maculata* also in the Moluccas). The remaining (introduced) species have apparently not yet established widely enough to show recognizable patterns (maps 1–6).

ECONOMIC USES

Two main qualities of *Tephrosia* species can be distinguished: the ability to increase nitrogen in soil from root nodules (symbiotic Rhizobium-bacteria) and the production of poisonous flavonoids. In the area under consideration ten species are recorded as a green manure in tropical agriculture (or tried as such in botanical gardens) and sometimes in addition as a covercrop, windbreak, contour hedge or shade plant because of the dense foliage and good root anchorage. *Tephrosia* species have been classified by Date and Halliday (1980) as 'promiscuous and effective' according to the effectiveness of nodulation respons with a range of strains of Rhizobium (Allen & Allen, 1981). W.M. van Helten (1911, 1913, 1915, 1917, 1924) has carefully described his investigations concerning the qualities of several green manures. *T. candida* proved to be one of the most satisfactory green manures. It flourishes in very poor soil for several years and has a dense foliage, which can be clipped many times. *T.*



Map 1. Open symbols from literature.



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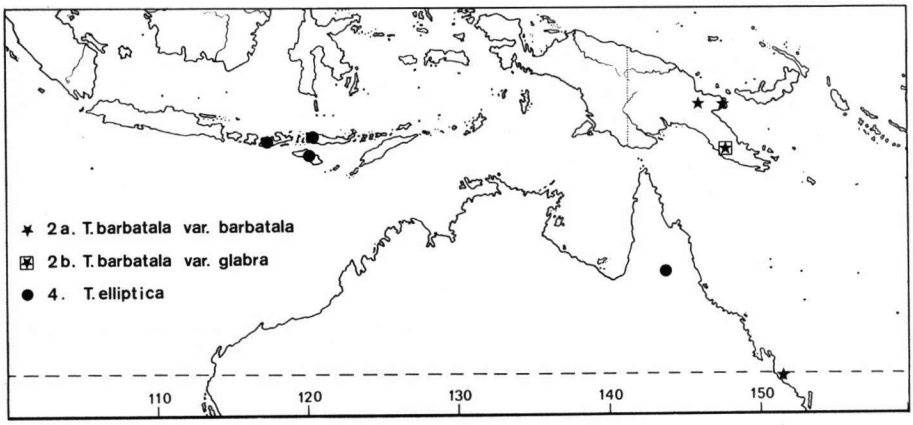
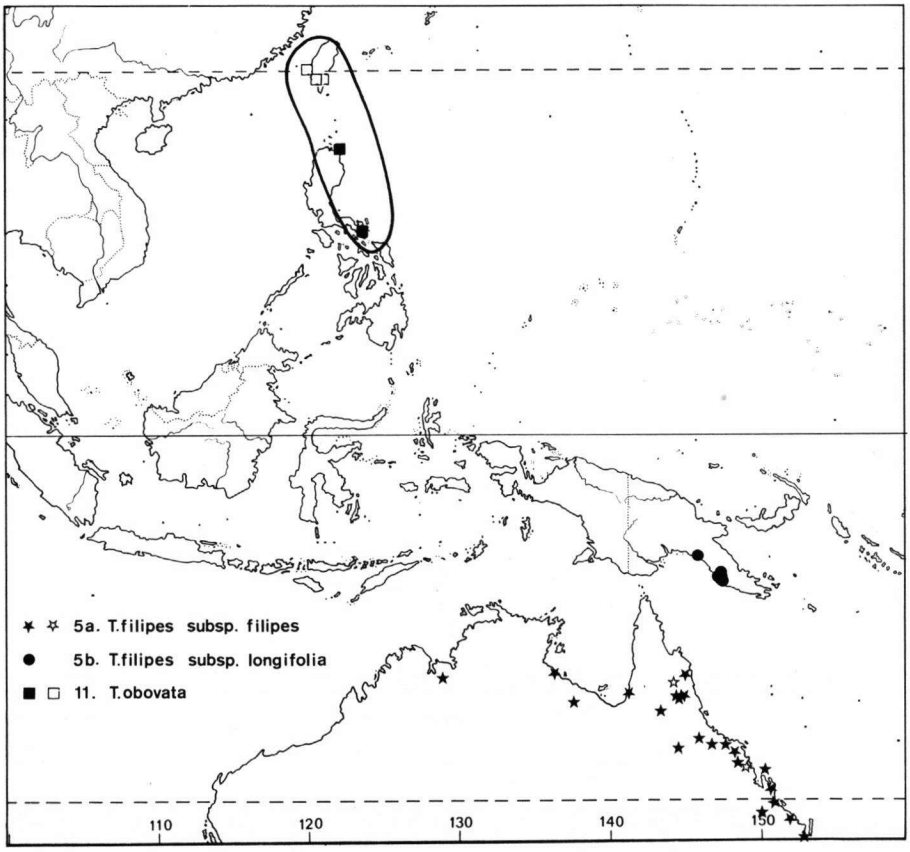


Map 3.



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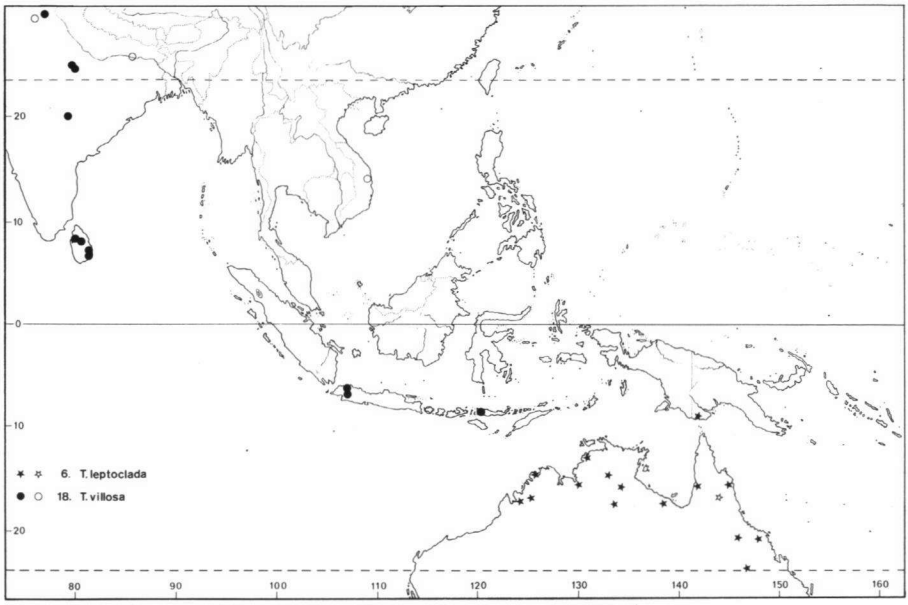

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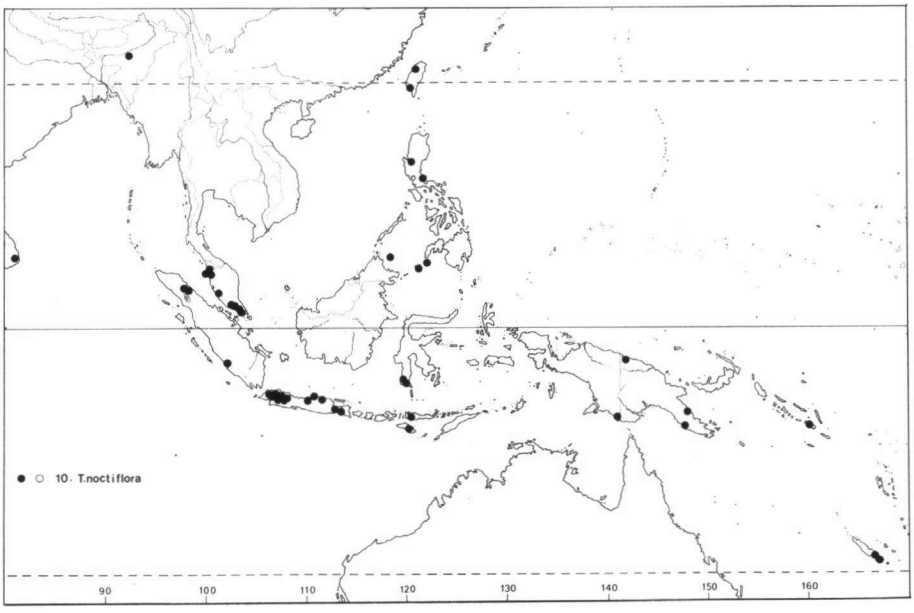

Map 6. Open symbols from literature.

noctiflora is one of the *Tephrosia* species first being used as a green manure. It produces many leaves and seeds. The seeds can be stored relatively long (20% still germinated after 13 years of rather bad storage; Wood, 1949). Seedlings of this species, however, are very sensitive for severe rains and therefore it is less suitable as a green manure than *T. candida*. *T. vogelii* grows larger than *T. candida* and is thus a good wind break and shade plant, but it does not flourish on poor soils, does not stand clipping and easily suffers from diseases and pests. *T. villosa* does not thrive as good and large as the above mentioned species, but it resists long dry and wet periods. *T. pumila* and *T. vestita* are not very suitable for manuring because they grow rather slow and the latter soon becomes woody. *T. purpurea* has been tried but proved to be not satisfactory as a green manure according to Keuchenius (1924) and Burkill (1935). No records have been found about the qualities of *T. luzoniensis* and *T. zollingeri*.

According to Greshoff (1924) two species from Africa, '*T. sp. moschii*' and '*T. barabugosa*' (which later appeared to be *T. barbigera*) have been tried as a green manure in Bogor. The plants of these species died of djamur upas (the species Corticium salmonicolor, now Phanerochaete salmonicolor) and were thus considered as unuseful.

The toxic properties of *Tephrosia* species are due to the presence of flavonoids; recorded are rotenone, tephrosin and an isomere of rotenone: deguelin. In America, Africa, Asia, and Australia aboriginal people, living isolated from each other, discovered and used various species of the genus and related genera for the same purpose, the poisoning of fish. The bruised or crushed leaves, stems, roots, or seeds, sometimes mixed with quicklime, are thrown into the water to stupefy the fish. Thus the floating fish can easily be caught for food supply. Four species occurring in Malesia are used outside Malesia as a fish-poison: *T. astragaloides, T. candida, T. noctiflora*, and *T. vogelii* (Greshoff, 1893, 1900). Two species are recorded to be poisonous for cattle, the evidences are at least partly conflicting (see 'uses' sub *T. purpurea* and *T. vestita*).

Although *Tephrosia* species proved to be useful on a small scale to produce poisons, they are not suitable as commercial sources of rotenone (in contrast with *Derris* and *Lochocarpus*), because the quantities of it are too low.

Data on *Tephrosia* species used for folk medicine, used as molluscicides, insecticides or rarely as a fodder or dyeing matter are treated under the species concerned.

ACKNOWLEDGEMENTS

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TEPHROSIA

Tephrosia Pers., Syn. 2 (1807) 328, nom. cons.; Miq., Fl. Ind. Bat. 1, 1 (1855) 292; Benth., Fl. Austr. 2 (1864) 202; Baker in Oliver, Fl. Trop. Afr. 2 (1871) 104; Baker in Hook., Fl. Brit. India 2 (1876) 110; Taub. in E. & P., Nat. Pfl. Fam. 3, 3 (1894) 269; Forbes, Bothalia 4 (1948) 53; C.E. Wood, Rhodora 51 (1949) 233; Ali, Biologia 10 (1964) 23; Hutch., Gen. Fl. Pl. 1 (1964) 396; Brummitt, Kew Bull. 35 (1981) 459; Geesink in Polhill & Raven (ed.), Adv. Legume Syst. (1981) 260. – *Cracca* L., Sp. Pl. ed. 1, 2 (1753) 752, nom. rej. vs. *Cracca* Benth.; L., Amoen. Acad. 3 (1756) 18. – *Colinil* Adans., Fam. 2 (1763) 327. – Type species: *T. villosa* (L.) Pers. (*Cracca villosa* L.).

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Needhamia Scopoli, Introd. (1777) 310, nom. rej. vs. *Tephrosia* Pers. – Type species: *Vicia littoralis* Jacq., nom. rej.

Reineria Moench, Suppl. Meth. (1802) 44, nom. rej. vs. *Tephrosia* Pers. – Type species: *Reineria reflexa* Moench.

Brissonia Necker ex Desv., J. Bot. 3 (1814) 78, nom. illeg.

Crafordia Raf., Specchio 1 (1814) 156. (fide Merr., Ind. Raf. 1949.) – Type species: *Crafordia bracteata* Raf.

Kiesera Reinw., Syll. Pl. Nov. 2 (1828) 11. – Type species: *Kiesera sericea* Reinw.

Xiphocarpus Presl, Symb. Bot. 1 (1830) 13, t. 7. – Type species: *Xiphocarpus martinisensis* Presl.

Apodynomene E. Meyer, Comm. Pl. Afr. Austr. 1, 1 (1836) 111. – Type species: non designatus.

Pogonostigma Boiss., Diagn. Pl. Orient. 1, 2 (1843) 39. – Type species: non designatus.

Catacline Edgew., J. As. Soç. Beng. 16, 2 (1847) 1314. – Type species: *Catacline sericea* Edgew.

Macronyx Dalz., Hook. J. Bot. Kew Misc. 2 (1850) 35. – *Seemannantha* Alef., Bonplandia 10 (1862) 264. – Type species: *Macronyx strigosus* Dalz.

Balboa Liebman ex Didrichsen, Vid. Medd. Nat. For. Kjøb. (1853) 106, nom. rej. vs. *Balboa* Planchon & Triana. – Type species: *Balboa diversifolia* Liebman ex Didrichsen.

Caulocarpus Baker f., Leg. Tr. Afr. (1926) 169. – Type species: *Caulocarpus gossweileri* Baker.

Lupinophyllum Hutch., Gen. Fl. Pl. 2 (1967) 626. – Type species: *Lupinophyllum lupinifolium* (DC.) Hutch.

Shrubs or herbs, then often woody at base. *Leaves* spirally arranged, imparipinnate or unifoliolate (in *T. leptoclada*), rarely palmately compound (in some African species). *Stipules* present (spinose in *T. spinosa*). Rachis of leaf pulvinate at base, with distinct infrajugal and interjugal parts, always distinct, rarely completely reduced in some leaves, but always combined with distinct ones. Stipellae absent. Petiolules pulvinate. *Leaflets* up to 18 pairs, usually opposite (subopposite in *T. zollingeri*). Midrib raised on undersurface. Nerves parallel, usually straight, sometimes upcurved, never S-shaped, 4–31 pairs, usually ending in a marginal nerve and with marginal arches only distinct at leaf apex. Intersecondary veins usually parallel to nerves. Marginal and tertiary arches usually indistinct, in some species distinct near leaf apex. Venation reticulate, usually indistinct. *Inflorescence* consisting of terminal, axillary, or leaf-opposed pseudoracemes (axillary fascicles in *T. spinosa*), sometimes some basal bracts similar to vegetative leaves. Fascicles with 2–30 flowerbuds. Bracteoles usually absent. *Flowers* up to 26 mm long. *Calyx* campanulate, 4-toothed, the

vexillary tooth two-topped, outside hairy all over; cup glabrous within; teeth sometimes glabrous within. *Standard blade* about orbicular, sometimes auricled at base; apex rounded to emarginate, the very apex sometimes acuminate to acute, with two basal callosities, outside sericeous, inside glabrous (except *T. vogelii*: sericeous within). *Wing blades* sometimes auricled at vexillary base, rarely with some hairs; usually with distinct lateral ribs. *Keel petals* partly connate along the carinal margin; blades sometimes auricled at vexillary base, in some species with some hairs, lateral pockets usually present. *Stamens* 10, the vexillary filament free or free at base and connate halfway. Vexillary filament auricled at base; the other filaments alternately longer and shorter. *Staminal tube* or *sheath* auricled closely parallel to auricles of vexillary filament thus basal fenestrellae 'closed'. Anthers uniform. Disk annular, lobed. *Ovary* sessile, usually sericeous. Style dorso-ventrally flattened, sometimes twisted, upcurved, sometimes bearded. Stigma capitate, usually penicillate at base. Ovules 4–20. *Pods* exserted from a persistent calyx, linear falcate (retrofalcate in *T. spinosa* and *T. villosa*), dehiscent, the valves spirally curved, without lenticels, with thickened margins, usually with a persistent style remnant, flat or slightly turgid, convex around seeds, hairy. *Seeds* 1–20, orbicular to transversely elliptic, quadrangular to irregularly rectangular laterally asymmetric, with lens, rarely reticulately ridged, light brown to black, sometimes with light or dark patches. Funicle short, slightly expanded at the hilar end. Hilum with median groove, sometimes surrounded by a rim aril. Embryo with folded radicle.

Note. In establishing the generic synonyms of *Tephrosia* other authors have been followed in case of doubt. Two names could not be checked because of the unavailable original description: *Erebinthus* Mitchell, and *Catacline* Edgew., mentioned by Forbes (1849), Taubert (1894), Ali (1964), and Hutchinson (1964) as synonyms of *Tephrosia*.

Of four genera: *Pogonostigma* Boiss., mentioned by Taubert (1894) and Hutchinson (1964); *Macronyx* Dalz., mentioned by Forbes (1849), Taubert (1894), Ali (1964), and Hutchinson (1964); *Caulocarpus* Baker f., and *Lupinophyllum* Hutch., mentioned by Brummitt (1981), the original descriptions could be compared with the description of *Tephrosia*, but these appeared to be different from *Tephrosia* of the Malesian area in some aspects, e.g. simple or digitately compound leaves, 1–2 seeds, stipellae present. They are placed in synonymy following the cited authors.

KEY TO THE SPECIES AND INFRASPECIFIC TAXA

Introduction. — Keys, starting with vegetative characters in at least the first few couplets have the advantage that the number of descriptions to be compared with e.g. sterile or exclusively fruiting material is limited. Previous to the present one, key skeletons were constructed starting with size and number of leaflets, lengths of leaf rachis, relative lengths of parts of the rachis, combinations of these characters, and combinations of vegetative and easily observed flower or fruit characters. These attempts were not successful, as too many taxa had to be taken up in several blocks,

due to overlap of the characters even in combination. Therefore, it was decided to use the traditional characters of indument of staminal tube and style as the first key divisions.

Explanation of some terms:

carinal/vexillary: Position corresponding with keel (carina) resp. standard (vexillum). These terms are used to avoid the ambiguous terms 'dorsal' and 'ventral'.

maxijugal leaf: Per specimen the vegetative leaf with the highest number of leaflets.

infrajugal part of the rachis: The part of the rachis from the base to the first pair of leaflets, including the basal pulvinus.

interjugal part of the rachis: The part of the rachis between successive pairs of leaflets. The mean length of the interjugal parts in the maxijugal leaf is used in the key.

ultrajugal part of the rachis: The part of the leaf rachis from the uppermost pair of lateral leaflets up to the terminal leaflet.

pseudoraceme: The flowers are arranged in fascicles, which are arranged in a raceme. The length of the rachis of the inflorescence includes the length of its vegetative basal part (if present).

flower, size: The flower is measured exclusive its pedicel in the stage just before the reflexion of the standard. The length is the distance along a line parallel to carinal calyx lobe from the base of the calyx cup to the tangent on the upcurved apical part.

wing/keel, sizes: The length of the blade is the distance along a line parallel to the claw, from the apex of the claw to the tangent on the upcurved apical part of the blade. The width is the largest width.

lateral ribs: Obliquely transversely arranged ridge-like thickenings, situated near the base of the wing blade close to its vexillary edge. The grip area for the front legs of a visiting bee.

pod, length: The length is measured exclusive its pedicel.

1a. Staminal tube and vexillary filament glabrous. Upper half of style glabrous or bearded 2
b. Staminal tube and vexillary filament hairy at vexillary side, sometimes only at the auricles. Upper half of style glabrous 20
2a. Style variously bearded. Stigma penicillate at base or not 3
b. Apical half of style glabrous. Stigma penicillate at base 7
3a. Apex of all leaflets acute and pedicel 9–16 mm long . . . . . **3. T. candida**
b. Apex of leaflets acute, obtuse or rounded to emarginate, if acute, then pedicel up to 3 mm long 4
4a. Stigma penicillate at base. Angle of distinct secondary nerves with main nerve 35–60 degrees at base. Pedicel up to 3 mm long 5
b. Stigma glabrous. Angle of distinct secondary nerves with main nerve 15–30 degrees at base. Pedicel 3–21 mm long 6

5a. Longest rachis of leaf 2–6 cm long. Calyx cup 1.3–2 by 2–2.5 mm. Standard blade 7.5–9 by 6.5–7.5 mm. Wing blades 6.5–8 by 1.8–2.8 mm. Keel blades 6.5–7 by 2.2–3.5 mm. Style 3–4.5 mm long . . . . . **15. T. senticosa**

b. Longest rachis of leaf 6.3–14 cm long. Calyx cup 2.3–3.5 by 4–6 mm. Standard blade 10.5–18 by 12–14 mm. Wing blades 11.8–15 by 2.8–6.5 mm. Keel blades 9–14 by 4–7 mm. Style 5–11 mm long . . . . . **17. T. vestita**

6a. Flower 8–14 mm long. Largest pod 50–60 by 5 mm. Flowerbuds 3–4 per fascicle . . . . . **9. T. nana**

b. Flower 18–26 mm long. Largest pod 75–140 by 10–20 mm. Flowerbuds 2 per fascicle . . . . . **19. T. vogelii**

7a. Stipules herbaceous or shaffy. Flowers in pseudoracemes 8

b. Stipules spinose. Flowers in fascicles, axillary to normal leaves . **16. T. spinosa**

8a. Carinal calyx tooth 2.5–4.5 times longer than the cup 9

b. Carinal calyx tooth less than 2.5 times longer than the cup 13

9a. Lateral calyx teeth 1.2–3.2 mm long, the carinal one 1.1–5.6 mm long, the vexillary one 1.2–3.2 mm long; the vexillary tops 0.5–2.5 mm long. Pod linear. The interjugal parts of the longest leaf rachis 0.5–1.5 times longer than the infrajugal part 10

b. Lateral calyx teeth 6–7 mm long, the carinal one 5.5–9 mm long, the vexillary one 4–6 mm long, the vexillary tops 3–5 mm long. Pod retrofalcate. The interjugal parts of the longest leaf rachis 1–3 times longer than the infrajugal part **18. T. villosa**

10a. Longest inflorescence 1–10 cm long. Calyx cup 1.3–2.5 mm wide, the lateral teeth 0.4–1 mm wide, the carinal one 0.5–1 mm wide, the vexillary one 1.5–2.3 mm wide. Standard blade 3–5.5 by 3.5–6.5 mm. Wing blades 1.1–2.8 mm wide, lateral ribs extending over 0.7–2.5 mm. Style 1.4–4 mm long 11

b. Longest inflorescence 13–43 cm long. Calyx cup 3–5 mm wide, the lateral teeth 1.5–2 mm wide, the carinal one 1.2–2 mm wide, the vexillary one 3.5–4.5 mm wide. Standard blade 5.5–8.2 by 7–11 mm. Wing blades 3–5 mm wide, lateral ribs extending over 2.8–4 mm. Style 4.5–5.5 mm long . . . . **10. T. noctiflora**

11a. Longest inflorescence 0.5–5.5 cm long, if longer than 3.5 cm, fascicles concentrated at the upper half of the inflorescence. More than 6 fascicles per inflorescence. Carinal calyx tooth 2.5–4 times longer than the cup . **7. T. luzoniensis**

b. Longest inflorescence 1.5–9.5 cm long. Fascicles per inflorescence 1–5, more or less evenly distributed along the rachis. Carinal calyx tooth 1–2.5 times longer than the cup. (**12. T. pumila**) 12

12a. Standard blade 3–5 mm long. Wing blades 2.5–5 by 1–1.8 mm. Keel blades 2.7–4.3 mm long. Vexillary filament free, 2.5–6.5 mm long **12a. T. pumila subsp. pumila**

b. Standard blade 5.5–6 mm long. Wing blades 5–5.5 by 2–2.3 mm. Keel blades 4.5–5 mm long. Vexillary filament free at base and connate halfway, 6–7 mm long . . . . . **12b. T. pumila subsp. aldabrensis**

13a. Longest inflorescence 13–43 cm long 14

b. Longest inflorescence 1–10 cm long 15

14a. Calyx cup 3–5 mm wide, the lateral teeth 1.5–2 mm wide, the carinal one 1.2–2 mm wide, the vexillary one 3.5–4.5 mm wide. Keel blades 4.5–6 mm long. Free parts of the short filaments 1.9–2.3 mm long. Style 4.5–5.5 mm long. Ovules 8–11. Seeds reticulately ridged ..... **10. T. noctiflora**

b. Calyx cup 1.5–2.6 mm wide, the lateral teeth 0.5–1 mm wide, the carinal one 0.4–1 mm wide, the vexillary one 1.5–3 mm wide. Keel blades 2.2–3.6 mm long. Free parts of the short filaments 0.8–1.8 mm long. Style 2–4.5 mm long. Ovules 5–8. Seeds smooth ..... **13a. T. purpurea subsp. purpurea**

