TAXONOMIC STUDIES IN THE GENUS PRINSEPIA[1] (ROSACEAE)

by

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The genus *Prinsepia* was founded by Royle about 125 years ago. Since that time there was, apparently, no attempt made of taxonomic revision of the genus as a whole, although being initially a monotypic group it comprises by now four species. In this connection it seems to be advisable to shed more light on the taxonomy of the genus and this paper is to be considered as an introduction to such work.

The first species of *Prinsepia*, *P. utilis* was described by Royle in 1839. In 1886 Oliver established the genus *Plagiospermum* with a single species, *P. sinense*, from Manchuria. In the absence of fruits Oliver felt some doubt regarding the affinity of his new genus and tentatively placed it in Celastreaceae. Only after the fruits of *Plagiospermum sinense* were studied, Bean in 1909, on the basis of Oliver's inedited manuscript, transferred this species to the genus *Prinsepia*. The third member of the genus was described by Batalin (1892) from Mongolia on the basis of fruiting branches. Since the fruits were solitary in leaf-axils of the shoots the new species was named "*uniflora*." Finally, the fourth species of *Prinsepia* was found in Taiwan (Formosa) in the early 1900's. Hayata who was first to study and describe the latter named it *P. scandens*.

Taxonomic position of the genus *Prinsepia* still remains somewhat uncertain, although some amount of work in this line has been done. This uncertainty depends, apparently, mostly on the peculiar structure of the flowers, especially gynoecium, in this small Asiatic group. As a result of this Oliver and Hayata, e. g., thought that some of its members were close to Celastraceae-which affinity seems to be merely of superficial character.

At the present time taxonomists treat *Prinsepia* as a genus of Rosaceae, but its position within the latter is, nevertheless, not definite. Royle (1839) and Lindley (1836, 1853), e. g., assigned this group to Chrysobalanoideae, while Bentham and Hooker (1862–1867), and all subsequent authors referred it to Prunoideae. However,

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still, within this subfamily *Prinsepia* occupies an uncertain position. Focke (1894) maintained it as an exceptional prunoid genus, standing next to the *Prunus* L. in the system. Komarov (1903–1904) also believed that it is a prunoid genus with strong affinities to *Chrysobalanoideae*, but Juel (1918, 1927) on the basis of floral anatomy concluded that there is no real close relationship between both mentioned groups, and that affinities of *Prinsepia* lay within the Prunoideae, especially with the genus *Nuttalia* Torr. et Gr. (=*Osmaronia* Greene). Bonne (1928) agreed with this view and on the basis of gross morphology of the flower and, partly, floral anatomy hypothetically interpreted this genus as having direct phylogenetical connections, on the one side, with *Nuttalia* Torr. et Gr. (=*Osmaronia* Greene), and through this genus with *Prunus* L., and on the other side a questionable affinity to *Chrysobalanus* L. in *Chrysobalanaceae* and probable relationship with *Chamaebatia* Benth. in Rosoideae. Apparently in accordance with these notions Rehder (1927, 1940) grouped *Prinsepia* next to *Osmaronia* Greene in Prunoideae. Finally, Sterling (1963) on the basis of carpel morphology, ovule position, ovule structure, and floral anatomy (vascularization) considered that *Prinsepia* has been incorrectly classified as a prunoid genus and proposed to separate it in the special sub-family (or tribe?) *Prinsepioideae*. Such approach to the classification of *Prinsepia*, is, however, not a new one, since Purpus in 1903 had already suggested on the basis of gross morphology that *Prinsepia* should be credited to the special subfamily "*Prinsepieae*" or at least to the special tribe "*Prinsepioideae*." It seems, nevertheless, that there is no need for such separation and that it is better to retain *Prinsepia* Royle in the *Prunoidae* since the relationships of this genus lay within the latter subfamily, especially with the genus *Osmaronia* Greene. The fruits of *Prinsepia* are definitely of prunoid type. They are similar to those of *Osmaronia* Greene, being oblique drupes subtended by persistent floral tube. Similarly to the *Osmaronia* Greene, *Prinsepia* has two collateral, submarginal, ovules inserted on the ventral side of the ovary. These ovules are pendulous by origin, but appearing nearly horizontal to somewhat ascendent due to the strongly reduced growth of the ventral side of the ovary[1]. The stylar position in *Prinsepia* resembles that of *Osmaronia* Greene where the style is excentric, sublateral. This peculiar asymmetry of the pistil in both genera can, apparently, again be explained by the unequal rate of growth of the dorsal and ventral sides of the ovary. While the ventral portion of the latter grows very slowly or not at all, the dorsal side grows very rapidly. The observations of the development of the pistils in *Prinsepia*, made by me, shows that in the young flower buds the style is terminal to sublateral, becoming lateral to subbasal only at maturity. This growth pattern can be also traced later in the immature fruits and

(1) "Diese Samenanlagen können wegen der Rapmverhältnisse nicht die für Pruneen typische hängende Lage einnehmen, sondern sind horizontal oder ein bisschen nach oben gerichtet." (Juel, 1927, p. 7)

finally results in the oblique symmetry of the drupe. (Cf. also Juel, 1927).