15a. Wing blades 2.5–5.5 mm long. Keel blades 2.2–5 mm long. Staminal tube 2–6 mm long 16

b. Wing blades 6–8 mm long. Keel blades 5.5–6 mm long. Staminal tube 6.2–7.3 mm long 19

16a. Maxijugal leaves with 4–9 pairs, if 4, pedicel 1–3 mm long 17

b. Maxijugal leaves with 3–4 pairs, if 4, pedicel 4–20 mm long .... **14. T. rigida**

17a. Vexillary filament free at base and connate halfway 18

b. Vexillary filament free ..... **12a. T. pumila subsp. pumila**

18a. Keel blades 4.5–5 mm long. Ovules 8–13 .. **12b. T. pumila subsp. aldabrensis**

b. Keel blades 2.2–3.6 mm long. Ovules 5–8 . **13a. T. purpurea subsp. purpurea**

19a. Longest inflorescence 8.5–10 cm long, if shorter, then the longest rachis of leaf 3–7 cm long. Venation distinct. Longest terminal leaflet 12–22 mm long. Interjugal part of the longest rachis 6–11 mm long ..... **14. T. rigida**

b. Longest inflorescence 1–5 cm long. Longest rachis of leaf 1.5–3 cm long. Venation invisible. Longest terminal leaflet 4–13 mm long. Interjugal parts of the longest rachis 2–6 mm long ..... **11. T. obovata**

20a. Largest lateral leaflet 9–18 by 1–2.5 mm. Flower 3–4 mm long. (**5. T. filipes**) 21

b. Largest lateral leaflet 20–75 by 1–11 mm, if shorter, 3–11 mm wide. Flower 3.5–12 mm long 22

21a. Longest terminal leaflet 9–18 mm long and 1–1.5 times longer than the uppermost pair of lateral leaflets. Keel blade 2.8–4 mm long **5a. T. filipes subsp. filipes**

b. Longest terminal leaflet 19–30 mm long and 1.5–2 times longer than the uppermost pair of lateral leaflets. Keel blade 1.8–2.2 mm long **5b. T. filipes subsp. longifolia**

22a. Maxijugal leaves with up to 6 pairs of leaflets 23

b. Maxijugal leaves with 7–18 pairs of leaflets 29

23a. Longest terminal leaflets 24–50 mm long. Longest lateral leaflets 21–40 mm long. Not all leaflets linear elliptic 24

b. Longest terminal leaflets (not the unifoliolate leaves) 55–95 mm long. Longest lateral leaflets 45–75 mm long. All leaflets linear elliptic .... **6. T. leptoclada**

24a. The infrajugal part of the longest leaf rachis 20–40 mm long, its interjugal parts 0.3–0.6 times longer than its infrajugal part. (**2. T. barbatala**) 25

b. The infrajugal part of the longest leaf rachis 2–18 mm long, its interjugal parts 0.8–3 times longer than its infrajugal part 26

25a. Upper surface of the leaflets sericeous or velutinous. Wing blades with hairs on the auricles and lateral ribs . . . . . **2a. T. barbatala var. barbatala**
b. Upper surface of the leaflets and wing blades glabrous **2b. T. barbatala var. glabra**
26a. Largest terminal leaflet 7.5–18 mm wide. Ovules 4–6. Maxijugal leaves with 2–6 pairs of leaflets. Flowers 4–7 mm long. (**8. T. maculata**) 27
b. Largest terminal leaflet 5–6 mm wide. Ovules 8–10. Maxijugal leaves with 6–9 pairs of leaflets. Flower 7–12 mm long . . . . . **1. T. astragaloides**
27a. Bracts to the fascicles 2.5–3.5 mm long. Longest stipules 4–8 mm long. Indument sericeous or velutinous 28
b. Bracts to the fascicles 5–9 mm long. Longest stipules 7–10 mm long. Indument dense-velutinous . . . . . **8c. T. maculata var. elongata**
28a. Branches, rachis and upper surface of the leaflets velutinous. Longest inflorescence 2–16 cm long . . . . . **8a. T. maculata var. maculata**
b. Branches, rachis and upper surface of the leaflets sericeous to strigose. Longest inflorescence 1.4–4 cm long . . . . . **8b. T. maculata var. appressepilosa**
29a. Longest rachis of leaf 6–20 cm long. Indument not silvery sericeous 30
b. Longest rachis of leaf 3.2–5.5 cm long. Indument of rachis and leaves silvery sericeous . . . . . **1. T. astragaloides**
30a. Pedicel 1–4.5 mm long. Maxijugal leaves with 7–13 pairs of leaflets. Staminal tube 4–6 mm long 31
b. Pedicel 5–7 mm long. Maxijugal leaves with 11–18 pairs of leaflets. Staminal tube 3–4 mm long . . . . . **20. T. zollingeri**
31a. Flowerbuds 4–5 per fascicle. Flower 5.5–8 mm long. Vexillary filament 6–8 mm long. Staminal tube 5–6 mm long. (**13b. T. purpurea** subsp. **barbigera**) . 32
b. Flowerbuds 8–30 per fascicle. Flower 3.5–5.5 mm long. Vexillary filament 5–5.5 mm long. Staminal tube 4–4.5 mm long . . . . . **4. T. elliptica**
32a. Flower 7–8 mm long. Longest inflorescence 11–19.5 cm long **13c. T. purpurea** subsp. **barbigera** var. **barbigera**
b. Flower 5.5–6 mm long. Longest inflorescence 4.5–11 cm long **13d. T. purpurea** subsp. **barbigera** var. **rufescens**

1. Tephrosia astragaloides R. Br. ex Benth. – Fig. 1c, 3n. Map 1.

T. astragaloides R. Br. ex Benth., Fl. Austr. 2 (1864) 208; Bailey, Queensl. Fl. 2 (1900) 394; C.T. White, Proc. R. Soc. Queensl. 34 (1922) 33; Verdc., Man. N. G. Legum. (1979) 338. – *Cracca astragaloides* (Benth.) O. K., Rev. Gen. Pl. 1 (1891) 174. – Lectotype: *R. Brown 4113* (BM, proposed here; iso K), Aug./Sept. 1802, Queensland, Shoalwater Bay, Broad Sound.

(When the measurements of the Australian specimens differ from those of the New Guinea specimens, they are placed between brackets.)

Indument sericeous, silvery. Stipules 2.5–7 by 0.5–1.5 mm. Rachis of *leaf* 0.8–5.2 cm long, 0.5–1 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 3–7 and 5–7 mm long; the interjugal parts 1–1.7 times longer than the infrajugal part; the ultrajugal part absent to distinct. Petiolules 1–2 mm long. *Leaflets*

2–9 pairs, in the maxijugal leaf 6–9, linear obovate to narrowly obovate to narrowly elliptic; base cuneate to acute; apex of the terminal leaflet emarginate, apex of the lateral leaflets obtuse to retuse; terminal leaflet smaller to larger than the lateral ones, 12–34 by 2.5–6 mm, the lateral leaflets 7–30 by 2–5 mm. Midrib slightly raised to slightly sunken above. Distinct nerves (4–)5–11 pairs, raised on both surfaces, angle with midrib 5–20 degrees at base, 5–10 degrees halfway the nerve. Angle of intersecondary veins with midrib 10–20 degrees at the base. Venation distinct only above. *Pseudoracemes* terminal up to c. 35 cm long; some basal bracts similar to vegetative leaves. Fascicles with 4–5 flowerbuds. Bracts to the fascicles linear triangular, 2.5–7 by (0.3–)0.5–0.8 mm. Bracts to the flowers linear triangular, (1–)1.2–3.2(–3.5) by (0.1–)0.2–0.4(–0.7) mm. Pedicel 1.5–4 mm long. *Flower* 7–12 mm long. *Calyx* cup 1.6–2.8 by 2.2–3 mm, sometimes sericeous to velutinous; teeth pubescent to sericeous within, the vexillary one triangular, 1.4–3.1(–4.5) by (1.9–)2.3–3 mm, its tops 0.4–1.7 by 0.2–1 mm; the lateral ones triangular to narrowly triangular, 1.5–2.8(–4.5) by 0.8–1.1 mm; the carinal one triangular to narrowly triangular, 2–3(–5) by 0.8–1.2(–1.3) mm, longer than or as long as the other teeth and 1–2 times longer than the cup. *Standard* blade orbicular, apex truncate to emarginate, 5–10.5 mm in diam.; claw (0.4–)0.5–2 mm long. *Wing* blades auricled at vexillary side, 4.2–8.7 by 2.2–4.2 mm, glabrous, lateral ribs extending over 1.5–3.5 mm; claw 0.5–2.7 mm long. *Keel* blades usually slightly auricled at vexillary side, 4–6.5 by 2–3.5 mm, glabrous, sometimes sericeous at the connection, lateral pockets sometimes present, bulgy, 1–1.8 mm long; claw 0.7–2.8 mm long. *Staminal tube* 2.2–6.5(–7) mm long, sericeous at the auricles. Vexillary filament free at base and connate halfway, 3.7–8(–8.5) mm long, sericeous at the auricles and up to halfway the connection; the other filaments alternately longer and shorter, free parts resp. 1.5–2.5(–3) and 1.1–2.2(–2.5) mm long. Anthers 0.4–0.5(–0.6) mm long. *Ovary* 3–5(–6) by 0.3–0.6(–0.7) mm, puberulous to sericeous. Style sometimes twisted, 1.8–3.8 mm long, apical half glabrous; stigma penicillate at base. Ovules (7–)8–10. *Pod* linear, slightly turgid, 10–47 by 3–5 mm, slightly convex around seeds, puberulous or sericeous to velutinous. *Seeds* 2–10, orbicular to broadly ovate or irregularly rectangular, brown, dark brown with light patches, 2–3.5 by 2–2.5 mm.

Collector's notes. Erect shrub or tall herb, 1–1.8 m. Upper surface of leaflets dull grey-green, undersurface silvery. Flowers white, pale cream or creamish yellow. Pods green when immature, green-brown when mature. Dies back in dry season.

Distribution. New Guinea, Queensland.

Habitat. Grassland, savannah, sometimes in Eucalyptus savannah, on ridges, roadsides, old garden sites. Heavy dark soil, shallow. Altitude 9–60 m.

Uses. Leaves used as a fishpoison (Australia).

First dated record. Queensland 1802 (R. Brown); New Guinea 1876 (Goldie).

Notes. 1. This species is characterized by the silvery undersurface of the leaflets and the emarginate apex of the terminal leaflets. It resembles *T. purpurea*, especially subsp. *barbigera*. *T. astragaloides* differs mainly by the striking silvery undersurface of the leaflets, the length of the leaf rachis, which is usually shorter in *T. astragaloides*, the longer flowers and the higher number of ovules.

2. The specimens from New Guinea differ from the Australian ones in the following characters: a) the New Guinea specimens always have an appressed indument, the Australian ones often have a spreading indument; b) the calyx teeth of the New Guinea specimens are mostly slightly shorter than those in the Australian ones.

The data of the Australian specimens are included in the description, because it seemed not appropriate to make a new variety of the New Guinea specimens, according to the above mentioned differences.

In the key to the species only characters of the New Guinea specimens are used.

2. Tephrosia barbatala Bosman & De Haas, *sp. nov.* – **Fig. 3i. Map 3.**

T. purpurea (L.) Pers. var. *paucifolia* Warb., Bot. Jahrb. 18 (1894) 193; K. Sch. & Laut., Fl. Schutzgeb. ([1901] 1900) 352; Verdc., Man. N. G. Legum. (1979) 346. – Type: *Hellwig 79* (BO; iso K), 1-8-1888, Papua New Guinea, 'Kaiser Wilhelmsland'.

T. purpurea similis, in parte infrajugali rachidis partibus interjugalibus duplo longiore, foliolis 1–6-jugatis, alis sparse barbatis in varietate typica differt. – Typus: *NGF 49806* (Henty & Katik) (L; iso LAE; photo K), 28-5-1975, Papua New Guinea, Sialum.

Indument strigose or silvery sericeous. Stipules 2–10 by 0.2–1.2 mm. Rachis of *leaf* 2.5–9 cm long, 0.5–1 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 20–40 and 11–15 mm long; the interjugal parts 0.3–0.6 times longer than the infrajugal part; the ultrajugal part distinct. Petiolules 1–1.5 mm long. *Leaflets* 1–6 pairs, in the maxijugal leaf 3–6 pairs, narrowly elliptic to linear elliptic; base acute to obtuse; apex rounded to retuse; terminal leaflet smaller to larger than the lateral ones, 12–43 by 3–8 mm; lateral leaflets 9–39 by 2–8 mm. Midrib (slightly) raised above. Distinct nerves 5–12 pairs, raised below, (slightly) raised above, angle with midrib 15–20 degrees at base, 10–20 degrees halfway the nerve. Venation usually distinct on undersurface. *Pseudoracemes* terminal, or leaf-opposed, 8.5–14 cm long; sometimes some basal bracts similar to vegetative leaves. Fascicles with 3–5 flowerbuds. Bracts to the fascicles linear triangular, 1.7–3 by 0.2–0.4 mm. Bracts to the flowers triangular to linear triangular, 0.4–1.5 by 0.2 mm. Pedicel 2–2.3 mm long. *Flower* 6–7 mm long. *Calyx* cup 1.5–2 by 2–3 mm, sometimes sericeous to strigose; teeth pubescent within, the vexillary one deltoid to triangular, 2.1–2.5 by 1.5–2.5 mm, its tops 1–1.2 by 0.5 mm; the lateral ones triangular to narrowly triangular, 1.8–2.5 by 0.9–1 mm; the carinal one triangular to narrowly triangular, 1.8–2.2 by 0.8–1 mm, shorter than, longer than or as long as the other teeth and 1–1.5 times as long as the cup. *Standard* blade broadly ovate, auricled at base, apex rounded to retuse, 5–6 by 6–8 mm; claw 1–2.5 mm long. *Wing* blades auricled at vexillary side, 3.5–5 by 2–3 mm, sometimes with hairs on the auricles and lateral ribs and sometimes at carinal side, lateral ribs extending over 1.8–2.2 mm; claw 1.5–2 mm long. *Keel* blades auricled at vexillary side, 2.5–3.8 by 2.5–2.8 mm, glabrous, lateral pockets sometimes bulgy, 0.8–1.5 mm long; claw 1.5–2.2 mm long. *Staminal tube* 3.5–4.3 mm long, velutinous on the auricles. Vexillary filament free at base and con-

nate halfway, 4.2–5.8 mm long, velutinous on the auricles and up to halfway the connection; the free parts of the other filaments alternately longer and shorter, resp. 1.2–2.5 and 0.9–1.5 mm long. Anthers 0.3 mm long. *Ovary* 3–4 by 0.4–0.6 mm, sericeous. Style sometimes twisted, 2.6–3.5 mm long, glabrous; stigma penicillate at base. Ovules 7–9. *Pod* linear, flat, 23–35 by 3–4 mm, sericeous to strigose, slightly convex around seeds. *Seeds* 4–8, mature seeds unknown.

Collector's notes. Trailing, clustered, straggling, glaucous herb, woody at base, 0.2 m. Leaves dull green. Flowers blue-violet.

Distribution. New Guinea, Queensland.

Habitat. Hillside, coastal dunes, low Themeda grassland, bunt grassland in savannah, limestone rocks. Thin soil over coral rock. Altitude 15–200 m.

First dated record. New Guinea 1888 (Hellwig, Kelana).

Note. Besides the original material on which *T. purpurea* var. *paucifolia* Warb. was based a few more specimens were found (identified as *T. purpurea*) with the infrajugal part of the leaf rachis 1.5–3 times as long as the interjugal parts and the auricles and lateral ribs of the wing petals with hairs. These characters are unique in Malesian *Tephrosia*, and combined with a constant and striking general appearance we consider this taxon a different species. The epithet '*pauciflora*' was not available because of the American species *T. pauciflora* Nutt. Because of the strikingly bearded wing we suggest the epithet '*barbatala*'.

a. var. barbatala

T. purpurea (L.) Pers. var. *paucifolia* Warb., Bot. Jahrb. 18 (1894) 193.

Stipules 3–6 by 0.8–1.2 mm. Upper surface of leaflets silvery sericeous or velutinous; terminal leaflet 12–31 by 3–6 mm; lateral leaflets 9–26 by 2–6 mm. Distinct secondary nerves 5–10 pairs. Tertiary arches absent. Venation reticulate, distinct or vague below, invisible above. Bracts to the fascicles 1.7–2 by 0.2–0.4 mm, sericeous to velutinous above. Upper surface of bracts to the flowers sericeous or sericeous to velutinous. Calyx cup 1.5 by 2 mm. Standard blade 5–6 by 6–7 mm. Wing blades with hairs on the auricles and lateral ribs and sometimes at carinal side. Style not twisted.

Distribution. New Guinea (2 collections), Queensland (1 collection).

b. var. glabra Bosman & De Haas, *var. nov.* – **Fig. 3i.**

A varietate typica foliolis et bracteis supra glabris, alis glabris differt. – Typus: *NGF 39488* (Streimann) (LAE), 25-6-1969, New Guinea.

Stipules 6–10 by 0.2–0.5 mm. Upper surface of leaflets glabrous, terminal leaflet 25–43 by 5–8 mm, lateral leaflets 15–39 by 4–7 mm. Distinct secondary nerves 8–12 pairs. Tertiary arches present at the apex. Venation reticulate, distinct on both surfaces. Bracts to the fascicles 3 by 0.3 mm, glabrous above. Upper surface of bracts

to the flowers glabrous. Calyx cup 2 by 2.5 mm. Standard blade 5 by 8 mm. Wing blades glabrous. Style twisted.

Distribution. New Guinea (only the type collection).

3. Tephrosia candida (Roxb.) DC. – Fig. 2f, 3p.

T. candida (Roxb.) DC., Prod. 2 (1825) 249; Spreng., Syst. Veg. 4, 2 (1827) 274; Sweet, Hort. Brit. ed. 2 (1830) 142; Wall., Cat. (1830) no. 5627; Wight, Cat. (1833) 54; W. & A., Prod. (1834) 210; Hassk., Tijd. Nat. Gesch. Phys. 5 (1838) 266; Sweet, Hort. Brit. ed. 3 (1839) 170; Span., Linnaea 15 (1841) 191; Hassk., Flora 25, Beibl. 2, 4 (1842) 58; Baker in Hook. f., Fl. Brit. India 2 (1876) 111; Prain in King, J. As. Soc. Beng. 66, 2 (1897) 84, 365; Greshoff, Meded. Lands Pl. Tuin 24 (1900) 48; van Helten, Meded. Cult. 1 (1913) 7, ibid. 2 (1915) 7, bijl.; Heyne, Nutt. Pl. ed. 1, 2 (1916) 277, ibid. ed. 2, 2 (1927) 776; van Helten, Teysmannia 28 (1917) 59; Haines, Bot. Bihar Orissa 3 (1922) 242; Heide, Meded. Alg. Proefst. Landb. 14 (1923) 24; Merr., En. Philip. 2 (1923) 278; Back. & Sloot., Theeonkr. (1924) 135; van Helten, Meded. Alg. Proefst. Landb. 16 (1924) 54, 60; Sampson, Kew Bull. (1928) 161; van der Pijl, Trop. Natuur 19 (1930) 190; Burk., Dict. 2 (1935) 2131; Ridl., Kew Bull. (1938) 276; Quis., Philip. J. Sc. 77 (1947) 153; Quis., Philip. J. For. 5, 2–4 (1947) 165; Wood, Rhodora 51 (1949) 374; Back. & Bakh. f., Fl. Java 1 (1963) 595; Ali, Biologia 10 (1964) 23; Gillett, Fl. T. E. Afr., Legum. 3, Pap. 1 (1971) 158; Verdc., Man. N. G. Legum. (1979) 338; Duke, Handb. Leg. Ec. Imp. (1981) 230. – *Robinia candida* Roxb. [Hort. Beng. (1814) 56, nom. nud.], Fl. Ind. 3 (1832) 327. – *Xiphocarpus candidus* (Roxb.) Endl. ex Hassk., Tijd. Nat. Gesch. Phys. 10 (1843) 147; Cat. Hort. Bog. (1844) 271; Zoll., Nat. Geneesk. Arch. N. I. 3 (1846) 56; Hassk., Pl. Rar. Jav. (1848) 336. – *Cracca candida* (Roxb.) O. K., Rev. Gen. Pl. 1 (1891) 173. – Type: *Roxburgh s.n.*, s.d. (K), East India.

Kiesera sericea Reinw. [ex Blume, Cat. (1823) 93, nom. nud.], Syll. Pl. Nov. 2 (1828) 11; Miq., Fl. Ind. Bat. 1, 1 (1855) 291; Sum. (1860) 114. – Type: *Reinwardt s.n.*, s.d. (L), Java.

Xiphocarpus martinicensis Presl, Symb. Bot. 1 (1830) 14, pl. 7. – Type: *Presl s.n.*, s.d. (PR, n.v.), Martinique, or Presl, Symb. Bot. 1 (1830) pl. 7.

Indument sericeous or velutinous. Stipules 5–11 by 0.8–1.5 mm, often deciduous. Rachis of *leaf* 3.5–22.5 cm long, 0.8–2 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 14–25 and 9–19 mm long; the interjugal parts 0.6–0.9 times longer than the infrajugal part; the ultrajugal part absent to distinct. Petiolules 1.5–4 mm long. *Leaflets* 6–13 pairs, in the maxijugal leaf 8–13, usually narrowly ovate, narrowly elliptic or narrowly obovate, sometimes linear, ovate or obovate; base acute; apex acute, long mucronate; terminal leaflet smaller to larger than the lateral ones, 30–72 by 5–17 mm, lateral leaflets 13–76 by 5–17 mm. Midrib flat or raised in a furrow above. Distinct nerves 13–31 pairs, raised below, flat or slightly raised above, angle with midrib 30–50 degrees at base, 20–45 degrees halfway the nerve. Venation distinct below, vague above. *Pseudoracemes* terminal, axillary, or leaf-opposed, 2.5–39.5 cm long; some basal bracts similar to vegetative leaves. Fascicles with 5–13 flowerbuds. Bracts to the fascicles narrowly triangular, 2.2–6 by 0.5–1.5 mm, often deciduous. Bracts to the flowers narrowly triangular, 1.6–3.5 by 0.2–0.8 mm, sometimes deciduous. Pedicel 9–16 mm long. *Flower* 13–26 mm long. *Calyx* cup fleshy, 3–4 by 4.5–7 mm, sericeous, teeth sericeous outside, glabrescent, pubescent to sericeous inside; vexillary one broadly deltoid, 1.5–2.5 by 5–7 mm, its tops 0.3–2 by 1–3 mm; lateral ones triangular, 1–2.5 by 1.5–3 mm; the carinal one

triangular, 1.2–4 by 1.3–3 mm, the carinal tooth longer than or as long as the other teeth and 0.5–1.5 times as long as the cup. *Standard* blade broadly ovate to orbicular to broadly obovate, sometimes auricled at base, apex rounded to emarginate, the very apex sometimes acuminate, 13.5–23.5 by 11–25 mm; claw 1–5 mm long. *Wing* blades 12–20 by 5.5–13 mm, glabrous, lateral ribs extending over 4–10 mm; claw 1–4.5 mm long. *Keel* blades 11–20 by 3–10 mm, glabrous, lateral pockets sometimes bulgy, 1.5–7 mm long; claw 1.5–4.8 mm long. *Staminal tube* 8–20 mm long, glabrous. Vexillary filament free at base and connate halfway, 13–26 mm long, glabrous; the other filaments alternately longer and shorter; free parts resp. 5–9 and 3–5.5 mm long. Anthers 1–1.5 mm long. *Ovary* 8.5–20 by 0.7–1 mm. Style not twisted, 7.2–11 mm long, bearded on both sides, or bearded only at vexillary side; stigma penicillate at base. Ovules 10–15. *Pod* linear, flat, 68–120 by 5–8 mm, slightly convex around seeds. *Seeds* 10–15, broadly ovate, brown or greyish brown with dark patches, 4–5.5 by 3–3.8 mm.

Collector's notes. Herbs, shrubs or small trees, erect, straggling branches from base, 1–3.5 m, d.b.h. 3–4 cm. Leaflets glaucous green, soft, with silvery indumentum. Rachis with brown indumentum. Flowers white, silky, with dark brown hairs on the outside. Calyx green. Pods green or brown with silky hairs. Flowering and fruiting the year round.