Prinsepia Royle, Ill. Bot. Himal. Mount. 206. *tab. 38*, fig. 1. 1839.
Plagiospermum Oliver, Hook. Ic. Pl. 16: pl. 1526. 1886.

Evergreen or deciduous, erect, rarely scandent, shrubs, with axillary spines (thorns); branchlets with lamellate pith; buds small, naked and/or covered with a few pubescent scales. Leaves alternate, often fascicled, simple, membranaceous to coriaceous, entire or toothed, petiolate; stipules small, persistent, or wanting. Flowers pedicled, in axillary bracteate racemes, or 1–8 on very short spurs each pedicel being axillary to one of the fascicled leaves, regular or somewhat irregular (as to the calyx), perigynous, bisexual. Floral tube (hypanthium) cup-shaped, terminated in 5 broad and short, equal or unequal calyx lobes. Petals 5, distinct, equal, suborbicular, clawed, white or yellow, spreading. Stamens many, multiseriate, or 10, biseriate, distinct; filaments short to long, subulate, inserted at and partly on the upper margin of an intrastaminal disc lining the floral tube within; anthers introrse, ca. 5 to 2 times shorter than the filaments, the anther-halves (locules) contiguous or separated by broad connective, longitudinally dehiscent. Gynoecium 1-carpellate; stigma capitate or dilated; style lateral to subbasal; ovary superior, 1-celled; ovules 2, collateral, submarginal ("marginal"), nearly horizontal to somewhat ascendent, anatropous, pleurotropous, provided with placental obturators. Fruit an oblique, 1-seeded drupe, red or purple, with style scar at base, subtended by the persistent floral tube; stone crustaceous ("leathery"?) or bony, ±smooth or sculptured, splitting into two valves in germination (at least in *P. utilis*). Seed without endosperm, the seed coat thin, the embryo straight, with large, fleshy plano-convex cotyledons and a short radicle.

The name commemorates James Prinsep (1800–1840) an eminent British orientalist, secretary of the Asiatic Society of Bengal and editor of the "Journal" of the Society.

Type species: *P. utilis* Royle.

Geographically the whole genus *Prinsepia* is confined primarily to continental eastern Asia. Its area of distribution ranges here from western Pakistan and N. W. India to southern and central China, E. Mongolia, Ussuriland in the Russian Far East, and Manchuria and Korea. In Japan the members of this genus have not been found and a single insular species of this group is *Prinsepia scandens* Hayata on Taiwan (Formosa.)

Morphological notes. In addition to the characteristics given in the formal generic description, a number of other morphological details some of which have been used in delimitation of the infrageneric categories should be given.

The bark of the trunk, or trunk and branches, is exfoliating at least in *Prinsepia utilis*, *P. uniflora*, and *P. sinensis*.

The thorns in *Prinsepia* represent modified short branches. This is obvious in *P. utilis* and *P. scandens* where they bear leaves or leaf scars. They, apparently, develop from the naked buds borne in the axils of the young leaves, while the regular shoots develop from the perulated buds. The axial origin of the thorns is much less pronounced in two other species, *P. uniflora* and *P. sinensis* where they are small and leafless.

The bases of the petioles in *Prinsepia utilis* especially on young shoots, are densely pubescent and furnished with brown fusiform glands. This character of the petiole bases was not observed in three other species.

The basic type of the inflorescence in *Prinsepia* is a simple raceme, although in some cases the tendency to form compound racemes was observed. On the other hand sometimes the inflorescences exhibit signs of reduction. Those with only one functional flower are often in *P. utilis* and *P. scandens* in which, however, the number of bracts on the peduncle indicates aborted flowers. The most developed racemes, as to length and number of flowers, are in *Prinsepia utilis*. In *P. scandens* there can already be noted a reduction of the number of flowers and internodes, and in *P. uniflora* and *P. sinensis* the number of flowers is lessened and the main axis of the raceme, is apparently, completely reduced. The solitary axillary flowers, which evolved as a result of such reductions, in the latter two species, are borne among the leaves on short spurs and give the appearance of being fascicled.

The bracts in *Prinsepia utilis* are occasionlly leaflike. In *P. uniflora.* and *P. sinensis* they are, apparently, wanting.

Floral tube (hypanthium) in *Prinsepia* Royle, as in many other rosaceous genera, is receptacular at the base and appendicular above (Bonne; Jackson).