Distribution. Native of India, introduced, cultivated and naturalized in Malesia. Records from India, Sri Lanka, Burma, Sumatra, Malay Peninsula, Java, Lesser Sunda Islands, Borneo, Philippines, Celebes, Moluccas, New Guinea, Solomon Islands, New Zealand, West Indies, Hawaii.

Habitat. Primary forest, forest regrowth, secondary forest, sago swamps, roadsides, cultivated ground, riverbanks, edge of a ravine, plantations, sunny places. Altitude up to 1650 m.

Ecology. Exhibits tolerance to drought, waterlogging, grazing, low pH, mine spoil, poor soil, shade, slope and wind. Ranging from subtropical moist to wet through tropical very dry to moist forest life zone. Tolerated annual precipitation 7.0–26.7 dm, annual mean temperature 18.0°–27.5° C and pH 5.0–8.0. Clay, sand or poor soil, pebble. Diseases caused by fungi (Back. & Sloot., 1924; Duke, 1981), nematodes (Back. & Sloot., 1924; Duke, 1981), insects (Duke, 1981), mites and the virus Brazilian tobacco streak. Pollinated by Xylocopa latipes (Heide, 1923).

Vernacular names. English name: White tephrosia. Sumatra: Poko tom, ydjo (Deli). Java: Entjeng-entjeng (Jav.), katjang babi, kapeping badah (Sund.). New Guinea: Nimelle (Wapi-lang., Wigote), pis pea (Pidgin). India: Boga medeloa (Assam).

Uses. Used as a green manure (Java, Sumatra, Hawaii) and as a covercrop especially in tea, coffee, coconut and rubber plantations and to some extent in citrus orchards. Said to improve tobacco and hasten ripening of coconut when intercropped. Often grown as a contour hedge in citrus area, around rubber plantations and cinnamon orchards. Cuttings used for mulching. Occasionally grown as an ornamental plant. The bark of the root and the leaves used as a fishpoison (according to Back. & Sloot., 1924, but this is according to Burkill (1935) doubtful), also recorded to be insecticidal.

Chromosome number. 2n = 22 (Duke, 1981).

First dated record. India 1808 (Wallich, Cat.); Java 1860 (Hort. Bog.).

Notes. 1. This species is characterized by the fleshy calyx, the shape of the calyx teeth, the large flower and long pedicel and the often glabrous outside of the calyx teeth.

2. The specimens with the upper surface of the leaflets puberulous do not differ in any other characters from the specimens with a glabrous upper surface or with hairs on the midrib. Therefore no varieties are distinguished in the Malesian area.

3. Hasskarl (1843) followed by Zollinger (1846) ascribed *Xiphocarpus candidus* to Endlicher (Gen. Pl., 1840: 1273). The latter, however, only mentioned *T. candida* as a synonym of *Xiphocarpus* Presl and did not present the new combination. By citing plate 7 in Presl, Symb. Bot. 1, which represents *X. martinicensis*, the only species described by Presl under *Xiphocarpus*, Endlicher could have considered *T. candida* to be a synonym of this species. Anyhow, Hasskarl is the author of *Xiphocarpus candidus.*

4. Tephrosia elliptica Bosman & De Haas, *sp. nov.* – **Fig. 4. Map 3.**

T. purpurea similis, foliolis ellipticis, 13–23 mm longis, floribus 10–30-fasciculatis, 3.5–5.5 mm longis differt. – Typus: *A. Horst 53* (BO), 1-12-1921, Flores.

Indument velutinous, sericeous or strigose. Stipules 2.4–5.5 by 0.2–0.5 mm. Rachis of *leaf* 1.2–12.8 cm long, 0.5–1 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 6–16 and 6–9 mm long; the interjugal parts 0.5–1.1 times longer than the infrajugal part; the ultrajugal part absent to distinct. Petiolules 1–2 mm long. *Leaflets* 3–13 pairs, in the maxijugal leaf 9–13, elliptic, narrowly elliptic or linear elliptic; base acute to rounded, apex rounded to emarginate; terminal leaflet smaller to larger than the lateral ones, 5–22 by 2–7 mm; lateral leaflets 4–23 by 2–6 mm. Midrib (slightly) raised above. Distinct nerves 5–11 pairs, raised below, (slightly) raised above, angle with midrib 20–25 degrees at base, 10–20 degrees halfway the nerve. Venation distinct on both surfaces, sometimes indistinct below. *Pseudoracemes* terminal, or axillary, or leaf-opposed, 7.5–26.5 cm long; some basal bracts similar to vegetative leaves. Fascicles with 8–30 flowerbuds. Bracts to the fascicles linear triangular, 2.2–4.2 by 0.2–0.4 mm. Bracts to the flowers narrowly triangular to linear triangular, c. 1 by 0.1–0.2 mm. Pedicel 1–4 mm long. *Flower* 3.5–5.5 mm long, strongly curved. *Calyx* cup 1–2.3 by 1.2–2.5 mm, teeth pubescent within; the vexillary one deltoid to broadly deltoid, 1.2–2.1 by 2–3 mm, its tops 0.3–0.9 by 0.1–0.2 mm; the lateral ones deltoid, 1.2–2.1 by 0.6–1.1 mm; the carinal one deltoid to triangular, 1.5–2.6 by 0.6–1 mm, longer than or as long as the other teeth and 1–2 times as long as the cup. *Standard* blade broadly ovate, apex retuse to emarginate, 4.5–5.5 by 5.5–6 mm; claw 1–1.5 mm long. *Wing* blades auricled at vexillary side, 3.5–4.5 by 2.5 mm, glabrous, lateral ribs extending over 1.5–2.5 mm; claw 1.3–2 mm long. *Keel* blades auricled at vexillary side, 2.5–4 by 2.2–2.9 mm, glabrous, lateral pockets bulgy, 1–1.5 mm long; claw 1.5–2 mm long. *Staminal tube*

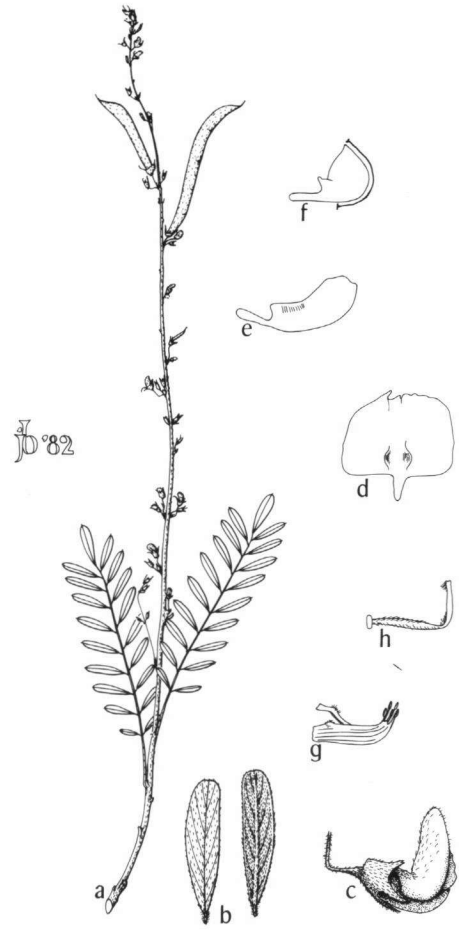

Fig. 4. *Tephrosia elliptica*. – a. Habit, x ½; b. leaflet, left from above, right from below, x 1½; c. flower, x 2½; d. standard inside, x 2½; e. wing petal, x 2½; f. keel petal, curved line indicates connate part, x 2½; g. stamens, only 5 anthers depicted, x 2½; h. ovary with disk, x 2½. (*A. Horst 53*, type, BO).

4–4.5 mm long, velutinous on the auricles. Vexillary filament free at base and connate halfway, 4.9–5.4 mm long, velutinous on the auricles and up to halfway the connection; the other filaments alternately longer and shorter, free parts resp. 1.2–2.5 and 0.8–1.8 mm long. Anthers 0.2–0.5 mm long. *Ovary* 3.8–4 by 0.2–0.4 mm, sericeous. Style not twisted, 2.5–3.5 mm long, glabrous; stigma penicillate at base. Ovules 4–9. *Pod* linear, flat, 20–37 by 3–4 mm, slightly convex around seeds. *Seeds* 2–5, rectangular, dark brown, c. 3.5 by 1.5 mm.

Collector's notes. Flowers pink.

Distribution. Lesser Sunda Islands (3 coll.), Queensland (1 coll.).

Habitat. Deserted fields, hills, forest. Rocky limestone country. Altitude 20 m.
First dated record. Sumbawa 1847 (Zollinger).

Notes. 1. *Tephrosia* species have the flowerbuds concentrated in fascicles. The number of flowerbuds per fascicle varies from 2–13. During the study of *T. purpurea* a group of specimens with 10–30 flowerbuds per fascicle has been distinguished. These specimens also share, besides a similar general appearance, a different number and shape of the leaflets. Because this group of specimens can easily be recognized and because the number of flowerbuds per fascicle is more or less constant in other *Tephrosia* species, it is considered to represent a separate species. Characteristic for *T. elliptica* is the number of flowerbuds per fascicle (10–30). In *T. candida* some specimens occasionally have 13 flowerbuds per fascicle, but other differences exclude confusion.

2. *T. elliptica* also resembles *T. zollingeri*, but differs even in more characters than from *T. purpurea.*

5. Tephrosia filipes Benth. – **Fig. 1i, 3f. Map 4.**

T. filipes Benth., Fl. Austr. 2 (1864) 208; Bailey, Queensl. Fl. 2 (1900) 394; Verdc., Man. N. G. Legum. (1979) 338. – *Cracca filipes* (Benth.) O. K., Rev. Gen. Pl. 1 (1891) 175. – Lectotype: *Leichhardt s.n.*, s.d. (K, proposed here), Queensland, Erythrina Creek.

Indument strigose. Stipules 1.5–4 by 0.1–0.4 mm. Rachis of *leaf* 0.1–3 cm long, 0.2–0.5 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 1–4 and 2–5 mm long; the interjugal parts 1–2 times longer than the infrajugal part; ultrajugal part absent to distinct. Petiolules 0.5–1 mm long. *Leaflets* 1–10 pairs, in the maxijugal leaf 3–10, linear elliptic to linear obovate; undersurface greyish; base cuneate; apex rounded to emarginate; terminal leaflet larger than or about as large as the lateral ones, 6–30 by 1–3 mm; lateral leaflets 3–18 by 1–2.5. Midrib flat or sunken above. Distinct nerves 3–10 pairs, raised below, flat or slightly raised above, angle with midrib up to 10 degrees at base, straight. *Pseudoracemes* filiform, terminal, or axillary, or leaf-opposed, 1.8–6.1 cm long, with only a few fascicles at apex. Fascicles with 2–5 flowerbuds. Bracts to the fascicles triangular to linear triangular, 1–4 by 0.1–0.4 mm. Bracts to the flowers triangular to linear triangular, 0.5–3 by 0.1–0.3 mm. Pedicel 1–2.5 mm long. *Flower* 3–4 mm long. *Calyx* cup 1–1.5 by 1–2 mm, teeth pubescent within at apex, the vexillary one deltoid to broadly deltoid, 1.1–2 by 1.2–2.2 mm, its tops 0.8–1.5 by 0.4–0.7 mm; the lateral ones triangular to narrowly triangular, 1.1–1.8 by 0.1–1 mm; the carinal one triangular to narrowly triangular, 0.7–2.3 by 0.1–0.8 mm, longer than or as long as the other teeth and 1–2 times as long as the cup. *Standard* blade ovate to orbicular, apex truncate to emarginate, 2.3–4.8 by 2.8–6 mm; claw 0.3–1.5 mm long. *Wing* blades often auricled at vexillary side, 2.3–4 by 1.1–2.5 mm, glabrous or slightly sericeous near the apex, lateral ribs extending over 0.8–2 mm; claw 0.4–1.8 mm long. *Keel* blades often auricled at vexillary side, 1.8–4 by 1–3 mm, glabrous, lateral pockets absent or sometimes bulgy, 0.5–2 mm long; claw 0.5–1.8 mm long. *Staminal tube* 2.3–5.4

mm long, sericeous at the auricles and up to halfway the connection. Vexillary filament free at base and connate halfway, 1.8–4.8 mm long, sericeous at the auricles and at the whole length of its connected part; the other filaments alternately longer and shorter, free parts resp. 0.9–1.8 and 0.6–1.1 mm long. Anthers 0.2–0.3 mm long. *Ovary* 1.8–3 by 0.3–0.4 mm, sericeous. Style often twisted, 1–2.5 mm long, apical half glabrous; stigma penicillate at base. Ovules 6–9. *Pod* linear, flat, 11–30 by 1.5–3 mm, slightly convex around seeds. *Seeds* 3–9, orbicular to transversely elliptic or rectangular, light brown to dark brown to black, some slightly reticulately ridged, 1.8–2.4 by 1.3–1.8 mm.

Distribution. N. Australia, New Guinea.

See further under the subspecies.

a. subsp. **filipes** – **Fig. 1i, 3f.**

Leaflets 7–10 pairs, 3–10 in the maxijugal leaf. The uppermost pair of leaflets (2/3–)3/4–1 times as long as the terminal leaflet, lateral leaflets 3–14 mm long, terminal leaflet 5–18 mm long. Bracts to the fascicles 1.1–1.8 mm long. Bracts to the flowers 0.5–1 mm long. Tops of the vexillary calyx lobe 0.8–1.1 mm long. Standard blade 3.2–4.8 by 3.5–6 mm. Wing blades 2.6–4 by 1.4–2.5 mm. Keel blades 2.8–4 by 1.7–3 mm. Ovary 2.5–3 mm long. Style 1.8–2.5 mm long.

Collector's notes. Small erect or semi-erect herb with numerous slender branches, sometimes spreading on the ground, up to 3 m. Leaflets grey to green. Flowers mauve, crimson, pink, purple, mauve blue or reddish lavender.

Distribution. N. Australia.

Habitat. On rocky hillsides, woodland, rocky savannah and roadsides. In sandy clay or skeletal soil with quartz. Altitude 15–950 m.

Cultivated. In Botanical Gardens Brisbane.

First dated record. New Holland 1821 (A. Cunningham).

b. subsp. **longifolia** Bosman & De Haas, *subsp. nov.*

A subspecies typica foliolis terminalibus foliolis lateralibus 1.5–2 plo longioribus, vexillo 2.3–3 mm longo, carina 1.8–2.2 mm longa, 1–1.4 mm lata, ovario 1.5–2.3 mm longo, stylo 1–1.5 mm longo differt. – Typus: *NGF 22208* (Gillison) (A; iso K, L, LAE, SING), 15-2-1965, New Guinea, Fairfax.

Leaflets 2–7 pairs, 4–7 in the maxijugal leaf. The uppermost pair of leaflets 1/2–2/3 times as long as the terminal leaflet; lateral leaflets 4–18 mm long; terminal leaflet 6–30 mm long. Bracts to the fascicles 1–4 mm long. Bracts to the flowers 0.8–3 mm long. Tops of the vexillary calyx lobe 0.8–1.5 mm long. Standard blade 2.3–3 by 2.8–3.2 mm. Wing blades 2.3–2.8 by 1.1–1.4 mm. Keel blades 1.8–2.2 by 1–1.4 mm. Ovary 1.5–2.3 mm long. Style 1–1.5 mm long.

Collector's notes. Small spreading erect herb, 0.2–0.3 mm. Upper surface of leaflets bluish green, undersurface grey green. Flowers red, purple, pink or mauve.

Distribution. New Guinea.

Habitat. Woodland savannah, savannah grasslands, open grassland, roadsides. Altitude 1–75 m.

First dated record. Papua New Guinea 1935 (C.E. Carr).

Note. In New Guinea *T. filipes* is characterized by the length of the terminal leaflets, which are linear and 1.5–2 times as long as the uppermost pair of leaflets.

6. Tephrosia leptoclada Benth. – Fig. 1k, 3d. Map 5.

T. leptoclada Benth., Fl. Austr. 2 (1864) 207; Bailey, Queensl. Fl. 2 (1900) 393; Merr. & Perry, J. Arn. Arb. 23 (1942) 400; Verdc., Man. N. G. Legum. (1979) 338. – *Cracca leptoclada* (Benth.) O. K., Rev. Gen. Pl. 1 (1891) 175. – Lectotype: *Bowman s.n.*, s.d. (K, proposed here), Queensland, Bowen River; *Mueller s.n.*, s.d. (para, K), Australia, Upper Victoria River.

Indument strigose or puberulous. *Leaves* sometimes unifoliolate or rarely bifoliolate. Stipules 1–8 by 0.1–1.1 mm. Rachis of leaf 1–7.3 cm long, 0.5 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 14–43 and 10–21 mm long; the interjugal parts 0.4–1.1 times longer than the infrajugal part; the ultrajugal part absent. Petiolules 0.5–1.5 mm long. *Leaflets* 1–4 pairs, also in the maxijugal leaf, linear elliptic, base cuneate; apex acute to obtuse; terminal leaflet larger than the lateral ones, 30–95 by 0.5–4 mm; lateral leaflets 10–75 by 1–3.5 mm, rarely reduced to 1–2.8 by 0.1 mm if only one pair of lateral leaflets is present; leaflet of the unifoliolate leaves 28–95 by 1–6 mm; leaflets of the bifoliolate leaves 25–59 by 1–1.5 mm. Midrib flat or slightly raised above. Distinct nerves 6–22 pairs, raised below, flat or slightly raised above, angle with midrib 5–10 degrees at base, up to 5 degrees halfway the nerve. *Pseudoracemes* terminal, or axillary, or leaf-opposed, 4–24 cm long; sometimes some basal bracts similar to vegetative unifoliolate leaves. Fascicles with 3–4 flowerbuds. Bracts to the fascicles triangular to narrowly triangular, 0.9–2.1 by 0.2–0.5 mm. Bracts to the flowers triangular, 0.3–1 by 0.1–0.4 mm. Pedicel 1.5–3(–5) mm long. *Flower* 5–7 mm long. *Calyx* cup 1–1.8 by 1.8–2.5 mm; teeth puberulous within at apex; the vexillary one broadly deltoid, 1.3–1.8 by 2–2.5 mm, its tops 0.6–1.3 by 0.3–0.6 mm; the lateral ones triangular, 1.2–1.7 by 0.6–0.9 mm; the carinal one triangular, 1.2–2.5 by 0.4–1 mm, about as long as the other teeth and 1–1.5 times as long as the cup. *Standard* blade broadly ovate to orbicular, apex truncate or retuse, 3.5–6.4 by 4.5–8.5 mm; claw 0.8–2.4 mm long. *Wing* blades auricled at vexillary side, 3.2–6.8 by 1.5–3.8 mm, glabrous, lateral ribs extending over 1.5–2 mm; claw 1–2 mm long. *Keel* blades slightly auricled at vexillary side, 2.5–4.8 by 2–3 mm, glabrous, lateral pockets often bulgy, 0.5–2 mm long; claw 1.4–2.4 mm long. *Staminal tube* 3–4.8 mm long, velutinous at the auricles and rarely some at the lateral sides. Vexillary filament free at base and connate halfway, 4–6 mm long, hairs at the auricles and up to halfway its connected part; the other filaments alternately longer and shorter, free parts resp. 1.4–1.8 and 1–1.2 mm long. Anthers 0.3–0.5 mm long. *Ovary* 3.5–4.5 by 0.4–0.5 mm. Style not twisted, 2–2.4 mm long, apical half glabrous; stigma penicillate at base. Ovules 6–11. *Pod* linear,

flat, 21–41 by 2.5–4 mm, convex around seeds. *Seeds* 5–10, transversely elliptic, dark brown to black, 1.8–3.5 by 1.5–3 mm.

Collector's notes. Spreading low shrub or small subshrub, c. 1.5 m. Stems reddish brown. Leaflets light green. Flowers red, pink or maroon deep pink.

Distribution. New Guinea (1 coll.), N. Australia (several collections).

Habitat. Savannah forest on ridges, low open forest with Eucalyptus, along railroad, roadsides. In N. Australia on reddish brown sandy soil, sandy lateritic soil, gravelly grey soil and rocky lateritic loam. Altitude 400–450 m.

First dated record. Australia 1802/5 (R. Brown); New Guinea 1936 (L.J. Brass, Wassi Kussa River).

Notes. 1. The linear shape of the leaflets and the occurrence of unifoliolate leaves is characteristic for this species.

2. Only one specimen from New Guinea has been collected. The description of *T. leptoclada* is mainly based on the Australian specimens.

7. Tephrosia luzoniensis Vogel – Fig. 1e, 3c. Map 2.

T. luzoniensis Vogel in Meyen, Nov. Act. Nat. Cur. 19, suppl. 1 (1842) 15; Walpers, Rep. Bot. Syst. 1 (1842) 675; Miq., Fl. Ind. Bat. 1, 1 (1855) 299; F.-Vill., Nov. App. (1880) 59; Perk., Fragm. Fl. Philip. 1 (1904) 17; Merr., Philip. J. Sc. 5 (1910) Bot. 69. – Neotype: *Merrill, Sp. Blanc. 499* (L; iso BM, BO, K).

T. confertiflora Benth. in Miq., Pl. Jungh. (1852) 208; Miq., Fl. Ind. Bat. 1, 1 (1855) 296; Gagn. in Lecomte, Fl. Gén. I.-C. 2 (1916) 272. – Lectotype: *Junghuhn 186* (K, proposed here; iso L), 1851, Java, Djogjakarta; *Junghuhn 52* (para, K), 1851, Java, Bantam.

Indigofera hirsuta auct. non L.: Blanco, Fl. Filip. ed. 1 (1837) 591.

Indigofera senegalensis auct. non Lamk.: Blanco, Fl. Filip. ed. 2 (1845) 412; ibid. ed. 3, 2 (1879) 392, t. 162.

T. villosa auct. non Pers.: Zoll., Nat. Geneesk. Arch. N. I. 3 (1846) 54.

T. coarctata Miq., Fl. Ind. Bat. 1, 1 (1855) 299. – *T. brachystachya auct. non* DC., *non* K. Sch. & Laut.: Zoll. ex Miq., Fl. Ind. Bat. 1, 1 (1855) 299, pro syn. – Type: *Zollinger 3216* (P, n.v.; iso L, U), 22-7-1846, Lombok.

T. dichotoma auct. non Desv.: Merr., Philip. J. Sc. 5 (1910) Bot. 69; Fl. Manila (1912) 244; Gates, Philip. J. Sc. 9 (1914) Bot. 426; Merr., Sp. Blanc. (1918) 180; En. Philip. 2 (1923) 277; Back., Onkr. Suikerr. (1930) 306; Back. & Bakh. f., Fl. Java 1 (1963) 593.

Indument strigose to sericeous or velutinous. Stipules 2–6.5 by 0.1–0.5 mm. Rachis of *leaf* 1–9 cm long, 0.5–1 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 5–10 and 4–10 mm long; the interjugal parts 0.8–1.7 times longer than the infrajugal parts, the ultrajugal part absent to distinct. Petiolules 0.5–1.5 mm long. *Leaflets* 2–12 pairs, in the maxijugal leaf 5–12, obovate to narrowly obovate or elliptic to linear elliptic; base acute to obtuse; apex rounded to emarginate; terminal leaflet smaller to larger than the lateral ones, 6.5–30 by 1.5–9 mm; lateral leaflets 5–28 by 2–7.5 mm. Midrib sunken to raised above. Distinct nerves 4–12 pairs, raised below, raised or slightly raised above, angle with midrib 15–35 degrees at base, 10–30 degrees halfway the nerve. *Pseudoracemes* terminal, or axillary, or leaf-opposed, 1–8.5 cm long, if longer than 3.5 cm then fascicles often close together and concentrated at the upper half of the inflorescence; some basal bracts

similar to vegetative leaves. Fascicles with 4–7 flowerbuds. Bracts to the fascicles linear triangular, 2.2–4.5 by 0.4–0.8 mm. Bracts to the flowers linear triangular, 0.8–3 by 0.1–0.5 mm. Pedicel 1–2 mm long. *Flower* 3–7 mm long. *Calyx* cup 1–2 by 1.3–2 mm; the lateral and carinal teeth and the tops of the vexillary tooth sericeous to pubescent; the vexillary one triangular to broadly deltoid, 1.4–3 by 1.5–2.3 mm, its tops 0.5–2.5 by 0.2–0.8 mm; the lateral ones narrowly triangular, 1.6–3 by 0.4–1 mm; the carinal one narrowly triangular, 2–3.8 by 0.5–1 mm, longer than or as long as the other teeth and 2.5–4 times as long as the cup. *Standard* blade orbicular to transversely elliptic, apex truncate to emarginate, 4–5.5 by 4–6 mm; claw 0.3–2 mm long. *Wing* blades sometimes auricled at vexillary side, 3.5–5.5 by 1.2–1.8 mm, glabrous; lateral ribs extending over 1.1–2 mm; claw 0.4–1.8 mm long. *Keel* blades not or slightly auricled at vexillary side, 3.1–5.5 by 1.8–2.9 mm, glabrous; lateral pockets sometimes present, bulgy, 0.9–1 mm long; claw 0.5–2 mm long. *Staminal tube* 2.2–5.8 mm long, glabrous. Vexillary filament free at base and connate halfway, 2.7–6.8 mm long, glabrous; the other filaments alternately longer and shorter, free parts resp. 1–2.2 and 0.7–1.9 mm long. Anthers 0.3–0.5 mm long. *Ovary* 2.8–5 by 0.4–0.7 mm, sericeous. Style sometimes twisted, 1.4–3.5 mm long, apical half glabrous; stigma penicillate at base. Ovules 8–10. *Pod* linear, flat, 12–36 by 3–7 mm, slightly convex around seeds. *Seeds* 2–10, transversely elliptic or rectangular to quadrangular, light brown to dark brown, 1.8–3 by 1.5–3.1 mm.

Collector's notes. Herbs or shrubs, 0.3–0.9 m. Flowers red, purple or pink. Fruits purple, red or brown. Periodically much desiccating.

Distribution. Java, Madura, Lesser Sunda Islands, Philippines.

Habitat. Grasslands, open dry places, ridges, dunes, roadsides, waste places, riverbeds, parang, alang fields, sunny localities. On loam, sand, rocky soil and volcanic sand. Altitude up to 500 m.

Vernacular names. Java: Tom'man (Jav.), kedong djati. Philippines: Bala batong (Buk.), dagang-dáng (Bis.), maásik (Pamp.), marakatúdal (Ilk.), tayom-tayóman (Tag.).

Cultivated. In the Botanical Gardens Bogor as a green manure.

First dated record. Java 1808/18 (Horsfield, Semarang).

Notes. 1. *T. luzoniensis* resembles *T. pumila*, but differs, among other characters, in the structure of the inflorescence. In *T. luzoniensis* the fascicles are concentrated at the upper half of the rachis of inflorescence, containing more than 6 fascicles per inflorescence. In *T. pumila* the fascicles are evenly distributed along the rachis of inflorescence, containing 1–5 fascicles per inflorescence.

2. The material under the name *T. dichotoma* is not very variable: 3–9 pairs of leaflets (5–9 in the maxijugal leaves), obovate, narrowly obovate or narrowly elliptic, the terminal leaflet about as large as the lateral ones. In the original description of Desvaux (Ann. Sc. Nat. 1, 9, 1826, 415), however, 4 pairs of ovate leaflets are mentioned. The type specimen of *T. dichotoma* is in Paris, and we saw a photo of it from Kew. On the type sheet two different species are found: the one on the left agrees with the original description: 4 pairs of leaflets, 10–12 seeds; the one on the right resembles the examined material. The specimen on the left is *T. dichotoma* Desv., the

one on the right represents *T. luzoniensis*. The synonyms of *T. dichotoma* Desv. have been examined, but these appeared to be synonyms of the right part of the sheet and not of *T. dichotoma*. The oldest available epithet for this group is '*luzoniensis*'. *T. dichotoma* Desv. is placed in the synonymy of *T. pumila* (Lamk.) Pers.

3. Bentham (1852) indicates that *T. diffusa* (Roxb.) W. & A. and *T. capitulata* Link resemble *T. confertiflora (= T. luzoniensis). T. diffusa* (Roxb.) W. & A. is characterized by 5–10 pairs of leaflets and 6–7 seeds and is not a synonym of *T. confertiflora*. The description of *T. capitulata* Link is very short and not very clear and because the type specimen was unavailable it is impossible to decide whether this is a synonym or not.

4. According to Merrill (1910) *T. piscatoria* Gray non Pers. is a synonym of *T. dichotoma* (sensu Merr.). The description of *T. piscatoria* is unfortunately too short to decide whether this is a synonym of *T. dichotoma* (sensu Merr.). Gray mentions *T. littoralis* as a synonym of his *T. piscatoria*. *T. littoralis* is certainly not a synonym of *T. dichotoma* (sensu Merr.) or *T. dichotoma* Desv., which makes the conspecificity of *T. piscatoria* Gray and *T. dichotoma* (sensu Merr.) not very probable.

5. The original type (*Meyen*, Luzon) is destroyed in Berlin. As long as no duplicates of the type collection have been located, a neotype has been designated above.

8. Tephrosia maculata Merr. & Perry – Fig. 2e, 3e.

T. maculata Merr. & Perry, J. Arn. Arb. 2 (1942) 401; Stemmerik in Van Meeuwen et al., Reinwardtia 6 (1961) 106; Verdc., Man. N. G. Legum. (1979) 343. – Type: *Brass 3703* (A; iso BM, BO), April 1933, New Guinea, Baroka.

Indument velutinous or velutinous to sericeous or sericeous to strigose. Stipules 3–10 by 0.2–0.5 mm. Rachis of *leaf* 0.8–7 cm long, the infrajugal and interjugal parts of the longest rachis resp. 2–18 and 5–13 mm long; the interjugal parts 0.8–3 times longer than the infrajugal part; the ultrajugal part distinct. Petiolules 1–2 mm long. *Leaflets* 1–6 pairs, in the maxijugal leaf 2–6, narrowly elliptic to narrowly obovate, elliptic to obovate; base acute; apex rounded to emarginate, terminal leaflet larger than or as large as the lateral ones, 10–50 by 2.5–18 mm; lateral leaflets 7–40 by 2.5–10 mm. Midrib (slightly) raised above. Distinct nerves 5–15 pairs, raised below, raised or slightly raised above, angle with midrib 10–35 degrees at the base, 10–20 degrees halfway the nerve. Venation distinct on both surfaces. *Pseudoracemes* terminal, or leaf-opposed, 0.5–18 cm long; some basal bracts similar to vegetative leaves; fascicles sometimes close together. Fascicles with 3–7 flowerbuds. Bracts to the fascicles linear triangular, 2.5–9 by 0.2–0.5 mm. Bracts to the flowers linear triangular, 0.8–5 by 0.1–0.3 mm. Pedicel 1.5–4.5 mm long. *Flower* 4–7 mm long. *Calyx* cup 1.2–2 by 1.5–2.5 mm; the teeth pubescent to sericeous within at apex; the vexillary one broadly deltoid, 0.9–2 by 1.3–3 mm, its tops 0.5–1.5 by 0.2–1 mm; the lateral ones triangular, 1–1.8 by 0.4–1 mm; the carinal one triangu-

lar to narrowly triangular, 1.1–2.2 by 0.5–1 mm, longer than or as long as the other teeth and 1–1.5 times as long as the cup. *Standard* blade orbicular to broadly ovate, slightly auricled at base, apex retuse to emarginate, 3.5–7 by 4.5–8 mm; claw 0.3–2 mm long. *Wing* blades auricled at vexillary side, 3–5.3 by 1.2–3.8 mm, glabrous, lateral ribs extending over 1–2 mm; claw 0.8–2.1 mm long. *Keel* blades auricled at vexillary side, 1.5–3 by 1.5–3 mm, glabrous, lateral pockets sometimes bulgy, 0.8–1.2 mm long; claw 0.8–2.4 mm long. *Staminal tube* 2–5 mm long, velutinous at the auricles. Vexillary filament free at base and connate halfway, 2.4–6 mm long, velutinous at the auricles and along the connected part, the other filaments alternately longer and shorter, free parts resp. 1.4–2.2 and 0.5–1.8 mm long. Anthers 0.2–0.4 mm long. *Ovary* 2.5–4 by 0.3–0.8 mm, sericeous. Style not twisted, 2–3 mm long, apical half glabrous; stigma penicillate at base. Ovules 4–6. *Pod* linear, flat, 7–27 by 2.5–4 mm, convex around seeds. *Seeds* 1–6, orbicular to transversely elliptic or rectangular to lozenge-shaped, pale greyish light brown to brown with dark brown patches, 1.5–3.3 by 1.5–3.4 mm.

Distribution. New Guinea, Moluccas.

Note. The size of the pod and the small number of seeds are characteristic for *T. maculata.*

a. var. maculata – Fig. 2e.

Branches, rachis and upper surface of the leaflets velutinous. Undersurface of the leaflets and pod velutinous to sericeous; upper surface of the stipules and of the bracts velutinous to sericeous or glabrous. Stipules 3–8 mm long. Infrajugal part of the longest leaf rachis 2–6 mm long. Inflorescence up to 2–16 cm long. Bracts to the fascicles 2.5–3.5 mm long.

Collector's notes. Low erect herb or shrub, much branched, 0.7–1.5 m. Leaflets grey green, midrib brown. Flowers pale purple, bright mauve, bright blue-mauve, bright purplish pink or lavender pink. Pod light green when young, light brown when ripe.

Distribution. New Guinea, Moluccas.

Habitat. Savannah forest grasslands, Eucalyptus savannah, low open forest on hill slopes, ridges, well drained slopes, alang field. Altitude 30–75 m and according to Verdcourt (1979) 990 m.

First dated record. Timor Laut 1884 (Meyer); New Guinea 1933 (Brass, Baroka).

b. var. appressepilosa (Verdc.) Bosman & De Haas, *stat. nov.* – Fig. 3e.

T. maculata Merr. & Perry subsp. *appressepilosa* Verdc., Kew Bull. 32 (1977) 247; Man. N. G Legum. (1979) 344. – Type: *Branderhorst 292* (K; iso L), 22-8-1908, New Guinea.

T. brachystachys K. Sch. & Laut., Fl. Schutzgeb. ([1901] 1900) 353, nom. inval., non DC. – Type: *Lauterbach 2784* (B †; photo K), 5-9-1896, New Guinea, Kaiser Wilhelmsland.

T. confertiflora auct. non Benth.: Valeton, Bull. Dép. Agr. Ind. Néerl. 10 (1907) 17; Pulle, Nova Guinea 8, 2 (1910) 375.

Indument strigose to sericeous, pod sometimes sericeous to velutinous. Upper surface of the stipules and of the bracts glabrous. Stipules 3–7 mm long. Infrajugal part of the longest leaf rachis 3–8 mm long. Inflorescence up to 1.4–4 cm long. Bracts to the fascicles 2.5–3.2 mm long.

Collector's notes. Shrub, 1–1.2 m. Leaflets grey. Flowers purple.

Distribution. New Guinea.

Habitat. Savannah forests, secondary grasslands, alang fields. Altitude 200–1000 m.

First dated record. New Guinea 1896 (Lauterbach, Bismarck Mts.).

Note. Verdcourt (1979) mentions *T. brachystachys* K. Sch. & Laut. as a synonym of *T. maculata* Merr. & Perry subsp. *maculata*. We saw only a photo of the type specimen, but the original description of *T. brachystachys* makes clear that it has an appressed indument, so that *T. brachystachys* K. Sch. & Laut. has to be considered a synonym of *T. maculata* Merr. & Perry var. *appressepilosa* (Verdc.) Bosman & De Haas.

c. var. **elongata** Bosman & De Haas, *var. nov.*

A varietate typica indumento dense velutino, stipulis 7–10 mm longis, bracteis fasciculorum 5–9 mm longis differt. [– *T. sp. A* Verdc., Man. N. G. Legum. (1979) 347.] – Typus: *Carr 11372* (BM; iso K, L), 17-2-1935, New Guinea, Hisiu.

Indument densely velutinous. Stipules 7–10 mm long, upper surface velutinous. Infrajugal part of the longest leaf rachis 5–18 mm long. Inflorescence up to 13–18 cm long. Bracts to the fascicles 5–9 mm long, upper surface sericeous to velutinous. Upper surface bracts to the flowers glabrous.

Collector's notes. Herb, 1.2 m. Flowers bright rose-purple.

Distribution. Papua New Guinea: Hisiu (1 coll.).

Habitat. Open grassy places near the sea. Altitude sea level.

First dated record. New Guinea 1935 (Carr, Hisiu); only one specimen has been collected.

9. Tephrosia nana Kotschy ex Schweinf. – **Fig. 2a, 3q.**

T. nana Kotschy ex Schweinf., Reliq. Kotsch. (1868) 20, t. 16; Baker in Oliver, Fl. Trop. Afr. 2 (1871) 109; Gillett, Kew Bull. 13 (1958) 130; Brummitt, Bol. Soc. Brot. 2, 41 (1967) 329; Gillett, Fl. T. E. Afr., Legum. 3, Pap. 1 (1971) 208. – *Cracca nana* (Schweinf.) O. K., Rev. Gen. Pl. 1 (1891) 175. – Type: *Schweinfurth 1871* (K; iso BM), 29-8-1865, Gallabat; *Boriani 109* (para, W, n.v.), 1839, Fesoglu.

T. barbigera Welw. ex Baker in Oliver, Fl. Trop. Afr. 2 (1871) 113; de Wildeman, Bull. Soc. R. Bot. Belg. 57 (1925) 115; Back. & Bakh. f., Fl. Java 1 (1963) 595. – *Cracca barbigera* (Baker) O. K., Rev. Gen. Pl. 1 (1891) 174; Hiern, Cat. Afr. Pl. 1 (1896) 220. – Lectotype: *Welwitsch 2096* (K, proposed here), March 1856, Angola.

Indument sericeous to velutinous. Stipules 3–13 by 0.5–3 mm. Rachis of *leaf* 1.7–14 cm long, 0.5–2 mm diam.; the infrajugal and interjugal parts of the longest

rachis resp. 6–28 and 9–24 mm long; the interjugal parts 0.7–2.3 times longer than the infrajugal parts; the ultrajugal part present. Petiolules 1–3 mm long. *Leaflets* 3–11 pairs, in the maxijugal leaf 5–11, elliptic to linear elliptic or obovate to narrowly obovate; base acute; apex obtuse or rounded to emarginate; terminal leaflet larger than or as large as the lateral ones, 15–68 by 3–17 mm; lateral leaflets 8–62 by 3–16 mm. Midrib raised or raised in a furrow above. Distinct nerves 5–18 pairs, raised on both surfaces, angle with midrib 15–30 degrees at base, 10–20 degrees halfway the nerve. Venation sometimes distinct on both surfaces. *Pseudoracemes* terminal, or axillary, or leaf-opposed, 2–33 cm long; some basal bracts similar to vegetative leaves. Fascicles with 3–4 flowerbuds. Bracts to the fascicles narrowly triangular, 3–8 by 0.5–0.9 mm. Bracts to the flowers narrowly triangular, 1–3 by 0.1–0.4 mm. Pedicel 3–5.5 mm long. *Flower* 8–14 mm long. *Calyx* cup 2–3.5 by 3–5.5 mm, the lateral and carinal teeth and the vexillary tops pubescent within; the vexillary one broadly deltoid, 1.1–2.1 by 3–4.5 mm, its tops 0.5–0.8 by 0.2–1 mm; the lateral ones deltoid to broadly deltoid, 1.1–1.8 by 1–1.8 mm, the carinal one triangular to deltoid, 2–3.5 by 1.2–2 mm, longer than the other teeth and 1–1.5 times as long as the cup. *Standard* blade broadly obovate, apex rounded to truncate, 9–13.5 by 8–11.5 mm; claw 1–3 mm long. *Wing* blades sometimes auricled at vexillary side, 7.5–12.5 by 2.5–5 mm, glabrous, lateral ribs extending over 3.2–5 mm; claw 1–3 mm long. *Keel* blades sometimes auricled at vexillary side, 6–12 by 3–6 mm, sometimes sericeous on the connection, lateral pockets 0.5–2.5 mm long; claw 1–3.5 mm long. *Staminal tube* 6.3–12.5 mm long, glabrous. Vexillary filament free at base and connate halfway, 9–16 mm long, glabrous; the other filaments alternately longer and shorter, free parts resp. 2.8–4.5 and 2–3 mm long. Anthers 0.6–1 mm long. *Ovary* 6–12.5 by 0.6–1.5 mm. Style not twisted, 4.5–6 mm long, bearded at vexillary and, sometimes, only the apical half at carinal side; stigma glabrous. Ovules 14–20. *Pod* linear, flat, 45–60 by 4–5 mm, velutinous, dense at the margins, slightly convex and dark brown around seeds. *Seeds* 14–20, transversely elliptic to rectangular, light brown, sometimes with dark patches, 2.6–3.2 by 2–3.1 mm.

Collector's notes. Erect annual herb, somewhat branched, 0.2–1.9 m. Stems pale green, brownish hairy. Leaflets dull grey glaucous green. Flowers purple pink, reddish purple, mauve, red, white. Keel white, pale pink. Calyx pale green. Pods green.

Distribution. Native of tropical Africa, cultivated and naturalized in Java.

Habitat. In Java as an adventive on field borders. In Africa: open savannah woodland, rocky hillside, plains, savannah, grass and gravel. Sandy soil. Altitude 650–1600 m.

Cultivated. In Botanical Garden Bogor ('*T. barabugosa*').

First dated record. Africa 1839 (Boriani, Fesoglu); Java 1923 (Backer, Hort. Bog.).

Notes. 1. The high number of seeds per (relatively short) pod is characteristic for this species.

2. *T. nana* Kotschy ex Schweinf. is native of Africa but introduced in Java (*T. barbigera* in Back. & Bakh. f., 1963). Only one specimen, cultivated in Hort. Bog.,

Java and collected by Backer, *37498*, Jan. 1923 has been seen. Therefore our description of *T. nana* is mainly based on specimens from Africa (including the type specimen). Some of these specimens have a glabrous upper surface of the leaflets, other specimens velutinous. The specimens can also be more or less robust. These differences, however, are possibly not sufficient to base infraspecific taxa upon. The single Java specimen is placed under *T. nana*, noticing that it is a more robust specimen with hairs on the upper surface of the leaflets.

10. Tephrosia noctiflora Bojer ex Baker – **Fig. 2c, d; 31. Map 6.**

T. noctiflora Bojer [Hort. Maur. (1837) 93, nom. nud.] ex Baker in Oliver, Fl. Trop. Afr. 2 (1871) 112; van Helten, Meded. Cult. 1 (1913) 6; Back. & Sloot., Theeonkr. (1924) 136; de Wildeman, Bull. Soc. R. Bot. Belg. 57 (1925) 123; Doct. v. Leeuwen, Zoocecidia (1926) 252; Heyne, Nutt. Pl. N. I. ed. 2, 2 (1927) 777; Back., Onkr. Suikerr. (1930) 306, 310; van der Pijl, Trop. Natuur 19 (1930) 190; Burk., Dict. 2 (1935) 2132; Mutinelli, Rev. Arg. Agr. 12, 4 (1945) 291; Forbes, Bothalia 4 (1948) 965; C.E. Wood, Rhodora 51 (1949) 379; Back. & Bakh. f., Fl. Java 1 (1963) 594; Ali, Biologia 10 (1964) 23; Brummitt, Bol. Soc. Brot. 2, 41 (1968) 228; Gillett, Fl. T. E. Afr., Legum. 3, Pap. 1 (1971) 182; Verdc., Man. N. G. Legum. (1979) 338. – *Cracca noctiflora* (Baker) O. K., Rev. Gen. Pl. 1 (1891) 175. – Type: *Bojer s.n.*, s.d. (K), Zanzibar.

T. subamoena Prain in King, J. As. Soc. Beng. 66, 2 (1897) 86, nom. inval.; Ridl., Fl. Mal. Pen. 1 (1922) 581; Hend., Gard. Bull. S. S. 4 (1928) 247; non Drumm. & Hemsl. ex Hemsl., J. Bot. 54, suppl. 2 (1916) 12. – *T. hookeriana* W. & A. var. *amoena* Prain in King, J. As. Soc. Beng. 66, 2 (1897) 87; van Helten, Teysmannia 22 (1911) 624; Meded. Cult. 2 (1915) bijl. 1; Heyne, Nutt. Pl. N. I. ed. 1, 2 (1916) 278; van Helten, Meded. Alg. Proefst. Landb. 16 (1924) 51; Sampson, Kew Bull. (1928) 161. – Lectotype: *Derry 270* (SING), Aug. 1889, Malacca, Bukit Sabukor; *Curtis 1878* (para, SING), Aug. 1892, Malaya, Penang; *Maingay 1200* (para, K; SING n.v.), 1865/66, Malacca.

Indument strigose to sericeous or pubescent to velutinous. Stipules 4–10 by 0.2–1 mm. Rachis of *leaf* 2–15 cm long, 0.5–1.5 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 5–20 and 7–18 mm long; the interjugal parts 0.6–1.4 times longer than the infrajugal parts; the ultrajugal part usually distinct. Petiolules 1.5–3 mm long. *Leaflets* 3–10 pairs, in the maxijugal leaf 4–10, obovate to narrowly obovate or elliptic; base acute or cuneate to acute; apex rounded to emarginate; terminal leaflet larger than or as large as the lateral ones, 15–41 by 3.5–10 mm; lateral leaflets 8–40 by 2.5–9 mm. Midrib raised, or flat, or raised in a furrow above. Distinct nerves 6–17 pairs, raised on both surfaces, angle with midrib 10–30 degrees at base, 10–25 degrees halfway the nerve. *Pseudoracemes* terminal, or axillary, or leaf-opposed, 13–43 cm long; some basal bracts similar to vegetative leaves. Fascicles with (3–)4–5 flowerbuds. Bracts to the fascicles narrowly triangular to linear triangular, 1–4.8 by 0.2–1 mm. Bracts to the flowers narrowly triangular to linear triangular, 1–3.5 by 0.1–0.5 mm. Pedicel 2–5 mm long. *Flower* 6–11 mm long. *Calyx* cup 2–3 by 3–5 mm, sericeous; teeth puberulous within at apex; the vexillary one broadly deltoid, 1.5–2.5 by 3.5–4.5 mm, its tops 0.5–1.1 by 0.2–1 mm; the lateral ones triangular to deltoid, 1.8–3 by 1.5–2 mm; the carinal one triangular, 2.8–5.6 by 1.2–2 mm, longer than the other teeth and 1.5–2.5 times as long

as the cup. *Standard* blade broadly ovate to transversely elliptic; apex truncate to emarginate, 5.5–8.2 by 7–11 mm; claw 2–2.5 mm long, strongly curved. *Wing* blades 5–8 by 3–5 mm, glabrous, lateral ribs extending over 2.8–4 mm; claw 1.1–3 mm long. *Keel* blades 4.5–6 by 2.5–4 mm, sometimes with a few hairs on the outside, lateral pockets sometimes present, 0.8–1 mm long; claw 1–2.4 mm long. *Staminal tube* 5.5–6.5 mm long, glabrous. Vexillary filament free at base and connate halfway, 7–8.5 mm long, glabrous; the other filaments alternately longer and shorter, free parts resp. 2.5–3.4 and 1.9–2.3 mm long. Anthers 0.5–0.7 mm long. *Ovary* densely sericeous, 5–6 by 0.6–0.8 mm. Style twisted, 4.5–5.5 mm long, apical half glabrous; stigma penicillate at base. Ovules 8–11. *Pod* linear, slightly turgid, 28–55 by 4–6.5 mm, slightly convex around seeds. *Seeds* 5–10, broadly ovate to reniform, reticulately ridged, brown to dark brown, 2.5–4 by 2–3 mm.

Collector's notes. Erect shrub or herb, 0.3–7.5 m, woody at base. Leaves bluish green. Flower white, purple, lavender, light blue, pale lilac, pale violet, pale yellow, purplish tinged yellow or pale purple turning white towards the margins, dorsally with brown hairs. Inside of corolla white and mauve or with radial purple lines. Wings white or at vexillary side purple. Keel somewhat purplish. Pods green or yellow-brown. Seeds green. Flowers open at night (Van der Pijl, 1930). Flowering and fruiting period Dec.–Febr.

Distribution. Native of Africa and probably of India, naturalized in the Malay Peninsula, Java, Philippines, Celebes and New Guinea, also recorded from tropical South America, Seychelles, Madagascar, China, Taiwan, Sumatra, Flores, Borneo, Solomon Islands, New Caledonia.

Habitat. Riverbanks, open Eucalyptus forests, savannah, alang fields, hills, roadsides, secondary coastal vegetation, among sawahs, grasslands, waste land, Hevea plantations, dry sunny or slightly shaded places. Red volcanic or sandy soil. Altitude up to 700 m.

Ecology. Possibly attacked by the bugs Helopeltis antonii and H. theivora in tea plantations (Back. & Sloot., 1924). Suffering from Djamur upas (the fungus Corticium salmonicolor, now Phanerochaete salmonicolor) when old (Van Helten, 1911). Sensitive for heavy rain when young.

Vernacular names. Sumatra: Tom sapi, tom gatel. Malay Peninsula: Petay balangkachil (Penang), kolo thakarai (Taunil), kachang bulu. Java: Nila hutan (Mal.), nila utan. New Guinea: Togarara (Wapi).