The presence of the nectariferous disc and the fragrance of the flowers indicate entomogamy but the data on the insect pollination have not been available. It is supposed by some botanists that flowers of *Prinsepia* being morphologically perfect are functionally unisexual (Rehder, 1916). This mechanism is aimed, evidently, to secure cross pollination.

The germination in *Prinsepia* is epigeous; the cotyledons are green, hastate, at least in *P. sinensis.*

Chromosome numbers have been reported previously for *Prinsepia utilis* by Sharma and Swarup (1962) and for *P. uniflora* by Sax (1931). In both species a haploid number of 16 was reported. The count of *P. uniflora* has been verified, by Dr. Mary Sanders. from material grown at the Arnold Arboretum. In addition, the chromosome number of *P. sinensis* is reported here for the first time ($n=16$). This count is based on observations of diakinesis in pollen mother cells. In both *P. uniflora* and *P. sinensis,* chromosome pairing appears to be normal with 16 bivalents at diakinesis. The bivalent formation is very loose and appears to be a distinctive and interesting feature. The mature pollen appears normal with little

variation in grain size. The pollen stainability, with cotton blue and lactophenol, is approximately 94%.

Anatomical data concerning *Prinsepia* are very fragmentary and inconclusive. Wood anatomy was studied by Kanehira (1921) only in one species, *P. scandens*. The wood structure of this shrub seems to be rather similar to that of some Formosan species of *Prunus* L.

Economic uses. Fruits of *Prinsepia utilis*, *P. uniflora* and *P. sinensis* are edible. Seeds of *P. utilis* are yielding oil. In *P. sinensis* they are also oily. Stones of the latter species are used in China for making beads. *Prinsepia utilis* is cultivated in India and S. China as a hedge plant, and *P. uniflora* and *P. sinensis* in Europe and N. America as ornamentals. Propagation by seeds, cuttings and layers (Fyson; Purpus; Rehder, 1946; Royle; Silva Tarouca & Schneider; Woeikoff).

Subgeneric division and relationship. Rehder (1915) subdivided the genus *Prinsepia* into two sections *Euprinsepia* and *Plagiospermum*. Stapf (1917) and Juel (1927), on the basis of gross morphology suggest that these sections should be recognized as separate genera. However, the strong structural resemblances (especially flower structure) between *Prinsepia* and *Plagiospermum* seem to favor the retention of the latter within the former.

Rehder's sections were based on the branch, inflorescence and androecium characters. The revision of these sections shows that besides the traits already mentioned above, they differ in the leaf characters, in the presence and absence of stipules and bracts, in calyx symmetry, and in the structure of anthers. The characters of endocarp are also different, at least with regard to *Prinsepia utilis* on the one side, and *P. uniflora* and *P. sinensis* on the other. Therefore, it seems to be preferable to treat these groups not as sections, but as subgenera, so much the more that Rehder (1916) spoke of them as of distinct subgenera and did not raise them formally to this rank.

KEY TO THE SUBGENERA AND SPECIES

A. Branchlets green, with rather large, straight, often foliated thorns; leaves usually subcoriaceous to coriaceous, ±persistent; stipules wanting; flowers white, bracteate, in sometimes reduced racemes; calyx lobes unequal ..... Subg. PRINSEPIA

B. Shrub erect; leaves thin coriaceous, elliptic to elliptic-lanceolate, usually long acuminate at apex, narrowly cuneate at base, usually sharply and finely serrulate; inflorescences 1–13–, most commonly 5–7-flowered; flowers 1.3–2 cm. across ..... *P. utilis*

B. Shrub scandent; leaves coriaceous, usually±elliptic-ovate, acute at apex, broadly cuneate at base, crenate-serrate or crenate; inflorescences 1–4–flowered; flowers ca. 1.3 cm. across....*P. scandens*

A. Branchlets light grey with small, always leafless,±curved thorns; leaves thin, membranaceous, deciduous; stipules present, persistent; flowers white or yellow, bractless, 1–8 among fascicled leaves, on very short spurs; calyx lobes equal .....Subg. PLAGIOSPERMUM

C. Branches with reddish-brown bark; leaves of the fertile branchlets usually linear-oblong, attenuate towards the base±obtuse, mucronate at apex, subsessile or very shortly petiolate; flowers white; drupes dark red, bloomy.....*P. uniflora*

C. Branches with yellowish-bark; leaves of the fertile branchlets oblong to lanceolate-oblong, obtuse to rounded at base, acuminate at apex, manifestly petiolate; flowers pale yellow; drupes bright red .....*P. sinensis*

Subg. 1. *Prinsepia* [Sect. *Euprinsepia* Rehder in Sarg. Pl. Wils. **2.** 344 (1915).]

Flowers in racemes; bracts present; calyx irregular, with 2 small and 3 large calyx lobes, entire or erose at margins; stamens numerous, many-seriate; anther-halves separated by broad connectives; style in the flowering time lateral; stone crustaceous, obliquely obovoid-oblong, very faintly sculptured or smooth; branchlets green; thorns large, straight, foliated; stipules wanting; leaves thin coriaceous to coriaceous±persistent; shrubs erect or scandent.

1. *Prinsepia utilis* Royle, Ill. Bot. Himal. Mount. 206. *tab 38.* fig. 1. 1839.

Type specimens: The type of this species is not designated in the original description. There is one specimen in the Royle herbarium at the City of Liverpool Museums, which, according to the letter of Mr. C. Cross, Keeper of Botany, is the one that, apparently, figured in the original description. It seems that this specimen should be proposed as the lectotype of *P. utilis* Royle. The apparent isotype is in Kew Herbarium, labelled: "N. W. India, Herb. Royle."

This species is a shrub 1.5, occasionally up to 3.6 m., high. Young branchlets and leaves puberulent. Thorns 1.0–5.0 cm. long. Leaves 1.1–10.5 cm. broad (blades), petioles 0.5–1.0 cm. long. Marginal denticles glandular. Inflorescences 1.5–6.0 cm. long, with glabrous or puberulous pedicels. Fruits oblong-obovoid, dark purple, bloomy. The leaf shape in *P. utilis* is very variable. Especially distinct form of the latter have some specimens from China (Yunnan and Szechuan). The leaves of these plants are small (average size, 2.5 cm. long, 1.1 cm. broad), broad elliptic with±rounded apex. However, the taxonomic status of these specimens is not clear due to the scarcity of material available. It may be either a special form or merely an ecological modification. To decide this question further field explorations are necessary.

Distribution. This species occurs on dry rocky slopes in mountainous regions, on high elevations, in W. Pakistan, India, Nepal, Bhutan and China where it is reported from S. E. Tibet, Yunnan, Kweichou, Szechuan and Hupeh provinces.

Specimens examined. **W. Pakistan.** Hazara, Abbotabad, alt. 4200 ft., *Stewart 16361* [A]; Hazara, Abbotabad, alt. 4–5000 ft., *Stewart 13691* [A]. **India.** N. W. Himalaya: N. W. Himalaya, alt. 4–8000 ft., *I. I. s. n.* [GH]; Chamba State, Bhandal valley, Kihar, alt. 4500 ft., *Parker s. n.* [A]. Punjab: Kangra, Kulu, alt. 5000 ft., *Walter Koelz 4673* [A]; Kulu, Kulu, alt. 4000 ft., *Walter Koelz 10292* [A]; Kulu, Banjar, alt. 5000 ft., *Walter Koelz 1520* [A]. C. Himalaya: Kumaon, Almora, alt. 500 ft., *Strachey & Winterbottom s. n.* [GH]; Simla, *Wilson s. n.* [A]. S. W. India: Octacamund, *Wilson, s. n.* [A]; Nilgiris, *Anstead 53* [A]. S. India: Danddi, *Y. G. Yadar s. n.* [A]. E. Himalaya: Darjeeling, *M. B. Raizade 18877* [A]. Assam: Khasia Hills, *Gammie 337* [A]; Khasia, *King s. n.* [A]. Sikkim: Lacheng, alt. 8000 ft., *K. Biswas 6868* [A]; Sikkim, alt. 8–9000 ft., *J. D. H. s. n.* [GH]. **W. Nepal.** Doti district, Masintola, *Bis Ram 372* [A]. **Bhutan.** Amo Chu River, Chumbi Valley, alt. 8500 ft., *Ludlow, Sherriff & Hicks 16004* [A]. **China.** S. E. Tibet: Tongyuk, Tongyuk Dzong, Pome prov., alt. 9000 ft., *Ludlow, Sherriff & Elliot 12027* [A]. Yunnan: Likiang valley, *Feng 314* [A]; Muli, Wachin, *Yü 6175* [A]; Kung-Ming, *Wang 62715* [A]; Yunning, Shytzeshan, alt. 2500–2600 m., *Yü 5364* [A]; Tung-hung-tang, Cheng-kiang, alt. 1800 m., *Tsiang & Wang 16081* [A]; Tong-tchouan, alt. 2900 m., *Maire 189* [A]; between Tengyeh and Likiangfu, *Rock 8063* [A]; Yunnanfu, *Schneider 86* [A]; between Talifu and Likiang, *Rock 3281* [A]; Drainage basin of Erhhai, Tsang-shan Range, alt. 8500 ft., *Rock 3111* [A]; Tali valley, alt. 6700 ft., *Forrest 4974* [A]; Kungming, *Lau 29405* [A]; Tali valley, alt. 6500–8000 ft. *Forrest 146* [A]; Mengtze, alt. 6000 ft., *Henry 9281* [A]; Mengtze, alt. 7000 ft., *Henry 11343* [A]; near Laitonpu, alt. 8000 ft., *Rock 12004* [A]; Bei Yunnanfu, *Schneider 86* [GH]; Chao-tung Hsien, alt. 1700 m., *Tsai 50924* [A]; Wei-se Hsien, alt. 2300 m., *Tsai 63113* [A]; Mengtze, alt. 2700 m., *Tsai 52384* [A]; Li-kiang Hsien, alt. 2700 m. *Wang 70866* [A]; Li-kiang Hsien, alt. 2300 m., *Wang 70470* [A]; Likiang valley, *Ching 20369* [A]; Kung-Ming, alt. 2200 m. *Wang 63043* [A]; Wen-shan Hsien, alt. 1600 m., *Tsai 51596* [A]; Chiu-pei Hsien, alt. 1400 m., *Tsai 51457* [A]; Chiu-pei Hsien, alt. 1400 m., *Tsai 51457* [A]; Lan-ping Hsien, alt. 3000 m., *Tsai 56295* [A]; Locality?, *Yü 5022* [A]. Szechuan: S. W. Tachienlu, *Cheng 914* [A]; Juei-she Hsien, alt. 2100 m., *Yu 988* [A]; Inter Oti et Jenyüan Hsien, alt. 3000 m., *Schneider 3535* [A]. Kweichow: An-lung, *Tsiang 7375* [A]. Hupeh: Enshih Hsien, *Ho-Ch'ang Chow 2043* [A].