Uses. Used as a green manure in Hevea, coffee (since 1907), tea and coconut plantations (Van Helten, 1911, 1913; Heyne, 1916; Back. & Sloot., 1924; Verdcourt, 1979). Grown as a covercrop. Used for contour hedges (Burkill, 1935) and as a fish-poison (Verdcourt, 1979). Often cultivated under the erroneous name of *T. purpurea*.

First dated record. Africa 1830 (Bojer, Zanzibar); Malesia 1891 (Ridley, Malay Peninsula).

Notes. 1. This species is characterized by the long inflorescence, the long carinal calyx tooth (longer than the other teeth and 1.5–2.5 times longer than the cup) and by the reticulately ridged seeds. *T. noctiflora* resembles *T. zollingeri* but has a lower

number of leaflets, less flowerbuds, a shorter pedicel, usually larger flowerparts, a glabrous vexillary filament and staminal tube.

2. Prain (1897) describes *T. hookeriana* W. & A. var. *amoena.* The description agrees with the description of *T. noctiflora.* In the same chapter Prain mentions that *T. hookeriana* var. *amoena* does in fact not belong to *Tephrosia hookeriana*, because of its glabrous leaflets and the length of the leaflets. He could not use '*amoena*' as a specific epithet because of a heterotypic *T. amoena* Meyer. Therefore he suggests that this species could be called *T. subamoena.* This is invalid, because this name is merely mentioned in a note.

11. Tephrosia obovata Merr. – Fig. 1h, 3a. Map 4.

T. obovata Merr., Philip. J. Sc. 5 (1910) Bot. 69; En. Philip. 2 (1923) 278; Huang & Ohashi, Fl. Taiwan 3 (1977) 391. – Lectotype: *FB 16939* (Curran) (K, proposed here), March 1909, Philippines, Luzon; *BS 2341* (Mearns) (para, n.v.), Jan./Febr. 1907, Philippines, Luzon.

Indument sericeous to strigose. Stipules 1–4 by 0.1–1.5 mm. Rachis of *leaf* 0.3–2.8 cm long, 0.3–1 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 9–15 and 2–6 mm long; the interjugal parts 0.2–0.7 times longer than the infrajugal part; the ultrajugal part distinct. Petiolules 0.5–1 mm long. *Leaflets* 2–6 pairs, in the maxijugal leaf 3–6, broadly obovate, obovate or narrowly obovate; base acute or obtuse; apex rounded to emarginate; terminal leaflet larger than or as large as the lateral ones, 3–13 by 2–8 mm; lateral leaflets 3–15 by 2–7 mm. Midrib flat or sunken above. Distinct nerves 4–8 pairs, raised below, raised to flat above, angle with midrib 30–40 degrees at base, 20–35 degrees halfway the nerve. *Pseudoracemes* terminal, or axillary, or leaf-opposed, 1–5 cm long; some basal bracts similar to vegetative leaves. Fascicles with 3–6(–7) flowerbuds. Bracts to the fascicles triangular, 1–2.5 by 0.5–1.5 mm. Bracts to the flowers triangular to narrowly triangular, 0.8–1.5 by 0.3–0.7 mm. Bracteoles sometimes present, 2 per pedicel, triangular, 0.5–0.6 by 0.1–0.3 mm. Pedicel 4–15 mm long. *Flower* 6–9 mm long. *Calyx* cup 1.5–2 by 1.5–3 mm, teeth glabrous, or short sericeous within at apex; the vexillary one deltoid to broadly deltoid, 1.8–2.5 by 2.5–2.8 mm, its tops 0.8–1.1 by 0.5–1 mm; the lateral ones triangular, 1.6–2.7 by 1 mm, the carinal one triangular, 1.9–2.7 by 1 mm, longer than or as long as the other teeth and 1–1.5 times as long as the cup. *Standard* blade transversely elliptic to orbicular, apex rounded or emarginate, 5.5–7 by 7.5–8.5 mm; claw 1.9–2.5 mm long. *Wing* blades auricled at vexillary side, 6–7 by 2–3.8 mm, glabrous, lateral ribs extending over 2.5–3.4 mm; claw 2–2.2 mm long. *Keel* blades sometimes auricled at vexillary side, 5.5–6 by 3–3.6 mm, glabrous, lateral pockets sometimes bulgy, 1–1.5 mm long; claw 2–2.1 mm long. *Staminal tube* 6.2–6.8 mm long, glabrous. Vexillary filament free at base and connate halfway, 6.5–8 mm long, glabrous; the other filaments alternately longer and shorter, free parts resp. 2.3–3 and 1.5–2.2 mm long. Anthers 0.4–0.5 mm long. *Ovary* 5–6 by 0.4–0.6 mm. Style twisted, 4.2–6 mm long, apical half glabrous; stigma penicillate at base. Ovules 7–9. *Pod* linear, slightly turgid, 20–31 by 3–4 mm, slightly con-

vex around seeds. *Seeds* 5–9, transversely elliptic to orbicular or slightly quadrangular, light brown, some with dark brown patches, 2–3.3 by 2–2.5 mm.

Distribution. Taiwan, Philippines, endemic in the Philippines.

Habitat. Dry open places. Altitude low.

Vernacular names. Philippines: Karkardīs (Ibn.).

First dated record. Philippines 1841 (Cuming).

Note. This species is characterized by the shape of the leaflets, the length of the infrajugal part of the rachis of leaf and the length of the pedicel. *T. obovata* resembles *T. rigida*, but differs in the lengths of the longest rachis of inflorescence, the longest rachis of leaf and of the interjugal parts of the longest leaf rachis. In *T. rigida* the venation is distinct, in *T. obovata* invisible.

12. Tephrosia pumila (Lamk.) Pers. – Fig. 1g, 3k.

T. pumila (Lamk.) Pers., Syn. 2 (1807) 330; Spreng., Syst. Veg. 3 (1826) 235; Prain in King, J. As. Soc. Beng. 66, 2 (1897) 366; Haines, Bot. Bihar. Orissa 3 (1922) 244; van Helten, Meded. Alg. Proefst. Landb. 16 (1924) 51; Back., Onkr. Suikerr. (1930) 306, 308; Back. & Bakh. f., Fl. Java 1 (1963) 594; Ali, Biologia 10 (1964) 27; Brummitt, Bol. Soc. Brot. 2, 41 (1967) 238, 258; Gillett, Fl. T. E. Afr., Legum. 3, Pap. 1 (1971) 184; Verdc., Man. N. G. Legum. (1979) 338. – *Galega pumila* Lamk., Enc. Meth. 2, 2 (1788) 599; Willd., Sp. Pl. 3, 2 (1802) 1250. – *T. purpurea* (L.) Pers. var. *pumila* (Lamk.) Baker in Hook. f., Fl. Brit. India 2 (1876) 113. – *T. commersonii* Elliot, J. Linn. Soc. Bot. 29 (1891) 13, nom. illeg. – Type: *Lamarck s.n.*, s.d. (P, n.v., microf. L), Madagascar.

T. procumbens (Hamilton) Benth., Gen. Index to Trans. Linn. Soc. (1866) 101, non Macfad.; Ali, Biologia 10 (1964) 27. – *Galega procumbens* Hamilton, Trans. Linn. Soc. 13 (1822) 547, nom. inval. – Type: *Hamilton s.n.*, s.d. (n.v.), Mysore.

T. timoriensis DC., Prod. 2 (1825) 254; Decne, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 470; Span., Linnaea 15 (1841) 191; Zoll., Nat. Geneesk. Arch. N. I. 3 (1846) 54; Miq., Fl. Ind. Bat. 1, 1 (1855) 298; Forbes, Wand. (1885) 503. – Type: *De Candolle 53* (G, n.v., microf. L; iso K), 1821, Timor.

T. dichotoma Desv., Ann. Sc. Nat. 1, 9 (1826) 415; Walpers, Rep. Bot. Syst. (1842) 674; Miq., Fl. Ind. Bat. 1, 1 (1855) 298. – *Cracca dichotoma* (Desv.) O. K., Rev. Gen. Pl. 1 (1891) 175. – Type: *Desvaux s.n.*, s.d. (P, n.v.; photo K), Philippines, left hand specimen.

T. hirsuta Schumacher, Beskr. Guin. Pl. (1827) 377. – Type: *Thonning s.n.*, s.d. (microf. L), Africa, Guinea, Ga and Adampi.

Indument strigose to sericeous or velutinous. Stipules 2–7 by 0.5–1 mm. Rachis of *leaf* 0.6–6.5 cm long, 0.5–1 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 3–12 and 3–10 mm long; the interjugal parts 0.3–1.5 times longer than the infrajugal part; the ultrajugal part distinct. Petiolules 0.5–1.5 mm long. *Leaflets* 2–7 pairs, in the maxijugal leaf 4–7, elliptic, obovate to narrowly obovate; base acute to obtuse; apex rounded to retuse; terminal leaflet larger than or as large as the lateral ones, 5–27 by 2–9 mm, lateral leaflets 3–24 by 1–8 mm. Midrib flat, sunken or raised in a furrow above. Distinct nerves 4–11 pairs, raised below, raised or flat above, angle with midrib 10–30 degrees at base, 10–20 degrees halfway the nerve. *Pseudoracemes* terminal, or leaf-opposed, 0.9–10 cm long; some basal bracts similar to vegetative leaves. Fascicles with 2–6 flowerbuds. Bracts to the fasci-

cles narrowly triangular to linear triangular, 1.8–3.5 by 0.2–0.7 mm. Bracts to the flowers narrowly triangular to linear triangular, 0.5–1.8 by 0.1–0.4 mm. Pedicel 1–3 mm long. *Flower* 2.5–7 mm long. *Calyx* cup 1–2 by 1.5–2.5 mm, teeth pubescent to sericeous within, the vexillary one deltoid, 1.2–3.2 by 1.5–2.3 mm, its tops 0.5–2.2 by 0.3–1 mm; the lateral ones narrowly triangular to linear triangular, 1.2–3.2 by 0.5–1 mm; the carinal one narrowly triangular to linear triangular, 1.1–4 by 0.5–1 mm, longer than or as long as the other teeth and 1–2.5 times as long as the cup. *Standard* blade orbicular to transversely elliptic, apex retuse to emarginate, 3–6 by 3.5–6.5 mm; claw 0.4–2 mm long. *Wing* blades usually auricled at vexillary side, 2.5–5.5 by 1.1–2.8 mm, glabrous, lateral ribs extending over 0.7–2 mm; claw 0.5–2 mm long. *Keel* blades usually auricled at vexillary side, 2.7–5 by 1.7–2.7 mm, glabrous, sometimes with some hairs along connected part, lateral pockets sometimes present, bulgy, 0.4–1 mm long; claw 0.5–2 mm long. *Staminal tube* or sheat 2–6 mm long, glabrous. Vexillary filament free or free at base and connate halfway, 2.5–7 mm long, glabrous; the other filaments alternately longer and shorter, free parts resp. 1–2.6 and 0.5–1.8 mm long. Anthers 0.2–0.5 mm long. *Ovary* 2–5 by 0.2–0.6 mm. Style sometimes twisted, 1.6–4 mm long, apical half glabrous; stigma penicillate at base. Ovules 6–13. *Pod* linear, slightly turgid, 20–43 by 3–5 mm, convex around seeds. *Seeds* 5–13, rectangular to quadrangular to lozenge-shaped, some somewhat rounded, light to dark brown with dark patches or dark brown, some slightly reticulately ridged, 1.5–3.5 by 1.1–3.5 mm.

Collector's notes (see also under the subspecies). Herb or shrub, 0.25 m. Flowers white. Flowering period throughout the year.

Distribution. Pantropical. In Malesia not recorded from Malaya, Sumatra, Borneo, and the Solomon Islands.

Habitat (see also under the subspecies). Beaches, Eucalyptus savannah, dry arable lands, grasslands, roadsides, riverbanks, hills, dry waste grounds, areas with pronounced east monsoon. Limestone, coral, stony soils. Altitude up to 75 m.

Uses (see also under the subspecies). Cultivated.

Notes. 1. Characteristic for this species are the long and thin calyx teeth. *T. pumila* resembles *T. purpurea*, different in the number of leaflets, the length of the leaf rachis, the number of ovules, the shape of the pod and the size of the seed. The main difference between *T. purpurea* and *T. pumila* subsp. *aldabrensis* is the way of connection of the vexillary filament. The main difference between *T. pumila* and *T. purpurea* subsp. *barbigera* is the hairy vexillary filament and staminal tube. See also the note on *T. luzoniensis*.

2. *Galega diffusa* Roxb., Fl. Ind. 3 (1832) 387 is according to Haines a synonym of *T. pumila* (Lamk.) Pers. Roxburgh describes his *G. diffusa* as a species with 5–10 pairs of leaflets and 6–7 seeds. Therefore this cannot be a synonym of *T. pumila*.

3. One specimen of Timor, Belu, collected by C.W. Kooy (*470*, 15-8-1968) slightly deviates from the normal habit of *T. pumila*. Some branches have very small leaves and leaflets with a glabrous upper surface. Beside these branches the specimen also bears branches with a 'normal' habit. The data of this specimen are not included in the description of *T. pumila*.

a. subsp. **pumila** – **Fig. 1g, 3k.**

[*Galega prostrata* Koenig ex W. & A., Prod. (1834) 213, pro syn.]

Branches, rachis of leaf and pod velutinous. Leaflets sericeous to velutinous on both surfaces. Standard blade 3–5 by 3.5–6.5 mm. Wing blades 2.5–5 by 1.1–1.8 mm. Keel blades 2.7–4.3 by 1.7–2.5 mm. Vexillary filament free, 2.5–6.5 mm long; free parts of the longer filaments 1–2 mm long, free parts of the shorter filaments 0.5–1.5 mm long. Ovary 2–4.8 by 0.2–0.6 mm. Style 1.6–3 mm long.

Collector's notes. Small erect or creeping shrub or herb, 0.5 m. Flower white, pale blue, bright reddish purple, white turning red, pinkish, pale cream turning pink, purple. Calyx green. Pods green. Flowering period: June.

Distribution. Tropical Africa, Madagascar, India, Thailand, Java, Madura, Lesser Sunda Islands, Philippines, Celebes. Probably native of Madagascar.

Habitat. Dunes, coast, riverbanks, roadsides, fields, grasslands, hills. Stony or sandy soils. Altitude up to 800 m.

Uses. Cultivated as a green manure and fodder.

First dated record. Africa 1788 (Lamarck, Madagascar); Malesia 1864 (Herb. Hooker, Timor).

b. subsp. **aldabrensis** (Drummond & Hemsley) Bosman & De Haas, *stat. nov.*

T. purpurea (L.) Pers. var. *ciliata* Craib, Fl. Siam. Enum. 1 (1928) 384. – *T. pumila* (Lamk.) Pers. var. *ciliata* (Craib) Brummitt, Bol. Soc. Brot. 2, 41 (1967) 261. – Type: *Kerr 11022*, s.d. (K), 23-7-1925, Bangkok.

T. pumila (Lamk.) Pers. var. *aldabrensis* (Drummond & Hemsley) Brummitt, Bol. Soc. Brot. 2, 41 (1967) 260; Gillett, Fl. T. E. Afr., Legum. 3, Pap. 1 (1971) 185; Verdc., Man. N. G. Legum. (1979) 345. – *T. aldabrensis* Drummond & Hemsley, J. Bot. 54, suppl. 2 (1916) 11. – Type: *Dupont 11* (lecto K, n.v.), 1906, Aldabra.

T. purpurea (L.) Pers. var. *angustata* Miq., Fl. Ind. Bat. 1, 1 (1855) 297. – Type: *Horsfield 41* (K), 1859, Java.

Branches, leaf rachis, and pod strigose to sericeous or velutinous. Leaflets glabrous or strigose to sericeous or sericeous to velutinous above, sericeous to velutinous below. Standard blade 5.5–6 by 5.5–6 mm. Wing blades 5–5.5 by 2–2.8 mm. Keel blades 4.5–5 by 2.5–2.7 mm. Vexillary filaments free at base and connate halfway, 6–7 mm long; free parts of the longer filaments 1.5–2.6 mm long, free parts of the shorter filaments 1.1–1.8 mm long. Ovary 4.5–5 by 0.4–0.5 mm. Style 2.5–4 mm long.

Collector's notes. Small, spreading, prostrate herb or shrub, 1 m, greyish. Leaves dull green. Flowers purple. Pods dark green.

Distribution. Africa. In Malesia: Java, New Guinea.

Habitat. Strand, clearings, grassland, roadside, Eucalyptus savannah. Limestone. Altitude up to 75 m.

First dated record. Malesia 1903 (Backer, Java).

Notes. 1. Brummitt described a *T. pumila* (Lamk.) Pers. var. *ciliata* (Craib) Brummitt, also occurring in Indonesia. The differences between this variety and *T. pumila* (Lamk.) Pers. var. *aldabrensis* are not very distinct, because the sizes of the calyx, petals and pods and the number of seeds show much overlap. Therefore Brummitt's var. *ciliata* is here considered a synonym of *T. pumila* subsp. *aldabrensis*.

2. The specimen in the Kew Herbarium of *T. purpurea* var. *angustata* Miq., collected by T. Horsfield (1859, Java) belongs to *T. pumila* subsp. *aldabrensis*. Because no other material identified as *T. purpurea* var. *angustata* was found, we consider the Horsfield collection the type.

13. Tephrosia purpurea (L.) Pers. – Fig. 1a, 3j.

T. purpurea (L.) Pers., Syn. 2 (1807) 329; DC., Prod. 2 (1825) 251; Spreng., Syst. Veg. 3 (1826) 233; Sweet, Hort. Brit. ed. 2 (1830) 142; Bojer, Hort. Maur. (1837) 93; Sweet, Hort. Brit. ed. 3 (1839) 170; Walpers, Rep. Bot. Syst. 1 (1842) 674; Benth. in Hook., Lond. Bot. 2 (1843) 217; Miq., Fl. Ind. Bat. 1, 1 (1855) 296; Benth., Fl. Austr. 2 (1864) 209; Baker in Oliver, Fl. Trop. Afr. 2 (1871) 124; Baker in Hook. f., Fl. Brit. India 2 (1876) 112; Scheffer, Ann. Jard. Bot. Btzg 1 (1876) 17; Gresh., Meded. Lands Pl. Tuin 10 (1893) 54; Murray in Watt, Dict. Ec. Prod. India 6, 4 (1893) 14; Prain in King, J. As. Soc. Beng. 66, 2 (1897) 85; Bailey, Queensl. Fl. 2 (1900) 395; Perk., Fragm. Fl. Philip. 1 (1904) 17; Merr., Philip. J. Sc. 5 (1910) Bot. 68; Gagn. in Lecomte, Fl. Gén. I.-C. 2 (1916) 270; Merr., Int. Rumph. (1917) 264; Haines, Bot. Bihar Orissa 3 (1922) 244; Ridl., Fl. Mal. Pen. 1 (1922) 582; C.T. White, Proc. R. Soc. Queensl. 34 (1922) 33; Merr., En. Philip. 2 (1923) 278; Keuchenius, Meded. Proefst. Thee 90 (1924) 41; de Wildeman, Bull. Soc. R. Bot. Belg. 57 (1925) 124; Craib, Fl. Siam. Enum. 1 (1928) 384; Hend., Gard. Bull. S. S. 4 (1928) 247; Back., Onkr. Suikerr. (1930) 306; Burk., Dict. 2 (1935) 2131; Merr., Trans. Amer. Phil. Soc. 24, 2 (1935) 195; Back., Bull. Jard. Bot. Btzg 3, 16 (1939) 110; Forbes, Bothalia 4 (1948) 974; C.E. Wood, Rhodora 51 (1949) 379; Quis., Med. Pl. Philip., Techn. Bull. Dep. Agr. & Nat. Res. 16 (1951) 437; Back. & Bakh. f., Fl. Java 1 (1963) 594; Ali, Biologia 10 (1964) 23; Ahluwalia & Smith, Kew Bull. 21 (1967) 311; Brummitt, Bol. Soc. Brot. 2, 41 (1967) 235; Raghavan & Wadhwa, Curr. Sci. 37 (1968) 536; Nayar, Bull. Bot. Surv. India 11 (1969) 187; Gillett, Fl. T. E. Afr., Legum. 3, Pap. 1 (1971) 186; Huang & Ohashi, Fl. Taiwan 3 (1977) 394; Verdc., Man. N. G. Legum. (1979) 338. – *Cracca purpurea* L., Sp. Pl. ed. 1, 2 (1753) 752; Amoen. Acad. 3 (1756) 19. – *Galega purpurea* L., Sp. Pl. ed. 2, 2 (1763) 1063; Syst. Nat. ed. 10, 2 (1759) 1172; Murray, Syst. Veg. (1784) 679; Willd., Sp. Pl. 3, 2 (1802) 1247; Roxb., Fl. Ind. 3 (1832) 386. – *Cracca villosa* L. β *purpurea* (L.) O. K., Rev. Gen. Pl. 1 (1891) 174. – Type: *Herb. Hermann*, vol. 1, Fol. 37 (BM), Ceylon.

T. colonila (Ham.) Benth., Gen. Index to Trans. Linn. Soc. (1866) 101. – *Galega colonila* Ham., Trans. Linn. Soc. 13 (1822) 545. – Type: Rheede, Hort. Mal. 1 (1678) 103, tab. 55.

T. diffusa (Roxb.) W. & A., Prod. (1834) 213; Wight, Cat. (1833) 54; Walpers, Rep. Bot. Syst. 1 (1842) 674; Miq., Fl. Ind. Bat. 1, 1 (1855) 295. – *Galega diffusa* Roxb. [Hort. Beng. (1814) 57, nom. nud.] Fl. Ind. 3 (1832) 387. – *T. purpurea* (L.) Pers. var. *diffusa* (Roxb.) Aitch., Cat. Pl. Punjab Sindh (1869) 42. – Type: plate in Roxburgh's unpublished icones (K, n.v.).

Indument sericeous, strigose or velutinous. Stipules 1.5–9 by 0.1–1.5 mm. Rachis of *leaf* 1–14.5 cm long, 0.5–1 mm diam., the infrajugal and interjugal parts of the longest rachis resp. 4–20 and 5–16 mm long; the interjugal parts 0.6–2.5 times longer than the infrajugal part; the ultrajugal part usually distinct. Petiolules 1–3 mm long. *Leaflets* 2–12 pairs, in the maxijugal leaf 7–12, obovate, narrowly obovate,

elliptic, narrowly elliptic or linear elliptic; base acute to obtuse; apex rounded to emarginate; terminal leaflet smaller to larger than the lateral ones, 7–28 by 2–11 mm; lateral leaflets 5–30 by 2–11 mm. Midrib (slightly) raised or flat above. Distinct nerves 5–13 pairs, raised below, raised or slightly raised above, angle with midrib 10–30 degrees at base, 10–20 degrees halfway the nerve. Venation usually distinct on both surfaces. *Pseudoracemes* terminal, or leaf-opposed, 1.5–25 cm long; sometimes some basal bracts similar to vegetative leaves. Fascicles with 4–6 flowerbuds. Bracts to the fascicles narrowly triangular to linear triangular, 0.9–4.7 by 0.2–0.6 mm. Bracts to the flowers narrowly triangular to linear triangular, 0.8–2.2 by 0.2–0.3 mm. Bracteoles rarely present, one on pedicel, 0.3–0.5 by 0.2 mm. Pedicel 2–6 mm long. *Flower* 4–8.5 mm long. *Calyx* cup 1.4–2.3 by 1.5–3.2 mm; teeth pubescent within; the vexillary one triangular, deltoid to broadly deltoid, 0.9–3.2 by 1.5–3 mm, its tops 0.7–2.8 by 0.2–1 mm; the lateral ones triangular to narrowly triangular, 0.7–3.4 by 0.5–1 mm; the carinal one triangular to narrowly triangular, 0.8–4.1 by 0.4–1.5 mm, shorter to longer than the other teeth and 0.5–2 times as long as the cup. *Standard* blade broadly ovate, apex rounded to emarginate, 3.5–7.3 by 5–10 mm; claw 1.2–3.2 mm long.*Wing* blades auricled at vexillary side, 2.5–6 by 1.5–3.8 mm, glabrous, rarely with hairs at carinal side, lateral ribs extending over 1.5–4 mm; claw 1.8–3.4 mm long. *Keel* blades auricled at vexillary side, 2.2–4.5 by 2–3 mm, glabrous, rarely with a few hairs along the connected part, lateral pockets sometimes bulgy, 0.6–2 mm long; claw 1.6–3.5 mm long. *Staminal tube* 4–6 mm long, glabrous or with hairs at the auricles. Vexillary filament free at base and connate halfway, 5–8 mm long, glabrous or velutinous at the auricles and up to halfway the connected part, the other filaments alternately longer and shorter, free parts resp. 1.2–3.4 and 0.8–2.5 mm long. Anthers 0.3–0.5 mm long. *Ovary* 2.5–6 by 0.3–0.9 mm, sericeous. Style sometimes twisted, 2–4.5 mm long, apical half glabrous; stigma penicillate at base. Ovules 5–8. *Pod* linear, flat, 20–45 by 3–5 mm, convex around seeds, with a small but distinctly flat space in between. *Seeds* 2–8, rectangular to transversely elliptic, light brown to dark brown to black, sometimes with brown, black or greyish patches, 2.5–5 by 1.8–3 mm.