2. *Prinsepia scandens* Hayata, Icon. Pl. Form. **5.** 69. fig. 12A. 1915.

Type specimens: Hayata cited three specimens when reporting in 1911 *Prinsepia utilis* from Formosa. But on seeing these shrubs in nature, he changed his mind and described this in 1915, as *P. scandens.* Apparently no specimens at this time were collected, as well as no type specimen was designated under the description of *P. scandens.* So the above mentioned three specimens should be considered automatic-

ally as the syntype of *P. scandens*. According to the information of Prof. H. Hara to me (in a letter) these three specimens are preserved in the herbarium of the Botanical Institute of Tokyo University. On the suggestion of Prof. Hara it is better to select as lectotype *P. scandens* the specimen, labelled, "M. Morrison, *Kawakami et Mori 2025*," because it is more complete ("better") than the other two.

This is a shrub 8–9 m. high. Young leaves and young branchlets in the upper part puberulous. Thorns 0.5–2.1 cm. long. Leaves 1.2–6 cm. long, 0.4–2.0 cm. broad (blades), petioles 0.3–1.0 cm. long. Marginal denticles glandular. Inflorescences 1.2–2.4 cm. long, with±densely puberulous pedicels.

Distribution. Common in thickets in the central mountain ranges of Taiwan (Formosa) at high elevations, between 1800–3300 m. Endemic.

This species is very near to *Prinsepia utilis* and it is difficult to distinguish one from another in herbaria. Apparently for this reason specific status of *P. scandens* in the opinion of some botanists is questionable. Komarov (1941), for instance, does not recognize it as a distinct species. The marked distinctive character of *P. scandens* is that it is scandent while all other species of *Prinsepia* are erect. The exact way of its climbing is described by Hayata in the following way: "It is a shrub of scandent habit like *Celastrus articulatus*, trailing and climbing to the top of other tall trees, and sending its branches downwards." (Hayata, 1915, p. 69). However, the wood anatomy of *P. scandens* does not exhibit features peculiar to lianas.

Morphological differences between *Prinsepia utilis* and *P. scandens* include leaves somewhat different in their texture, shape, and type of dentation; and all parts (except length of the stem) relatively smaller in the latter species.

Geographically these taxa are sharply isolated.

The fruits of *Prinsepia scandens* are hitherto not described. Regretfully it was impossible to get them for the description in this study.

The chromosome number of this species is also unknown.

Prinsepia scandens is the only member of the genus which is not in cultivation. Therefore it is desirable to try growing it in the United States and elsewhere in order to study its horticultural qualities.

Specimens examined. **China.** Taiwan (Formosa): Mt Morrison, *Kawakami & Mori 2025* [A] isotype; Mt. Arisan, *Kanehira & Sasaki s. n.* [A]; Arisan prov., Kagi, *Wilson 9641* [A]; Mt. Lee-shan, Taichung Hsien, *Feung & Kao 4555* [A].

Subg. 2. *Plagiospermum* (Oliv.) A. Baranov stat. nov.

[*Plagiospermum* Oliver in Hooker's Icon. Pl. **16:** t. 1526 (1886); sect. *Plagiospermum* (Oliv.) Rehder in Sarg. Pl. Wils. **2:** 345. (1915).]

Flowers 1–8 among fascicled leaves on very short spurs; bracts wanting; calyx regular, with 5 equal sepals, ciliate on the margins; stamens 10, biseriate; anther-halves contiguous; style in the flowering time subbasal; stone bony, obovate to suborbiculate, strongly laterally flattened, definitely sculptured, the sculpture consist-

ing of irregularly shaped tubercles; branchlets light grey; thorns small, leafless; stipules present, persistent; leaves membranaceous, deciduous; erect shrubs.

Type species: *Plagiospermum sinense* Oliver. (=*Prinsepia sinensis* (Oliv.) Oliv. ex Bean).

3. *Prinsepia uniflora* Batalin, Act. Hort. Petrop. **12**(**1**). 167. 1892.

Type specimen: This species was described on the basis of specimen labelled: "Ordos, in collibus arenae mobilis inter Baga-gol et Borobalgasun, fructif., 13 Septm. 1884, *G. N. Potanin.*" Its holotype is extant in the herbarium of Botanical Institute of the Academy of Sciences of the U. S. S. R. in Leningrad.

Shrub up to 1.6 m. high. Thorns 0.3–1.6 cm. long. Leaves of the fertile and sterile branches different in form and size; in fertile branches, 0.8–4.4 cm. long, 0.3–0.8 cm. broad (blades), petioles 0.1–0.6 cm. long; in sterile branches, 4.7–8.2 cm. long, 0.7–1.4 cm. broad (blades), petioles 0.2–0.4 cm. long. Flowers ca. 1.4 cm. across, 1–6 in a fascicle, with glabrous pedicels, 0.3–0.7 cm. long. Fruits 1.0–1.5 cm. across. Stone ca. 1 cm. long, ca. 0.8 cm. broad, more shallowly sculptured than in the next species.

var. *serrata* Rehder. Jour. Arn. Arb. **22.** 575. 1941.

Type specimen: The holotype of this variety is extant in the herbarium of the Arnold Arboretum, labelled; "Central Kansu, Lien hoa shan, Tao river valley below Titao, *Rock 13225.*"

Morphological differences between var. *serrata* and var. *uniflora* are not great. The former is distinguished from the latter only in more remotely arranged, broader and constantly serrate leaves. However, in var. *uniflora* some specimens also have fairly broad and partly serrate leaves. The leaf size is nearly the same in both forms. In the fruits and also in the flowers there is little or no difference between them, except that in var. *uniflora* these organs are a little smaller (Rehder, 1941). The difference in the geographical range is uncertain (Rehder, l. c.). It seems that var. *serrata* is limited in distribution by the central and southern Kansu, and probably may extend into northwestern Szechuan. On the basis of herbarium material available in the Arnold Arboretum it is impossible to decide this question. With regard to this problem additional field explorations are necessary.

Distribution. The geographical range of this species extends from Ordos and Inner Mongolia to the provinces Shensi, Shansi, Kansu, Honan, and Kiangsu in N. W. and C. China. The indications on its ecology are very scarce. It seems to occur mostly on dry situations with sandy or loess soil.

Specimens examined. Var. *uniflora*. **China.** Honan: Mienchih, alt. 800 m., *J. Hers 68* [A]; Siao hsien, Huang Tsang Yü alt. ca. 200 m., *J. Hers 1034* [A]; Kunghsien, *J. Hers 89* [A]; Kunghsien, *J. Hers 197* [A]. Shensi: Yenanfu, *Purdom 324* [A]. Shansi: Fucheng, alt. 4000 ft., *Meyer 1633* [A]; Fenchow, *J. Hers 1907* [A]; locality?, alt. 800–1300 m., *Tang 676* [A]. Var. *serrata*. **China.** Kansu: Between Choni and

Lanchou, alt. 2600–3000 m., *Ching 1033* [A]; Lower Tebbu country, Pezhu valley, *Rock 14957* [A]; Upper Tebbu country, banks of Peshwekiang between Tsaruku and Pezhu, alt. 8000 ft., *Rock 14564* [A]; below Lien hoa shan, alt. 8000 ft., *Rock 13504* [A]; Valley of Motzuping, *Rock 12065* [A].