Collector's notes (see also under the subspecies). Flowering between October and January.

Distribution. Pantropical, no records from Borneo. Native of India or Java.

Habitat (see also under the subspecies). Open grasslands, waste places, roadsides, beaches, riverbanks. Rock, chiefly on sand, disturbed soils. Areas with pronounced east monsoon. Altitude up to 1200 m.

Vernacular names (see also under the subspecies). India: Sarphónká (Hind., Beng., Pb.), ban-nīl gáchh (Beng.), bánsabánsu, jhojhrú, sarpankh (Pb.), surpunka (Sind.), sarphúnkha, jangli kulthi, unhali (Bomb.), sharapunkha (Mar.), jhila (Guz.), hun, náli, janglī-kulthī (Dec.), kolluk-káyvélai (Tam.), nempali, bonta vempali, yampali, tella yampali (Tel.), kozhinnila (Malay), sarapunkhá (Sans.), wild-indigo (of some Anglo-Indians). Indo-China: Nha troi, houi, hui. Java: Pohon nila hutan (Mal.). Philippines: Balatong-pula, balba-látong, tinatináan (Tag.). China: Dam haui, con cây nhà troi.

Uses. Cultivated as a green manure (not satisfactory according to Keuchenius, 1924, and Burkill, 1935). In Indo-China the seeds are a substitute for coffee (Burkill, 1935). In India the plant is medicinal (Quisumbing, 1951). The whole plant is said to be tonic and laxative, a decoction of the bitter root is prescribed in Fiji in cases of dyspepsia, dysentery, tympanitis and colic. In Bengal it is given as a cure for chronic diarrhoea. In Ceylon it is employed as an anthelmintic for children.

The dried plant is deobstruent, diuretic and useful in bronchitis, bilious febrile attacks and obstructions of the liver, spleen and kidneys. Also recommended as a blood purifier, in treatment of boils, pimples etc., and is considered a cordial medicament.

Mohammedan writers mention its use in combination with Cannabis sativa leaves as a remedy for bleeding piles and with black pepper as a diuretic, which is also said to be useful against gonorrhoea. In India (Punjab) an infusion of the seeds is believed to be 'cooling'. Fresh root-bark, ground and made into a pill with a little black pepper is frequently given in case of obstinate colic with marked success.

In Australia the plant is reported to be poisonous to cattle, but it is said to serve as fodder in Bombay. It is also recorded to be 'a fair fodder before flowering.' The plants are used by Madras fishermen for luring fish with the object of getting their eggs: a bunch of the plant is suspended in the water and the fish spawn in it (Burkill, 1935). The plant contains a resin, traces of wax and a principle allied to quercitrin or quercetin. Cold water extracted gum, a trace of albumen, and dyeing matter. The leaves contain the glycoside rutin.

Chromosome number. 2n = 24 (Ali, 1964).

Notes. 1. This species is characterized by the shape of the pod: convex around seeds with a clearly flat space in between.

T. zollingeri resembles *T. purpurea*, especially *T. purpurea* subsp. *barbigera*. The main differences between *T. purpurea* subsp. *purpurea* and *T. zollingeri* are the glabrous vexillary filament and staminal tube of the former. Subsp. *barbigera* has, in contrast with *T. zollingeri*, a smaller number of leaflets, smaller number of flowerbuds, shorter pedicel, longer vexillary filament and a longer staminal tube. See also the notes under *T. astragaloides* and *T. pumila*.

2. *T. purpurea* (L.) Pers. is a variable, pantropical species, including many subspecies and varieties. The available collections were so abundant that this study has been limited to specimens of the Malesian area, but in order to be sure that the new subspecies (and varieties) were not yet published before, literature and material from NE. Australia and tropical Africa have been examined as well. Because of the abundance in literature only the names are mentioned which could be traced to subspecies or variety there, the remainder is mentioned under the species.

a. subsp. purpurea – Fig. 1a, 3j.

T. wallichii Grah. [ex Wall., Cat. 5640 (1831/32), nom. nud.] ex Fawc. & Rendle, J. Bot. 55 (1917) 35; Craib, Fl. Siam. Enum. 1 (1928) 386; C.E. Wood, Rhodora 51 (1949) 380; Ali, Biologia 10 (1964) 29. – *Cracca wallichii* (Grah. ex Fawc. & Rendle) Rydberg, N. Amer. Fl. 24, 3 (1923) 180. – Lectotype: *Wallich 5640* (K-W), 31-10-1831/32; *Wallich 5640* (para, K), 28-9-1831/32, Banks of Irawaddi.

Stipules 1.5–9 by 0.1–1.5 mm. Infrajugal part of the longest leaf rachis 8–20 mm long, the interjugal parts 0.8–1.2 times longer than the infrajugal part. Petiolules 1–3 mm long. Leaflets 2–9 pairs, 7–9 in the maxijugal leaf, obovate to narrowly elliptic; terminal leaflets 7–28 by 2–11 mm; lateral leaflets 5–30 by 2–11 mm. Distinct nerves sometimes with marginal arches at the apex. Venation distinct on both surfaces or only on the upper surface, sometimes invisible. Pseudoracemes 1.5–25 cm long. Bracteoles rarely present, then always one on pedicel, 0.3–0.5 by 0.2 mm. Calyx cup 1.4–2.3 by 1.5–2.6 mm; carinal tooth 0.8–4 by 0.4–1 mm; vexillary tops 0.7–2.8 by 0.3–1 mm. Standard blade 3.5–7 by 5–8.5 mm; claw 1.2–3.2 mm long. Wing blades 2.5–5.5 by 1.5–3.4 mm, lateral ribs extending over 1.5–4 mm; claw 1.8–3.4 mm long. Keel blades 2.2–3.6 by 2–3 mm, glabrous, rarely with a few hairs at the connected part; claw 2–3.5 mm long. Staminal tube 4–6 mm long, glabrous. Vexillary filament 5–7.5 mm long, glabrous; free parts of the longer and shorter filaments resp. 1.2–2.5 and 0.8–1.8 mm long. Ovary 2.5–6 by 0.4–0.9 mm.

Collector's notes. Small shrub or herb, creeping or erect, woody at base, 0.4–1.5 m. Leaves green. Flowers red, violet, purple, yellow, bluish violet, blue-maroon, bright purplish red, pale mauve. Calyx green. Fruit green. Ripe seed motted brown.

Distribution. As the species, at least in the Malesian area. Sri Lanka, Sumatra, Malay Peninsula, Java, Lesser Sunda Islands, Philippines, Celebes, Moluccas, New Guinea.

Habitat. Open, waste places, riverbanks, hillside, grasslands, roadsides, mountain forest, at an old airstrip, dry places, beaches, secondary vegetation. Limestone, sandy soil. Altitude up to 1300 m.

Vernacular names. Philippines: Tom hatè (Ternate). Java: Pohon-nila-hutan (Mal.).

Uses. Cultivated, see under the species.

First dated record. India 1753 (Linnaeus, Sri Lanka); Malesia 1859 (De Vriese & Teysmann, Moluccas).

b. subsp. **barbigera** Bosman & De Haas, *subsp. nov.*

A subspecie typica filamento vexillare in parte connata auriculisque barbata, tubo filamentorum in parte vexillari barbato differt. – Typus: *Cuming 601*, s.d. (MEL), Philippines.

Stipules 3–9 by 0.1–1 mm. Infrajugal part of the longest leaf rachis 4–12 mm long, the interjugal parts 0.6–2.5 times longer than the infrajugal part, the ultrajugal part usually distinct. Petiolules 1–2 mm long. Leaflets 2–12 pairs, 7–12 in the maxijugal leaf, obovate to linear elliptic; terminal leaflet 8–25 by 2–8 mm; lateral leaflets 8–27 by 2–7.5 mm. Distinct nerves with distinct marginal arches at the apex. Venation distinct on both surfaces, sometimes only on upper surface. Pseudoracemes 4.5–20 cm, the terminal ones about half as long as the leaf-opposed ones. Bracteoles absent. Calyx cup 1.5–2.1 by 2.5–3.2 mm; carinal tooth 2–4.1 by 0.8–1.5 mm; vexillary tops 0.8–1.6 by 0.2–0.5 mm. Standard blade 4.8–7.3 by 5–10 mm; claw 1.5–

2 mm long. Wing blades 3–6 by 2–3.8 mm, lateral ribs extending over 2–3 mm; claw 2–3 mm long. Keel blades 3–4.5 by 2.5–3 mm, glabrous; claw 1.6–2.5 mm long. Staminal tube 5–5.8 mm long, velutinous at the auricles. Vexillary filament 6.2–8 mm long, velutinous at the auricles and up to halfway the connected part, free parts of the longer and shorter filaments resp. 1.5–3.4 and 1.3–2.5 mm long. Ovary 3.5–5 by 0.3–0.6 mm.

Distribution. Philippines (1 coll.), New Guinea (3 coll.), Queensland (1 coll.).

Notes. 1. The main difference between the subspecies *barbigera* and *purpurea* is the presence resp. absence of hairs on the vexillary filament and staminal tube.

2. The cultivated specimen *Zollinger 3000*, of Java, seems to belong to *T. purpurea* (L.) Pers. subsp. *barbigera*. The specimen deviates slightly in the lengths of the claws of the flowerparts (up to 1.1 mm), the vexillary filament (5 mm), and the staminal tube (3.8 mm).

c. var. **barbigera**

Stipules 3–4.7 by 0.4–0.8 mm. Rachis of leaf 6.7–10.7 cm long; the interjugal parts of the longest rachis 0.6–1.8 times longer than the infrajugal part; the ultrajugal part distinct. Pseudoracemes 11–19.5 cm long. Flower 5.5–6 mm long. Calyx cup 2–2.1 by c. 3 mm; vexillary lobe 2.2–2.4 by 1.7–2.6 mm, its tops 1.6 by 0.2–0.3 mm; the lateral ones 2.1 by 0.9–1 mm; the carinal one 2.8–3.2 by 0.8 mm. Standard blade 4.8–6 by 5–8 mm; claw 2 mm long. Wing blades c. 3 by 2 mm, lateral ribs extending over c. 2 mm. Keel blades c. 3 by 2.5 mm; claw 1.6 mm long. Free parts of the longer and shorter filaments resp. 1.5–2.2 and 1.3–1.6 mm long. Style not twisted, c. 3 mm long. Pod 20–45 by 3–4.5 mm.

Distribution. Philippines (1 coll.), New Guinea (1 coll.).

d. var. **rufescens** Benth.

T. purpurea var. *rufescens* Benth., Fl. Austr. 2 (1864) 210; Bailey, Queensl. Fl. 2 (1900) 395. – *T. brachyodon* Domin var. *rufescens* (Benth.) Domin, Bibl. Bot. 22 (1926) 752, Heft 89: 198; Verdc., Man. N. G. Legum. (1979) 340. – Lectotype: *Stuart s.n.*, s.d. (K, proposed here), Morton Bay; *Cunningham s.n.*, s.d. (para, n.v.), Port Bowen; *Leichhardt s.n.*, s.d. (para, n.v.), Archer's Hill.

[*T. purpurea* (L.) Pers. subsp. *A* Verdc., Man. N. G. Legum. (1979) 346, based on *Brass 27344*, 5-7-1956 (A, K, L).]

Stipules 3–9 by 0.1–1 mm. Rachis of leaf 3–13 cm long; the interjugal parts of the longest rachis 0.8–2.5 times longer than the infrajugal part; the ultrajugal part sometimes absent. Pseudoracemes 4.5–11 cm long. Flower 7–8 mm long. Calyx cup 1.5–1.7 by 2.5–3.2 mm; vexillary lobe 2–3.2 by c. 3 mm, its tops 0.8–1 by 0.5 mm; the lateral ones 2–3.4 by 1 mm; the carinal one 2–4.1 by 1–1.5 mm. Standard blade 7–7.3 by 8–10 mm; claw 1.5 mm long. Wing blades 6 by 3–3.8 mm, lateral ribs extending over c. 3 mm. Keel blades 4–4.5 by 2.5–3 mm; claw 2.2–2.5 mm long. Free parts of the longer and shorter filaments resp. 1.8–3.4 and 1.3–2.5 mm long. Style sometimes twisted, 2.8–4.5 mm long. Pod 23–38 by 3.5–5 mm.

Collector's notes. Shrub, 1–1.2 m. Flowers lilac, pink, later blue.
Distribution. New Guinea (2 coll.), Queensland (1 coll.).
Habitat. Open places, secondary grasslands, hills; rocky soil. Altitude 10–1220 m.
First dated record. Australia 1864 (Bentham).

14. Tephrosia rigida Span. – **Fig. 1f, 3o.**

T. rigida Span., Linnaea 15 (1841) 191; Walpers, Rep. Bot. Syst. 1 (1842) 674; Miq., Fl. Ind. Bat. 1, 1 (1855) 298; Forbes, Wand. (1885) 503. – Lectotype: *Spanoghe s.n.*, s.d. (L, proposed here), Timor.

Where the measurements of the specimen of Roti (see note 3) differ from the other specimens, these are placed between brackets.

Indument strigose. Stipules 1.5–3 by 0.4–0.8 mm. Rachis of *leaf* 0.8–3(–7) cm long, 0.5 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 11–30 and 6–11 mm long; the interjugal parts 0.4–0.5 times longer than the infrajugal part; the ultrajugal part distinct. Petiolules 1(–1.5) mm long. *Leaflets* 1–3(–4) pairs, in the maxijugal leaf 3(–4), obovate to narrowly obovate, rarely linear obovate; base acute; apex rounded to emarginate; terminal leaflet larger than or about as large as the lateral ones, 10–22 by 3–8 mm; lateral leaflets 3.5–22 by 2–6 mm. Midrib flat, or slightly raised, or sometimes raised in a furrow above. Distinct nerves 6–12 pairs, raised on both surfaces, angle with midrib 10–30 degrees at base, 10–20 degrees halfway the nerve. Venation vague above, indistinct below. *Pseudoracemes* terminal or leaf-opposed, 4.5–10 cm long; some basal bracts similar to vegetative leaves. Fascicles with 3–5 flowerbuds. Bracts to the fascicles triangular, 1.6–2 by 0.5–0.8 mm. Bracts to the flowers narrowly triangular, 1.2–1.8 by 0.3–0.5 mm. Bracteoles often present on pedicel, sometimes just below the calyx, sometimes only on the pedicel of young flowerbuds, triangular, 0.1–0.2 by 0.1 mm, strigose to pubescent. Pedicel 4–10 (15–20) mm long, strigose to pubescent. *Flower* 7–10 mm long. *Calyx* cup 1.5–2.2 by 2.2–3 mm, strigose to pubescent; teeth glabrous within, the vexillary tops sometimes thin puberulous within; the vexillary one deltoid to broadly deltoid, 1.3–3 by 2–3 mm, its tops 0.8–2 by 0.4–0.9 mm; the lateral ones triangular, 1.5–2.8 by 1–1.5 mm, the carinal one triangular, 1.8–3 by 0.7–1.2 mm, about as long as the other teeth and 1–1.5 times as long as the cup. *Standard* blade broadly ovate to orbicular, apex emarginate, 6–8 by 7–9 mm; claw 1.2–2.3 mm long. *Wing* blades auricled at vexillary side, 4.5–8 by 1.5–3.5 mm, glabrous, lateral ribs extending over 1.5–3.5 mm; claw 2–2.2 mm long. *Keel* blades slightly auricled at vexillary side, 4–6.5 by 2.5–4 mm, glabrous, lateral pockets rarely present, bulgy, 1–1.5 mm long; claw 2–2.2 mm long. *Staminal tube* 5.6–7.3 mm long, glabrous. Vexillary filament free at base and connate halfway, 7.2–8.7 mm long, glabrous; the other filaments alternately longer and shorter, free parts resp. 1.8–3.1 and 1.2–2.4 mm long. Anthers 0.5–0.6 mm long. *Ovary* 4.5–6.2 by 0.2–0.6 mm, pubescent to sericeous. Style twisted, 3.8–5 mm long, apical half glabrous; stigma penicillate at base. Ovules 8–10. *Pod* linear, flat, 23–26 by 3–4 mm, slightly convex around seeds. *Seeds* 7–8, mature seeds unknown.

Collector's notes. Flowering in March.

Distribution. Timor (several coll.), Roti (1 coll.).

Habitat. Limestone.

First dated record. Timor 1841 (Spanoghe).

Notes. 1. Characteristic for this species are the long infrajugal part of the leaf rachis, the number of leaflets and the long pedicel. See also the note under *T. obovata*.

2. *T. rigida* seems to be closely allied to *T. obovata*: both species show a very long pedicel and a relative long infrajugal part. Also the flowerparts are very much alike in shape and size. The species differ in the shape and size of the leaflets, the length of the inflorescence, the relative length of the carinal calyx tooth and the indument of the pod. Supported by the difference in distribution these two species are still distinguished, despite our initial hesitation.

3. The specimen of Roti, collected by Father J.A.J. Verheijen (*2431*, 1969) is obviously a *T. rigida* because of its long pedicel, long infrajugal part and its sizes of the flower and flowerparts. It differs, however, in a few other characteristics: the length of the rachis, the infrajugal and interjugal parts, the length of the petiolules and of the pedicel (these data are placed between brackets in the description above). To decide if this specimen belongs to a new variety of *T. rigida* or whether it shows only an extreme of the variability of *T. rigida*, more specimens need to be collected.

15. Tephrosia senticosa (L.) Pers. – Fig. 1b, 3g.

T. senticosa (L.) Pers., Syn. 2 (1807) 330; DC., Prod. 2 (1825) 254; Spreng., Syst. Veg. 3 (1826) 233: W. & A., Prod. (1834) 211; Wight, Ic. 2 (1840) t. 370; Miq., Fl. Ind. Bat. 1, 1 (1855) 294; Dallzell & Gibson, Bomb. Fl. (1861) 61. – *Cracca senticosa* L., Sp. Pl. ed. 1, 2 (1753) 752; Amoen. Acad. 3 (1756) 19; O. K., Rev. Gen. Pl. 1 (1891) 175. – *Galega senticosa* L., Sp. Pl. ed. 2, 2 (1763) 1063; Murray, Syst. Veg. (1784) 679; Lamk., Enc. Meth. 2, 2 (1788) 598; Willd., Sp. Pl. 3, 2 (1802) 1251. – Lectotype: *Herb. Hermann*, vol. 1, fol. 72 (BM); *Herb. Hermann*, vol. 2, fol. 2 (para, BM).

T. intermedia [Grah. ex] Wall. [Cat. (1831/32) 5632, nom. nud.] ex W. & A., Prod. (1834) 211, pro syn. – *T. tinctoria* (L.) Pers. var. *intermedia* (W. & A.) Baker in Hook. f., Fl. Brit. India 2 (1876) 112. – Type: *Herb. Wallich 5632*, s.d. (K; iso K, SING), India.

Indument strigose to sericeous. Stipules undersurface reddish, 2–6 by 0.8–3 mm, upper surface glabrous. Rachis of *leaf* 0.4–6 cm long, 0.5–0.8 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 2–4 and 8–12 mm long; the interjugal parts 2–6 times longer than the infrajugal part; the ultrajugal part distinct. Petiolules 1–3 mm long. *Leaflets* 1–6 pairs, in the maxijugal leaf 3–6, elliptic to narrowly elliptic, obovate to narrowly obovate, sometimes orbicular; base acute to obtuse; apex rounded to emarginate; terminal leaflet larger than or as large as the lateral ones, 7–50 by 4–16 mm; lateral leaflets 4–41 by 2–16 mm. Midrib raised in a furrow above. Distinct nerves 8–29 pairs, raised below, raised above, angle with main nerve 35–55 degrees at base, 35–55 degrees halfway the nerve. Venation distinct on both surfaces. *Pseudoracemes* terminal, or axillary, or leaf-opposed, 1–11.5 cm long; sometimes some basal bracts similar to vegetative leaves. Fascicles with 4–6 flower-

buds, concentrated at the apex of the rachis of the inflorescence. Bracts to the fascicles narrowly triangular, 2–3.2 by 0.5–1 mm, surface glabrous. Bracts to the flowers narrowly triangular to linear triangular, 1.5–3 by 0.2–0.6 mm. Pedicel 1.5–3 mm long. *Flower* 8–10 mm long. *Calyx* cup 1.3–2 by 2–2.5 mm; teeth pubescent to sericeous within; the vexillary one triangular to broadly deltoid, 1–2.8 by 2–2.8 mm, its tops triangular to narrowly triangular, 0.8–2.3 by 0.3–1 mm; the lateral ones triangular to narrowly triangular, 1.2–3 by 0.6–1 mm; the carinal one narrowly triangular, 1.5–3.5 by 0.7–1.5 mm, longer than or as long as the other teeth and 1–2 times as long as the cup. *Standard* blade elliptic to orbicular, apex rounded to retuse, 7.5–9 by 6.5–7.5 mm; claw 1–1.5 mm long. *Wing* blades auricled at vexillary side, 6.5–8 by 1.8–2.8 mm, glabrous, lateral ribs extending over 2.4–3.5 mm; claw 1.4–1.8 mm long. *Keel* blades auricled at vexillary side, 6.5–7 by 2.2–3.5 mm, glabrous, lateral pockets sometimes bulgy, 0.6–1.5 mm long; claw 0.9–2 mm long. *Staminal sheath* 5.5–8 mm long, glabrous. Vexillary filament free, 7–9 mm long, glabrous; the other filaments alternately longer and shorter, free parts resp. 2–3.5 and 1.3–2.5 mm long. Anthers 0.3–0.4 mm long. *Ovary* 4.5–6.5 by 0.5–0.7 mm. Style not twisted, 3–4.5 mm long, bearded at vexillary edge, sometimes only the apical half, at the carinal side; stigma penicillate at base. Ovules 8–10. *Pod* linear, flat, 23–70 by 4–6 mm, slightly convex around seeds. *Seeds* 7–10, transversely elliptic to reniform, dark brown, 3.5–4.2 by 2.1–3 mm.

Collector's notes. Flowers bright reddish orange or vermillion.

Distribution. India, Burma, Sri Lanka, Java. Probably native of Sri Lanka or S. India.

Habitat. Sandy soil. Altitude 1350 m.

First dated record. before 1753 (Linnaeus, Herb. Hermann, Sri Lanka).

Notes. 1. Characteristic for this species are the midrib of the leaflets, which is raised in a furrow on the upper surface, the number of leaflets and the length of the inflorescence. In dried state the plant can easily be recognized by the yellow pods.

2. This species is closely allied to *T. tinctoria* (L.) Pers. This is endorsed by the following characteristics in which they resemble: the number of pairs of leaflets, the number of secondary nerves, the position of the fascicles, the number of flowerbuds per fascicle, the size of the flowers, the length of the calyx teeth, the attachment of the vexillary filament, the indument of the style.

In *T. tinctoria* in the axils of leaves a lower placed fascicle is often found next to the rachis of inflorescence. One specimen of *T. senticosa* of Sri Lanka (*Rudd & Balakrishnan 3234*, 6-3-1970) has beside this axillary fascicle also a very short pseudoraceme, both with a bract. This pseudoraceme can be considered to be developed instead of a fascicle, while the axillary fascicle is a slightly higher placed lowered fascicle and the main rachis of the inflorescence is reduced. This single specimen endorses the alliance with *T. tinctoria* in this characteristic also. Despite these resemblances there are enough differences to keep the two species separate: *T. tinctoria* has often a velutinous indument, often orbicular leaflets, the terminal leaflet 1.8–5 times larger than the lateral ones (in contrast with 1.1–2.7 times in *T. senticosa*), often a larger angle of secondary nerves with the main nerve (40–70 degrees at the base),

only axillary inflorescences, longer (up to 5 mm) bracts, wider wings (2.5–3.5 mm) and keel (3–4.2 mm) and 8–13 ovules. Gagnepain indicates that *T. tinctoria* probably occurs on Java, but in the examined collections no specimens of the Malesian area were found.

3. In Wight & Arnott (1834) *T. tinctoria* (L.) Pers. var. *a* is made, with in its synonymy (among others) *T. intermedia* Grah. *T. intermedia*, however, is quite different from the specimens collected by Hohenacker under the number *618a*, s.d., which has '*T. tinctoria* (L.) Pers. var. *a*, *T. intermedia*' on the label. Therefore *T. intermedia* is not a synonym of *T. tinctoria* var. *a*. This variety should not be called '*intermedia*' but interpretation of it should wait until a complete revision of *T. tinctoria* is made.