Cultivated material. Var. *uniflora*. **U. S. A.** Philadelphia, Pa., *Dudley s. n.* [AAH]; San Francisco, Calif., *Eric Walter* [AAH]; Chico, Calif., no. 39432, *Russell* [AAH]; Chico, Calif., no. 39432, *Thomas* [AAH], Arnold Arboretum; no. 7188–1, *E. J. P.;* no. 21610, *F. J.P.;* no. 21611, *E. J. P.;* no. 82–27, *E. J. P.;* no. 7188, *A. R.;* no. 1281–38, *Lily Perry;* no. 7188, *C. E. K. & F. P. M.* (voucher specimen for chromosome count), **Europe:** Hort. Bot. Darmstadt, *A. R. s. n.* [AAH]; Hort. Vilmorin, Verrieres [AAH]; Hort. Bot. Darmstadt, *Purpus s. n.* [AAH]. Var. *serrata*. **U. S. A.** Chico, Calif., no. 40023, *Thomas* [AAH]; Arnold Arboretum; no. 82–27, *A. R.;* no. *21610*, A. R.; no. 82–27, *Kobuski & Roush;* no. 1437–26, *Kobuski & Roush.*

4. *Prinsepia sinensis* (Oliv.) Oliv. ex Bean, Kew. Bull. 1909. 354. 1909.

Type specimens: The syntype of this species (three specimens) is preserved in the herbarium at Kew. On the suggestion of Mr. Jeffrey and Dr. Hubbard (in a

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Explanation of Plates

Figs. 1–5. Semi-diagrammatic and diagrammatic figures of leaves, inflorescences, flower parts and stones of *Prinsepia* species.

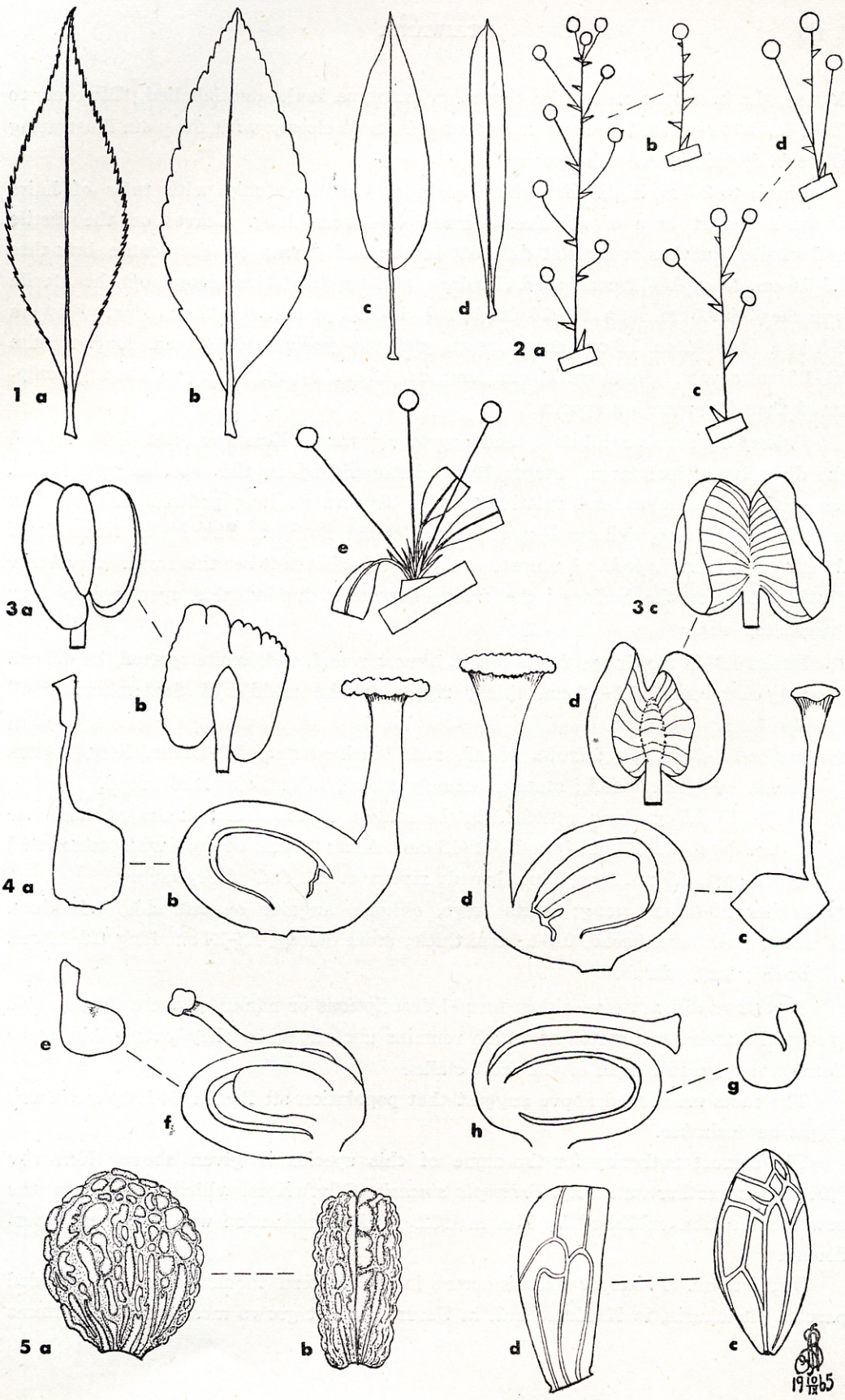
Fig. 1. Leaf outlines (×ca. 1.4). a. *P. utilis* (India, Kihar, *Parker s. n.* [A]); b. *P. scandens* (Formosa, *Kanehira & Sasaki s. n.* [A]); c. *P. sinensis* (Manchuria, *Dorsett 3054* [A]); d. *P. uniflora* (China, *Purdom 324* [A]).