16. Tephrosia spinosa (L. f.) Pers. – **Fig. 1j, 3b.**

T. spinosa (L. f.) Pers., Syn. 2 (1807) 330; DC., Prod. 2 (1825) 254; Spreng., Syst. Veg. 3 (1826) 233; Wight, Cat. (1833) 54; W. & A., Prod. (1834) 214; Decne, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 469; Wight, Ic. 2 (1840) t. 372; Span., Linnaea 15 (1841) 191; Walpers, Rep. Bot. Syst. 1 (1842) 674; Zoll., Nat. Geneesk. Arch. N. I. 3 (1846) 54, 76; Miq., Fl. Ind. Bat. 1 1, 1 (1855) 297; Kurz, Nat. Tijd. N. I. 27 (1864) 161; Baker in Hook. f., Fl. Brit. India 2 (1876) 112; Blatt. & Hallb., J. Bomb. Nat. Hist. Soc. 26 (1918) 240; Back., Onkr. Suikerr. (1930) 306; Back. & Bakh. f., Fl. Java 1 (1963) 593. – *Galega spinosa* L. f., Suppl. Pl. ([1781] 1782) 335; Murray, Syst. Veg. (1784) 679; Willd., Sp. Pl. 3, 2 (1802) 1250; Roxb., Fl. Ind. 3 (1832) 383. – *Cracca spinosa* (L. f.) O. K., Rev. Gen. Pl. 1 (1891) 175. – Type: *Herb. Linn., 924 sheet 6* (LINN).

T. spinosa (L. f.) Pers. var. *mucronata* Miq., Fl. Ind. Bat. 1, 1 (1855) 298. – Type: *Zollinger s.n.* ? (P, n.v.), Java, Malang.

Indument sericeous to strigose. Stipules spinose, 3–11 by 0.8–1 mm. Rachis of *leaf* 0.6–2.4 cm long, 0.5 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 4–7 and 4–6 mm long; the interjugal parts 0.7–1 times longer than the infrajugal part; the ultrajugal part absent to distinct. Petiolules 0.5–1 mm long. *Leaflets* 2–7 pairs, in the maxijugal leaf 4–7, obovate to narrowly obovate to inversely triangular; base acute; apex rounded to emarginate; terminal leaflet smaller to larger than the lateral ones, 4.5–10 by 1.5–5 mm; lateral leaflets 4–9.5 by 1.5–5 mm. Midrib flat or sunken above. Distinct nerves 5–9 pairs, raised below, sunken, flat or raised above, angle with midrib 10–20 degrees at base, 10–20 degrees halfway the nerve. No pseudoracemes. Fascicles axillary with 4–6 flowerbuds. Bracts to the flowers narrowly triangular, 0.3–2.1 by 0.1–0.5 mm. Bracteoles sometimes present, on pedicel, wart-like or triangular, 0.1 by 0.1 mm. Pedicel 1.5–6.5 mm long. *Flower* 3–6.5 mm long. *Calyx* cup 1.1–2 by 1.5–2.5 mm; teeth strigose or glabrous within, the vexillary one deltoid, 0.9–2 by 1.8–2.2 mm, its tops 0.5–1.3 by 0.2–0.5 mm, the lateral ones triangular, 0.8–2 by 0.6–1 mm; the carinal one triangular, 0.7–2.5 by 0.6–1.1 mm, as long as or slightly longer than the other teeth and 0.5–1.5 times as long as the cup. *Standard* blade transversely elliptic to broadly obovate, apex emarginate, the very apex sometimes acuminate, 3.2–5 by 4–7 mm; claw 0.5–2.5 mm long. *Wing* blades auricled at vexillary side, 2–4.5 by 1–2.5 mm, glabrous, lateral ribs extending over 1.5 mm; claw 1.5–2.4 mm long. *Keel* blades auricled at vexil-

lary side, 2–4 by 1–3 mm, glabrous, lateral pockets bulgy, 1.1 mm long; claw 1–3 mm long. *Staminal tube* 3–3.6 mm long, glabrous. Vexillary filament free at base and connate halfway, 4.5–6 mm long, glabrous; the other filaments alternately longer and shorter, free parts resp. 1.5–1.8 and 1–1.2 mm long. Anthers 0.3–0.5 mm long. *Ovary* 2.1–4.5 by 0.3–0.5 mm. Style sometimes twisted, 2 mm long, apical half glabrous; stigma penicillate at base. Ovules 4–7. *Pod* retrofalcate, flat, 16–34 by 2.5–4.5 mm, slightly convex around seeds. *Seeds* 2–7, irregularly rectangular, brown to dark brown to black, 2.2–4 by 1.5–2.5 mm.

Collector's notes. Stiff spinous undershrub with deep taproot. Flowers pink or bright red.

Distribution. S. India, Java, Timor (according to Miquel, 1855).

Habitat. Grasslands, bushes, along cultivated fields, roadsides, along ricefields and among rocks, in areas with east monsoon. Calcareous marl. Altitude 15–80 m.

First dated record. India 1782 (Linnaeus f., Coromandel); Malesia 1855 (Miquel, Timor).

Notes. 1. This species is easily recognized by the spinose stipules and the retrofalcate pod. It is the only species in Malesia with axillary fascicles, a character which is shared by the Australian genus *Paratephrosia.*

2. According to Wight & Arnott (1834) and Miquel (1855) *T. pentaphylla* [Roxb.] Sweet is a synonym of *T. spinosa.* The original description is very short. The type is plate 1628 in Roxburgh's unpublished icones. These icones have been reproduced in Wight, Icones, t. 372. This plate of Roxburgh's drawing is distinctly not a *T. spinosa* (L. f.) Pers. Thus the following names are no synonyms of *T. spinosa*:

T. pentaphylla [Roxb.] Sweet, Hort. Brit. ed. 2 (1830) 142; Graham ex Wall., Cat. 5650 (1831/32); Sweet, Hort. Brit. ed. 3 (1839) 170. – *Galega pentaphylla* Roxb. [Hort. Beng. (1814) 57, nom. nud.] Fl. Ind. 3 (1832) 384. – Type: plate 1628 in Roxburgh's unpublished icones (K, n.v.), reproduced by Wight, Ic. 2 (1830) 372.

17. Tephrosia vestita Vogel – Fig. 5.

T. vestita Vogel in Meyen, Nov. Act. Nat. Curr. 19 suppl. 1 (1842) 15; Walpers, Rep. Bot. Syst. 1 (1842) 674; Benth. in Miq., Pl. Jungh. (1852) 208; Miq., Fl. Ind. Bat. 1, 1 (1855) 299; Sum. (1860) 114; K. Sch. & Hollr., Fl. Kais. Wilh. Land (1889) 95; K. Sch. & Laut., Fl. Schutzgeb. ([1901] 1900) 353; Merr., Philip. J. Sc. 5 (1910) Bot. 68; C.T. White, Proc. R. Soc. Queensl. 34 (1922) 33; Merr., En. Philip. 2 (1923) 278; van Helten, Meded. Alg. Proefst. Landb. 16 (1924) 51; Craib, Fl. Siam. Enum. 1 (1928) 385; Kaneh. & Hatus., Bot. Mag. Tokyo 56 (1942) 370; Back. & Bakh. f., Fl. Java 1 (1963) 595; Verdc., Man. N. G. Legum. (1979) 338. – *Cracca vestita* (Vogel) O. K., Rev. Gen. Pl. 1 (1891) 175. – Type: *Meyen s.n.*, s.d. (B†). See note 4.

Kiesera minor Miq., Fl. Ind. Bat. 1, 1 (1855) 291. – *Xiphocarpus minor* Zoll., Nat. Geneesk. Arch. N. I. 3 (1846) 54. – Type: *Zollinger 2668* (P, n.v.; iso BM, BO), 1918, Java.

Kiesera sumatrana Miq., Fl. Ind. Bat. 1, 1 (1855) 1083; Sum. (1860) 114. – Type: *Teysmann 859* (U; iso L), 1907, Sumatra.

T. mollis Valeton, Bull. Dép. Agr. Ind. Néerl. 10 (1907) 17, nom. illeg., non H.B.K. – *T. papuana* Stemmerik in Van Meeuwen et al., Reinwardtia 6 (1961) 107. – Type: *Atasrip 126* (L; iso BO), 1903, New Guinea.

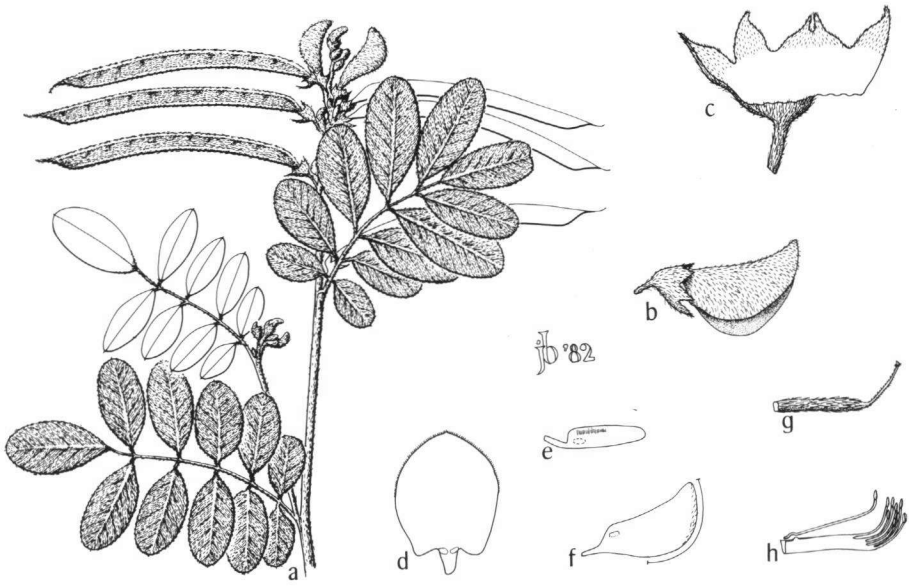

Fig. 5. *Tephrosia vestita*. – a. Habit, x ½; b. flower just before reflection of the standard, x 1; c. calyx inside, x 2½; d. standard inside, x 1; e. wing petal, x 1; f. keel petal, curved line indicates connate part, x 1; g. ovary, x 1; h. stamens, x 1 (*P. van Royen 5107*, L).

T. repentina Drumm. & Craib ex Craib, Kew Bull. (1912) 150; Gagn. in Lecomte, Fl. Gén. I.-C. 2 (1916) 274; Craib, Fl. Siam. Enum. (1928) 385. – Type: *Kerr 2053* (K), 18-9-1911, Siam, Sriracha.

T. tinctoria auct. non Pers.: Gagn. in Lecomte, Fl. Gén. I.-C. 2 (1916) 275.

Indument sericeous to dense sericeous. Stipules 2–6 mm by 0.8–1.5 mm. Rachis of *leaf* 2.4–14 cm long, 0.5–2 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 6–29 and 12–30 mm long; the interjugal parts 1–3.3 times longer than the infrajugal part; the ultrajugal part distinct. Petiolules 1.5–5 mm long, sometimes dense pubescent. *Leaflets* 2–7 pairs, in the maxijugal leaf 4–7, orbicular, obovate, elliptic or narrowly ovate to narrowly elliptic; base cuneate to obtuse; apex acute, obtuse or rounded to emarginate; terminal leaflet larger than or as large as the lateral ones, 21–90 by 6–35 mm, lateral leaflets 11–80 by 7–30 mm. Midrib raised in a furrow above. Distinct nerves 9–26 pairs, raised below, raised or flat above, angle with midrib 40–60 degrees at base, 35–50 degrees halfway the nerve. Venation distinct on both surfaces. *Pseudoracemes* terminal, or axillary, or leaf-opposed, 2–24.5 cm long; some basal bracts similar to vegetative leaves. Fascicles with 4–6(–7) flowerbuds. Bracts to the fascicles triangular to narrowly triangular, 1.6–4 by 0.8–1.8 mm. Bracts to the flowers triangular to linear triangular, 1.5–4 by 0.3–0.8 mm. Pedicel 0–3 mm long. *Flower* 8–19 mm long. *Calyx* fleshy, cup 2.3–3.5 by 4–6 mm, densely sericeous; teeth sericeous outside, puberulous to pubescent within; the

vexillary one broadly deltoid, 1.1–3 by 3–5.5 mm, its tops 0.5–1.6 by 0.5–1.5 mm, the lateral ones triangular, 1.4–3 by 1.8–2.1 mm, the carinal one narrowly triangular, 2–4 by 1.1–2.8 mm, longer than or as long as the other teeth and 0.5–1.5 times as long as the cup. *Standard* blade fleshy, orbicular to elliptic, slightly auricled at base, apex rounded, the very apex acuminate to acute, 10.5–18 by 12–14 mm; claw 1–4 mm long. *Wing* blades usually distinctly auricled at vexillary side, 11.8–15 by 2.8–6.5 mm, glabrous, lateral ribs extending over 3–6.5 mm; claw 0.8–3 mm long. *Keel* blades 9–14 by 4–7 mm, outside sometimes with some sericeous hairs, lateral pockets, if present, bulgy, 1.5–2.5 mm long; claw 0.8–3 mm long. *Staminal sheath* 4.8–12.5 mm long, glabrous. Vexillary filament free, 8–17 mm long, glabrous, the other filaments alternately longer and shorter, free parts resp. 4–11 and 2.5–6 mm long. Anthers 0.8–1.1 mm long. *Ovary* 6–13 by 0.7–1.5 mm. Style not twisted, 5–11 mm long, bearded on both sides, or bearded only at vexillary side; stigma penicillate at base. Ovules 10–15. *Pod* linear, often with petals and style remnant at the apex, 32–95 by 4–7 mm, sericeous to velutinous, slightly convex around seeds. *Seeds* 6–14, rectangular to transversely elliptic to reniform, brown to dark brown, sometimes with greyish patches, 3.1–3.5 by 2.5–3 mm.

Collector's notes. Herbs, shrubs or small trees, semi-woody or woody, erect, 0.1–3 m. Stems with yellowish hairs. Upper surface of leaves light green to dark green, dull green, olive green, yellowish green with light yellow margins, undersurface light green, greyish green, greyish silvery, grey. Flowers white, dirty white, white-olive, greenish white, pinkish white, creamy white, yellow or brown. Standard brown, brownish white, dark green or with white brownish hairs outside. Pod pale green, greyish green, light brown, brown or yellow brown, olive yellow when young. Flowers and pods taste bitter.

Distribution. Thailand, Laos, Vietnam, South China, Malesian area except Borneo.

Habitat. Grassland savannah, among grass in savannah forest, grassland with Melaleuca or with Imperata, open Eucalyptus-Imperata savannah, Eucalyptus forest, primary forest, bamboo forest, deciduous forest, riverbank, among grass and shrubs on riverbed, dry level land, dry alang fields, sands ground by the sea, ridges, hills, slopes, roadsides, open places. Stony, sandy or open lateritic soil. Altitude up to 800 m.

Vernacular names. Thailand: Tua pi. Sumatra: Kasang riti, riti riti, dam katjang kotdang. Java: Entjeng-entjeng. Celebes: Seno-seno, tiboang balam. Moluccas: Katjang-utang. New Guinea: Eba matsiuna.

Uses. Cultivated and tried for a green manure, and proved to be not very suitable for this purpose (Van Helten, 1924). According to Verdcourt (1979) it has once been suspected of poisoning cattle in the Ramu Valley, New Guinea. The latter record may be due to confusion with *T. vogelii*.

First dated record. Philippines 1841 (A. Cuming).

Notes. 1. This species is characterized by the fleshy calyx and the carinal calyx tooth which is longer than or as long as the other teeth. The young pods often have petals or style remnants at the apex.

2. *T. vestita* is a rather variable species: e.g. the apex of the leaflets varies from acute to rounded to emarginate (also within one specimen). Also in the size and shape of leaflets great differences have been found: small and nearly orbicular, small and (narrowly) ovate or (narrowly) elliptic and large elliptic or (narrowly) ovate. Sometimes more than one of these shapes have been found within one specimen. The specimens with the clearly larger leaflets tend to have never more than 5 pairs of leaflets and smaller flowers (up to 14 mm). There appears to be too much overlap in these characters for establishing infraspecific taxa. Furthermore no relation between the morphological and the geographical differences have been found.

3. Of *T. papuana* Stemmerik only one specimen has been collected. It differs from *T. vestita* only in the indumentum (dense velutinous) and the narrowly ovate, acute shape of the leaflets, which however also occurs occasionally in *T. vestita*.

4. The original type of *T. vestita* is *F.J.F. Meyen s.n.*, s.d. ('In Promontorio Syng-Moon Chinae'), which is destroyed in Berlin. As long as no duplicate collections have been located, a neotype should be designated. Such a neotype, however, should preferably be located on or near the original locality. As in this study the Chinese material has not been studied in detail, we prefer to leave the designation of it to future investigators.

18. Tephrosia villosa (L.) Pers. – Fig. 1d, 3m. Map 5.

T. villosa (L.) Pers., Syn. 2 (1807) 329, no 23, non Pers. no 17 [= *T. villosa* (Michx.) Pers. = *T. prostrata* Nutt., Gen. N. Amer. Pl. 2 (1818) 20]; DC., Prod. 2 (1825) 251; Spreng., Syst. Veg. 3 (1826) 233; Sweet, Hort. Brit. ed. 2 (1830) 142; Wall., Cat. (1831/32) 5645; Wight, Cat. (1833) 54; W. & A., Prod. (1834) 212; Sweet, Hort. Brit. ed. 3 (1839) 170; Walpers, Rep. Bot. Syst. 1 (1842) 674; Zoll., Nat. Geneesk. Arch. N. I. 3 (1846) 54; Miq., Fl. Ind. Bat. 1, 1 (1855) 295; Baker in Hook. f., Fl. Brit. India 2 (1876) 113; Murray in Watt, Dict. Ec. Prod. India 6, 4 (1893) 15; Heyne, Nutt. Pl. ed. 1, 2 (1916) 279; ibid. ed. 2 (1927) 778; Gagn. in Lecomte, Fl. Gén. I.-C. 2 (1916) 272; van Helten, Teysmannia 28 (1917) 62; Merr., Philip. J. Sc. 19 (1921) 356; Haines, Bot. Bihar Orissa 3 (1922) 244; van Helten, Meded. Alg. Proefst. Landb. 16 (1924) 51; C.E. Wood, Rhodora 51 (1949) 380; Cufod., Bull. Jard. Bot. Brux. 25 (1955) 280; Gillett, Kew Bull. 13 (1958) 121; Back. & Bakh. f., Fl. Java 1 (1963) 594; Ali, Biologia 10 (1964) 23; Brummitt, Bol. Soc. Brot. 2, 41 (1967) 220; Gillett, Fl. T. E. Afr. Legum. 3, Pap. 1 (1971) 190. – *Cracca villosa* L., Sp. Pl. ed. 1, 2 (1753) 752; Amoen. Acad. 3 (1756) 19. – *Galega villosa* L., Syst. Nat. ed. 10, 2 (1759) 1172; Sp. Pl. ed. 2, 2 (1763) 1063; Burman, Fl. Ind. (1768) 171; Murray, Syst. Veg. (1784) 679; Willd., Sp. Pl. 3, 2 (1802) 1245; Roxb., Fl. Ind. 3 (1832) 385. – Type: *Herb. Hermann* vol. 1, fol. 31 (BM).

Galega colutea auct. non Burm. f.: Willd., Sp. Pl. 3, 2 (1893) 1246. – *T. colutea* (Burm. f.) Pers., Syn. 2 (1807) 329 (only the second description there, the first part refers to the actual type). See note 2.

Galega incana Roxb. [Hort. Beng. (1814) 57, nom. nud.] Fl. Ind. 3 (1832) 385. – *T. incana* (Roxb.) Sweet, Hort. Brit. ed. 2 (1830) 142; Graham in Wallich, Cat. (1831/32) 5644; Wight, Cat. (1833) 57; W. & A., Prod. (1834) 212; Walpers, Rep. Bot. Syst. 1 (1842) 674 [non sensu Baker in Oliver, Fl. Trop. Afr. 2 (1871) 123; non sensu Harms in Engler, Pflanzenw. Afr. 3, 1 (1915) 589.] – *T. villosa* (L.) Pers. var. *incana* (Roxb.) Baker in Hook. f., Fl. Brit. India 2 (1876) 113. – *Cracca villosa* L. ♀ *incana* (Roxb.) O. K., Rev. Gen. Pl. 1 (1891) 174. – *Cracca villosa* L. var. *incana* (Roxb.) Hiern, Cat. Afr. Pl. 1 (1896) 223. – Type: Roxburgh's unpublished icones t. 1630 (K, n.v.), reproduced by Wight, Ic. 2 (1840) 371.

Galega hirta Hamilton, Trans. Linn. Soc. 13 (1822) 546. – *T. hirta* (Hamilton) Benth., Gen. Index to Trans. Linn. Soc. (1866) 101. – *Cracca villosa* L. *t hirta* (Hamilton) O. K., Rev. Gen. Pl. 1 (1891) 174. – Type: *Buchanan Hamilton s.n.* (BM, n.v.), India, Mysore.

Indument sericeous or sericeous to velutinous. Stipules 2–5 by 1–2 mm. Rachis of *leaf* 1–10 cm long, 0.5–1 mm diam.; the infrajugal part and interjugal parts of the longest rachis resp. 3–11 and 6–10 mm long; the interjugal parts 0.9–2.7 times longer than the infrajugal part; the ultrajugal part distinct. Petiolules 0.5–2 mm long. *Leaflets* 3–8 pairs, in the maxijugal leaf 6–8, obovate to narrowly obovate to elliptic; base acute to obtuse; apex truncate to emarginate; terminal leaflet smaller to larger than the lateral ones, 3.5–20 by 2–9 mm; lateral leaflets 3–21 by 1.5–8 mm. Midrib flat or sunken above. Distinct nerves 4–8 pairs, raised on both surfaces, angle with main nerve 10–20 degrees at base, 0–20 degrees halfway the nerve. *Pseudoraceme* terminal or leaf-opposed, 8–22 cm long; some basal bracts similar to vegetative leaves. Fascicles with 4–6 flowerbuds. Bracts to the fascicles triangular, sometimes narrowly triangular, 1.1–3.5 by 0.8 mm. Bracts to the flowers triangular to linear triangular, 1–1.8 by 0.2–0.5 mm. Pedicel 1.5–3 mm long. *Flower* 6–8 mm long. *Calyx* densely velutinous; cup 1.5–2 by 3.5–4.5 mm; teeth puberulous within, sericeous at the tops; the vexillary one triangular, 4–6 by 3–3.5 mm, its tops 3–5 by 1–1.5 mm; the lateral ones narrowly triangular to linear triangular, 6–7 by 0.8–1.8 mm; the carinal one narrowly triangular to linear triangular, 5.5–9 by 1.5–2 mm, longer than the other teeth and 3–4.5 times as long as the cup. *Standard* blade transversely elliptic to broadly ovate, sometimes auricled at base, apex truncate to retuse, the very apex sometimes acuminate, 4.5–7 by 6–9.5 mm; claw 1–2.5 mm long. *Wing* blades auricled at vexillary side, 4–7 by 2–4.2 mm, glabrous, lateral ribs extending over 1.5–4 mm; claw 1–2.5 mm long. *Keel* blades auricled at vexillary side, 4–5 by 2.1–3.5 mm, sericeous at the apex, lateral pockets 0.7–1.2 mm long; claw 1–2.3 mm long. *Staminal tube* 3.4–5 mm long, glabrous. Vexillary filament free at base and connate halfway, 4.8–7 mm long, glabrous; the other filaments alternately longer and shorter, free parts resp. 1.7–2.5 and 0.9–1.8 mm long. Anthers 0.3–0.5 mm long. *Ovary* 3.2–5 by 0.5–1 mm. Style twisted, 3–4 mm long, upper half glabrous; stigma penicillate at base. Ovules 7–10. *Pod* retrofalcate, slightly turgid, 20–40 by 3–6 mm, dense velutinous, slightly convex around seeds. *Seeds* 4–10, rectangular, brown, sometimes reticulately ridged, 2–3.5 by 1.8–2.5 mm.

Collector's notes. Erect suffrutescent herb, horizontally spreading, 0.2–0.5 m, slightly greyish. Calyx with brown hairs. Flowers reddish purple, purple or pink. Corolla pale purple with dark purple centre. Pods persistently velvety.

Distribution. Tropical and subtropical Africa, W. Pakistan, India, Sri Lanka, Indo-China, Java, Flores, possibly native in India, in E. Africa a different subspecies.

Habitat. Java: cultivated and on dry grassy places. Outside Malesia: open fields, open belt next to forest margin, dominated by low suffrutescent herbs, flood plains. Sandy soil. Altitude 20–160 m.

Vernacular names. India: Vaykkavalai (Tam.), Búpilla (Sing.).

Uses. Green manure in coffee and Hevea plantations (Van Helten, 1917, 1924; Heyne, 1916, 1927), covercrop in tea plantations (Van Helten, 1924). In Puduko-

ta, India, the juice of the leaves is used as a medicine against dropsy (Watt, 1893).

First dated record. India 1753 (Linnaeus); Malesia 1869 (Hasskarl, Java).

Notes. 1. This species is easily recognized by the shape of the calyx teeth, the carinal tooth much longer than the other teeth, much longer (3–4.5 times) than the cup, the retrofalcate dense velutinous pod.

2. According to Wight & Arnott (1834) and Baker (1876) *Galega colutea* Willd. is a synonym of *T. incana* Grah. They suspected that Willdenow took the shape of the pods from the description of *Galega colutea* by Burman f., which was based on Plukenet, Phyt. (1691) t. 166, f. 3. Plukenet's plate and description was based upon a specimen in Herbarium Sloane (vol. 95, fol. 185), which was studied by De Kort & Thijsse (pers. comm.). This specimen is definitely an *Indigofera* and Merrill made the combination *Indigofera colutea* for it in 1921. The confusion originated from Willdenow (1803) who based his description upon a specimen belonging to *T. villosa* L. (*Herb. Willdenow 13931*, photo received from B), calling it *Galega colutea* without author, adding 'W' behind the description, and referring to Burman f. From the protologues of surrounding species we concluded that Willdenow did not intend to describe a new species, but only indicated that the description was from his hands. Matters complicated when Persoon (1807) made the combination *T. colutea* with two short descriptions, the first based upon Plukenet's description and plate, and a second based on Willdenow's description. Persoon did not refer to Burman f., but his new combination needs to be typified by Sloane's specimen, and is nomenclaturally a synonym of *Indigofera colutea* (Burm. f.) Merr.

3. Merrill (1921) and Ali (1964) mentioned under the synonymy of *T. villosa* resp. *Galega barba-jovis* and *T. argentea*. Burman mentioned in the original description of *Galega barba-jovis* the Garcin herbarium. This should contain the type specimen, but unfortunately the Garcin herbarium has been destroyed and we did not find any duplicates. He also mentions Pluk., Phyt. (1691) t. 52 f. 1, so that this should be the lectotype. Pluk., Phyt. (1691) t. 52 f. 1, however, is not a *T. villosa*, because of its straight pod and 13–15 seeds. Furthermore Burman describes a glabrous pod. Therefore the following names should be removed from the synonymy of *T. villosa*. We have no suggestions for the proper identity:

Galega barba-jovis Burm., Fl. Ind. (1768) 172. – *T. barba-jovis* (Burm.) Cufod., Bull. Jard. Bot. Brux. 25, 3 (1955) 280. – *Galega argentea* Lamk., Enc. Meth. 2, 2 (1788) 599, nom. illeg. – *T. argentea* (Lamk.) Pers., Syn. 2 (1807) 329, nom. illeg.; W. & A., Prod. (1834) 212; Walpers, Rep. Bot. Syst. 1 (1842) 674; Miq., Fl. Ind. Bat. 1, 1 (1855) 295. – Type: Pluk., Phyt. (1691) t. 52 f. 1.

19. Tephrosia vogelii Hook. f. – **Fig. 6.**

T. vogelii Hook. f. & Benth. in Hook., Niger Fl. (1849) 296; Baker in Oliver, Fl. Trop. Afr. 2 (1871) 110; Gresh., Meded. Lands Pl. Tuin 10 (1893) 51; Taub. in E. & P., Nat. Pfl. Fam. 3, 3 (1894) 269; Gresh., Meded. Lands Pl. Tuin 24 (1900) 74; van Helten, Meded. Cult. 1 (1913) 7; ibid. 2 (1915) 7; Heyne, Nutt. Pl. N. I. ed. 1, 2 (1916) 279; ibid. ed. 2, 2 (1927) 778; van Helten, Teysmannia 28 (1917) 62; Heide, Meded. Alg. Proefst. Landb. 14 (1923) 24; Back. &

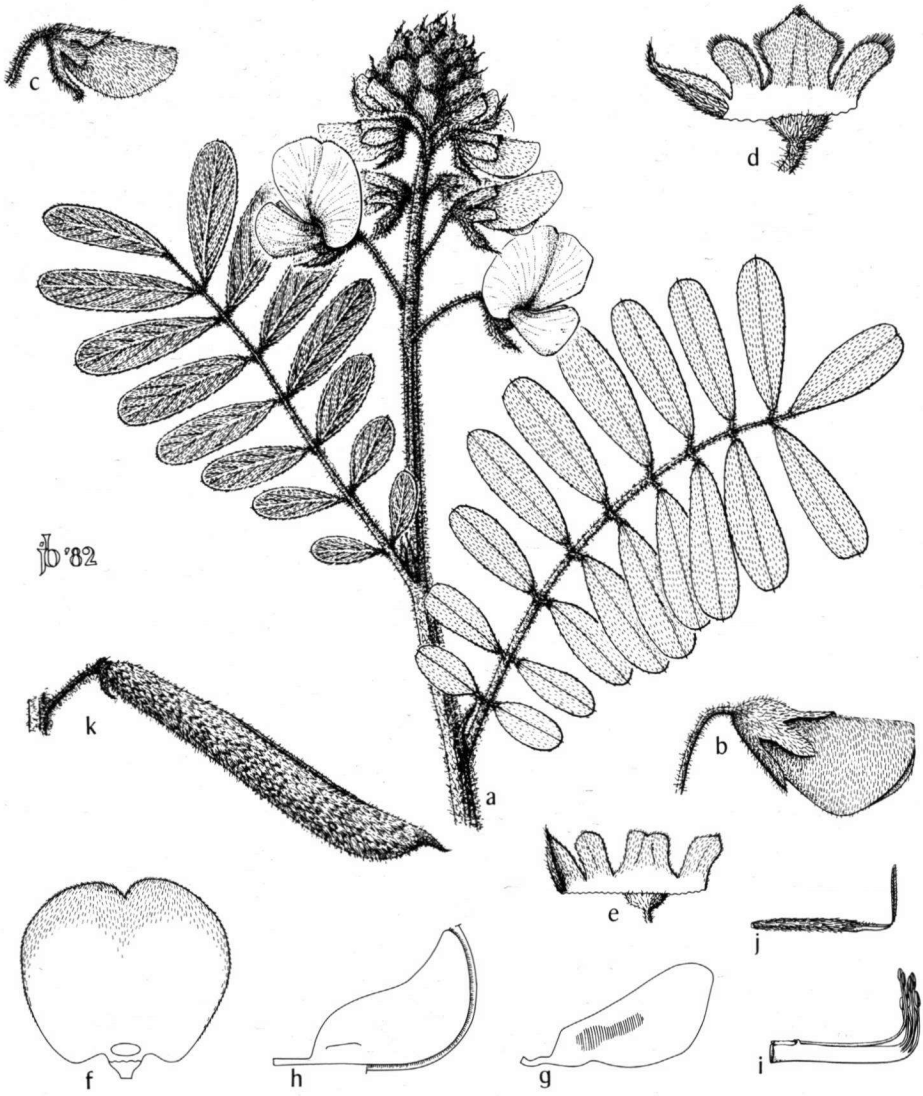

Fig. 6. *Tephrosia vogelii*. – a. Habit, x ½; b. flower just before reflection of standard, with 'Malesian' calyx, x ½; c. idem, with 'African' calyx, x ½; d. 'Malesian' calyx inside, x 1; e. 'African' calyx inside, x 1; f. standard inside, x 1; g. wing petal, x 1; h. keel petal, curved line indicates connate part, x 1; i. stamens, x 1; j. ovary, x 1; k. pod, x ½. (a, c, d, k *Verdcourt & Johns 4931*, LAE; b, e, f, g, h, i, j *Vogel s.n.*, lectotype, K).

Sloot., Theeonkr. (1924) 137; van Helten, Meded. Alg. Proefst. Landb. 16 (1924) 51; de Wildeman, Bull. Soc. R. Bot. Belg. 57 (1925) 129; Merr., Contr. Arn. Arb. 8 (1934) 76; Wilbaux, Rev. Bot. Appl. Agr. Trop. 14 (1934) 1019; Burk., Dict. 2 (1935) 2131; Tattersfield et al., Kew Bull. 5 (1940) 177; C.E. Wood, Rhodora 51 (1949) 376; Ali, Biologia 10 (1964) 23; Back. & Bakh. f., Fl. Java 1 (1963) 595; Gillett, Fl. T. E. Afr., Legum. 3, Pap. 1 (1971) 210; Verdc., Man. N. G. Legum. (1979) 338; Duke, Handb. Leg. Ec. Imp. (1981) 232. – *Cracca vogelii* (Hook. f.) O. K., Rev. Gen. Pl. (1891) 175; Hiern, Cat. Afr. Pl. 1 (1896) 223. – Lectotype: *Vogel s.n.*, s.d. (K), Niger (Herb. Benth.); *Vogel 28* (para, K), Sept. 1941, Niger, on the Quorra (Herb. Hook.).

Indument velutinous to sericeous. Branches velutinous to woolly. Stipules 10–22 by 3–3.5 mm. Rachis of *leaf* 5–20 cm long, 1.5–3 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 12–23 and 9–20 mm long; the interjugal parts 0.4–1.5 times longer than the infrajugal part; the ultrajugal part absent to distinct. Petiolules 1.5–5 mm long. *Leaflets* 5–12 pairs, in the maxijugal leaf 6–12, narrowly elliptic to narrowly obovate or elliptic; base acute to obtuse; apex rounded to emarginate; terminal leaflet shorter to larger than the lateral ones, 28–66 by 8–20 mm; lateral leaflets 14–67 by 6–18.5 mm. Midrib raised, flat, or raised in a furrow above. Distinct nerves 6–13 pairs, diffusely ending in a marginal nerve, raised below, slightly raised above, angle with main nerve 20–30 degrees at base, 10–25 degrees halfway the nerve. Venation distinct on both surfaces. *Pseudoracemes* terminal or leaf-opposed, 8–26 cm long; some basal bracts similar to vegetative leaves. Fascicles with 2 flowerbuds. Bracts to the fascicles orbicular to obovate, cuspidate, 12–17 by 7–12 mm. Bracts to the flowers narrowly elliptic to spatulate, sometimes cuspidate, 10–13.5 by 1.8–3.1 mm. Bracteoles sometimes present on the calyx, spathulate, 4.5 by 0.8 mm. Pedicel 3–21 mm long. *Flower* 18–26 mm long. *Calyx* cup 4–6 by 6.5–10 mm, outside sometimes sericeous; teeth puberulous to sericeous within, the vexillary one about broadly obovate, 5–12 by 8–12 mm, its tops 0.2–3 by 1–5 mm, the lateral ones about elliptic, apex rounded, 4.5–10.5 by 3.3–6.8 mm; the carinal one deltoid, 6–15 by 4–7 mm, longer than or as long as the other teeth and 1.5–3 times as long as the cup. *Standard* blade auricled at base, orbicular, apex emarginate, 20–28 by 24–32 mm, the apical half and the margins puberulous to sericeous within; claw 3–5.5 mm long. *Wing* blades auricled or slightly auricled at vexillary side, 17–22 by 11–13 mm, outside sometimes sericeous at carinal side, inside sericeous at carinal side, lateral ribs extending over 8–13 mm; claw 2–6 mm long. *Keel* blades sometimes slightly auricled at vexillary side, 15–20 by 10–12 mm, only sericeous or villous at the carinal side, lateral pockets, if present, sometimes bulgy, 1.5–5 mm long; claw 3.5–6 mm long. *Staminal tube* 19–20 mm long, glabrous. Vexillary filament free at base and connate halfway, 22–26 mm long, glabrous; the other filaments alternately longer and shorter, free parts resp. 6–11 and 4–7 mm long. Anthers 1.8–2.2 mm long. *Ovary* 11–19 by 1–2.5 mm, densely sericeous. Style not twisted, 11–15 mm long, bearded at vexillary and carinal side; stigma glabrous. Ovules 13–18. *Pod* linear, slightly turgid, 55–140 by 8–18 mm, woolly to sericeous. *Seeds* 6–18, transversely elliptic to reniform, brown to dark brown to black, 5–7 by 3–5 mm.

Collector's notes. Ascending shrub or small tree with dense foliage, 0.5–4 m. Stems ferrugineous or with golden hairs. Leaves furry and mid greyish green or blue green. Midribs, petioles and pedicels covered by golden hairs. Calyx pale green brown. Flowers fragrant, white, in Bali violet, in Java white, purple or blue, in East Africa mainly white, in West Africa mainly purple. Standard outside brown hairy. Pods hairy brown when mature or furry green. Flowering and fruiting throughout the year.

Distribution. Native in tropical Africa. Introduced in tropical America. In Asia recorded from India, Sumatra, Malay Peninsula, Java, Lesser Sunda Islands, Philippines, Celebes, New Guinea.

Habitat. Savannah, grasslands, fields, grassy slopes, among shrubs, along jungle trail, low ridge in mossy forest, forest margins, secondary regrowth forest and shrubland, waste ground, old cultivations. Exhibit tolerance to drought, fire, grazing, insects, low pH, poor soil and wind. Ranging from warm temperate moist through tropical dry to wet forest life zone. Tolerated annual precipitation 8.7–26.7 dm, annual mean temperature 12.5–26.2° C and pH 5.0–6.5. Humic brown clay, usually not subject to flooding, black silty well drained forest loam. Altitude 20–2440 m. (Partly from Duke, 1981.)

Ecology. Diseases and pests caused by fungi, nematodes and insects (Back. & Sloot., 1924; Duke, 1981). Pollinated by Xylocopa latipes (Heide, 1923).

Vernacular names. English names: Vogel tephrosia, fish bean, fish-poison bean. New Guinea: Pilawa. Africa: Asingoh, mukulu, m'panga, igongo, cafoto, caleuite, t'chingando, agbo-odo (sweep the water), mdombosa.

Uses. Cultivated as a green manure, windbreak, covercrop, shade plant in coffee, cacao, Hevea and Cinchona plantations (Van Helten, 1913, 1915, 1917, 1924; Heyne, 1916, 1927). Grown as an ornamental and fence plant. Cultivated in Africa as a fishpoison, the crushed leaves, roots and pods mixed with quicklime being thrown into the water (Taubert, 1894; Burkill, 1935; Duke, 1981). Used as an arrow poison in Africa (Greshoff, 1900). Dry crushed leaves are used as an insecticide against lice, fleas and thicks and as an molluscicide (Wilbaux, 1934). Medically used as an abortifacient, cure for mange, used for bactericide, ecbolic, emetic, pediculicide, piscicide, purgative, repellent, schistosomiasis and skin sores, weak infusion of the leaves used internally as an anthelmintic. Not suitable as a fodder.

Chromosome number. 2n = 22 (Duke, 1981).

First dated record. Africa 1841 (Th. Vogel, Niger); Malesia 1928 (Karta, Sumatra); according to Back. & Sloot. (1924) introduced in Java c. 1908.

Notes. 1. This species is easily recognized by the shape of the bracts, the number of flowerbuds per fascicle (2) and the large flowers and pods.

2. The type specimen is collected in Africa. The African specimens differ from the specimens of the Malesian area only in the shape of the calyx teeth. The indument of the undersurface of the leaflets of the specimens of New Guinea and Africa is somewhat more appressed than that of the specimens of the other Malesian islands, indicating recent introduction.

20. Tephrosia zollingeri Back. – Fig. 2b, 3h. Map 1.

T. zollingeri Back., Bull. Jard. Bot. Btzg 3, 16 (1939) 110; Stemmerik in Van Meeuwen et al., Reinwardtia 6 (1961) 107; Back. & Bakh. f., Fl. Java 1 (1963) 594. – *Kiesera gracilis* Miq., Fl. Ind. Bat. 1, 1 (1855) 291 (non *T. gracilis* Nutt.). – Type: *Zollinger 3321* (P, n.v.; iso BM, L, U), July 1847, Salayer.

Indument strigose. Stipules 3–6 by 0.5–0.6 mm, often deciduous. Rachis of *leaf* 3.5–20 cm long, 0.5–1 mm diam.; the infrajugal and interjugal parts of the longest rachis resp. 9–21 and 8–11 mm long; the interjugal parts 0.5–1.1 times longer than the infrajugal part, ultrajugal part distinct. Petiolules 1–2 mm long. *Leaflets* 5–18 pairs, in the maxijugal leaf 11–18, opposite at base, subalternate halfway, opposite at the apex of the rachis, narrowly obovate to narrowly elliptic or obovate to elliptic, strikingly thin; base acute; apex rounded to emarginate; terminal leaflet smaller to larger than the lateral ones, 9–32 by 3–10 mm; lateral leaflets 6–34 by 3–10 mm. Midrib raised or flat above. Distinct nerves 6–15 pairs, not ending in a marginal nerve, with distinct marginal arches, raised below, slightly raised above, angle with main nerve 20–35 degrees at base, 10–25 degrees halfway the nerve. Venation distinct on both surfaces. *Pseudoracemes* terminal, or axillary, or leaf-opposed, 14.5–21.5 cm long; some basal bracts similar to vegetative leaves. Fascicles with 5–8 flowerbuds. Bracts to the fascicles linear triangular, 0.7–3.5 by 0.1–0.4 mm. Bracts to the flowers narrowly triangular to linear triangular, 0.5–1.5 by 0.1–0.3 mm. Pedicel 5–7 mm long. *Flower* 4–9 mm long, curved. *Calyx* cup 1.5–2 by 1.5–3 mm; teeth pubescent to strigose within, the vexillary one broadly deltoid, 1.1–1.8 by 2–2.8 mm, its tops 0.3–0.8 by 0.1–0.5 mm; the lateral ones triangular, 1.2–1.8 by 0.8–1.2 mm; the carinal one triangular, 1–2.5 by 0.8–1.1 mm, longer than or as long as the other teeth and 0.5–1.5 times as long as the cup. *Standard* blade transversely elliptic, auricled at base, apex retuse to emarginate, 4–6 by 5–7.5 mm; claw 0.8–2 mm long. *Wing* blades auricled at vexillary side, 3.5–5.5 by 2–4 mm, glabrous, lateral ribs extending over 1–2.5 mm; claw 1–2.2. mm long. *Keel* blades auricled at vexillary side, 2.5–4 by 2–3 mm, glabrous, lateral pockets bulgy, 0.5–2 mm long; claw 1.2–2.7 mm long. *Staminal tube* 3–4 mm long, sericeous at the auricles. Vexillary filament free at base and connate halfway, 4.2–5.9 mm long, sericeous at the auricles and sometimes up to halfway the connected part; the other filaments alternately longer and shorter, free parts resp. 1.5–2.1 and 1–1.5 mm long. Anthers 0.4 mm long. *Ovary* 2.9–4.8 by 0.3–0.5 mm, sericeous. Style not twisted, 2.5–3.8 mm long, upper half glabrous; stigma penicillate at base. Ovules 5–9. *Pod* linear, slightly turgid, 30–53 by 3–4 mm, slightly convex around seeds. *Seeds* 5–8, rectangular, brown, 3.5–4.5 by 2–2.9 mm.

Collector's notes. Erect shrub, 1 m. Flowers white, violet, purple, light purplish red.

Distribution. Java, Lesser Sunda Islands, Celebes, Moluccas.

Habitat. Dry places in the forest. Altitude 80–700 m.

Vernacular names. Sumba: Aunu manu. Timor: Taum fui (Dawan language), ta-o fus.

Uses. Cultivated as a green manure.

First dated record. Malesia 1847 (Zollinger, Salayer).

Note. The large number of leaflets which are opposite at base, subalternate halfway and opposite at the apex of the rachis and the long rachis of inflorescence are characteristic for this species. The venation dries strikingly reddish.

See also notes under *T. purpurea, T. noctiflora, T. barbatala.*

EXCLUDED SPECIES

Tephrosia argentea (Lamk.) Pers. = not a synonym of *T. villosa*; see note 3 under *T. villosa.*

Tephrosia barba-jovis (Burm. f.) Cufod. = not a synonym of *T. villosa*; see note 3 under *T. villosa.*

Tephrosia colutea (Burm. f.) Pers. = **Indigofera colutea** (Burm. f.) Merr.; see note 2 under *T. villosa.*

Tephrosia pentaphylla [Roxb.] Sweet = not a synonym of *T. spinosa*; see note 2 under *T. spinosa.*

IDENTIFICATION LIST OF COLLECTIONS

1. astragaloides
2. **barbatala**
2a. var. **barbatala**
2b. var. **glabra**
3. candida
4. **elliptica**
5. filipes
5a. subsp. filipes
5b. subsp. **longifolia**
6. leptoclada
7. luzoniensis
8. maculata
8a. var. maculata
8b. var. **appressepilosa**
8c. var. **elongata**
9. nana
10. noctiflora
11. obovata
12. pumila
12a. subsp. pumila
12b. subsp. **aldabrensis**
13. purpurea
13a. subsp. purpurea
13b. subsp. **barbigera**
13c. var. **barbigera**
13d. var. rufescens
14. rigida
15. senticosa
16. spinosa
17. vestita
18. villosa
19. vogelii
20. zollingeri

Unnumbered collections and obvious unicates are omitted.

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Backer 37: 16, 633: 10, 846: 17, 2065: 10, 2492: 7, 2581: 12b, 2683: 7, 4765: 13a, 6407: 12b, 6949: 12a, 7533: 16, 7702: 12, 8155: 12a, 8168: 7, 8210: 13a, 8270: 12, 11347: 12a, 12983: 12a, 14693: 10, 15246: 13a, 15267: 7, 15548: 12b, 16340: 12b, 16491: 12, 16601: 10, 16714: 7, 16879: 13a, 17688: 12a, 17799: 13a, 18132: 7, 18937: 7, 19203: 7, 19476: 7, 19892: 12a, 20012: 7, 20381: 12a, 20495: 12, 20506: 7, 20660: 12a, 24307: 12, 24475:

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Carr 11372: 8c, 11154: 17, 11840: 5b, 11894: 5b, 14867: 13d, 16272: 3, 16299: 3 – Chalmers 1878: 13a, 1880: 1 – Charoenphol, Larsen & Warncke 4926: 17 – Chuang 3127: 10 – Cinatti 175: 12a – Coert 1101: 16 – Collins 211: 17, 1472: 17 – Comanor 580: 3, 581: 3, 1215: 18 – Craven & Schodde 905: 17 – Cribs 373: 10 – Cruttwell 172: 17 – Cuming 601: 13b, 1237: 11, 1257: 11, 1454: 17, 1621: 17 – Cunningham 37: 5, 92: 1, 93: 1, 150: 6 – Curran 3455: 19, 5851: 7, 16939: 11 – Curtis 1878: 10.

Daalen, van 483: 13a – Darbyshire 400: 3, 680: 1 – Darbyshire & Hoogland 7819: 10 – Derry 270: 10 – Dietrich 511: 1 – Dilmy 1038: 12, 1040: 13a, 1067: 13a – Djadoek 1064: 10, 1065: 10, 1070: 3, 1193: 17 – Dockrill 351: 5a – Docters van Leeuwen 117: 13a, 118: 13a, 1664: 20 – Docters van Leeuwen-Reynvaan 726: 10 – Dorgelo 934: 12 – Drummond 3072: 12, 3073: 12, 3074: 12, 3075: 12, 3076: 12, 4379: 12, 24878: 18 –Durand & Nelson 187: 19.

Elbert 574: 7, 1999: 7 – Elmer 5535: 7 – Elsener H164: 3 – Enoh 104: 3 – Everaarts 65: 19 – Everist 7242: 5a.

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INDEX

The numbers refer to the number of the accepted taxon. Synonyms are followed by an '=' preceding the number of the accepted taxon. New taxa and combinations in **bold type**. Excluded (Excl.) taxa are referred to a note under the numbered taxa.

(Tephrosia)
- pentaphylla Excl., see note 2 sub 16
- pumila 12
  - subsp. **aldabrensis** 12b
  - subsp. pumila 12a
  - var. aldabrensis = 12b
  - var. ciliata = 12b
- purpurea 13
  - subsp. A Verdc. = 13d
  - subsp. **barbigera** 13b
    - var. **barbigera** 13c
    - var. rufescens 13d
  - subsp. purpurea 13a
  - var. angustata = 12b
  - var. ciliata = 12b
  - var. diffusa = 13
  - var. paucifolia = 2a
  - var. pumila = 12
- repentina = 17
- rigida 14
- senticosa 15
- spinosa 16
  - var. mucronata = 16
- subamoena = 10
- timoriensis = 12
- tinctoria auct. non Pers. = 17
- tinctoria var. intermedia = 15
- vestita 17
- villosa 18
  - var. incana = 18
- villosa auct. non Pers. = 7
- vogelii 19
- wallichii = 13a
- zollingeri 20

Xiphocarpus
- candidus = 3
- martinicensis = 3