Fig. 2. Diagrams of inflorescences of *Prinsepia* species belonging to two subgenera (a-d ×ca. 1.4; e ×ca. 2.8). a, b. *P. utilis* (subg. *Prinsepia*): a. normal inflorescence (China, Yunnan *Tsai 51596* [A]), b. reduced (India, Punjab, *W. Koelz 10292* [A]); c, d. *P. scandens* (subg. *Prinsepia*): c. normal inflorescence (Formosa, *Kanehira & Sasaki s. n.* [A]), d. reduced (Formosa, *Wilson 9641* [A]); e. *P. sineusis* (subg. *Plagiospermum*) (Manchuria, Suifenho, *Skvortzov s. n.* [A]).

Fig. 3. Anthers of *Prinsepia* species belonging to two subgenera, with upper parts of filaments (×ca. 28). a, b. *P. sinensis* (subg. *Plagiospermum*): a. front view, (cult. material Arn. Arb. 16381-A); c, d. *P. utilis* (subg. *Prinsepia*): c. front view, d. back view (China, Yunnan, *Schneider 86* [A]).

Fig. 4. Pistils of *Prinsepia* species (×ca. 14). a, b. *P. utilis*:
a. immature pistil (China, Yunnan, *Tsai 51457* [A]),
b. mature (India, *Wilson s. n.* [A]); c, d. *P. scandens*:
c. immature pistil (Formosa, *Kanehira & Sasaki s. n.* [A]),
d. mature (Formosa, *Wilson 9641* [A]); e, f. *P. sinensis*:
e. immature pistil (cult. material Arn. Arb. 16381-A),
f. mature (Manchuria, Suifenho, *Skvortzov s. n.* [A]);
g, h. *P. uniflora;* g. immature pistil (cult. material Arn. Arb. 7188-1) h. mature (China, *Purdom 324* [GH]).

Fig. 5. Stones of *Prinsepia* species belonging to two subgenera (×ca. 2.8).
a, b. *P. sinensis* (subg. *Plagiospermum*): a. front view,
b. side view (Manchuria, Hsiaoling, *Skvortzov s. n.* [A]);
c, d. *P. utilis* (subg. *Prinsepia*): c. front view, d. side view (India, Kulu, *W. Koelz 4673* [A]).


1 a
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letter), the best specimen to be chosen as lectotype is the one labelled, "Mukden to Yalu R., *Webster s. n.*", because it corresponds most closely with the plate illustrating Oliver's description of this species.

Shrub to 2–3 m. high. Branchlets glabrous sometimes only with tufts of hairs at the nodes, at base of stipules. Thorns 0.3–1.2 cm. long. Leaves on the fertile and sterile branches somewhat different in size and form; on the fertile branches 2.5–5.6 cm. long, 0.6–1.6 cm. broad (blades), petioles 0.3–1.4 cm. long; on the sterile branches 3.0–9.0 cm. long, 0.8–2.4 cm. broad (blade), petioles 0.8–2.4 cm. long. Flowers 2–8 in a fascicle, ca. 1.3 cm. across, with glabrous pedicels 0.8–2.1 cm. long. Fruits 1.1–1.3 cm. across. Stone ca. 1.3 cm. long, ca. 1.2 cm. broad, more prominently sculptured than in preceding species.

Prinsepia sinensis exhibits a tendency to variation. Komarov (1903–1904) noticed the diversity of leaf form. Stapf (1917) distinguished in this species two forms, one with large leaves and relatively large flowers on long pedicels, and another with smaller leaves, and smaller, short pedicelled flowers. The latter form Stapf described as f. *brachypoda*. I, unfortunately, had no chance to see this form. Skvortzov (1920) chiefly on the basis of the fruit characters divided this species into four "varieties," viz.,

1) Stalks 1.2–1.7 cm. long; fruits small, almost round, red, white-spotted, 1.2–1.3 cm. long and broad, 1.0–1.2 cm. thick; ripens in the middle of September; small shrub.
2) Stalks 0.7–2 cm. long; fruits round, red, black-spotted, 1.2–1.4 cm. long, 1.4 cm. broad, 1.0–1.1 cm. thick; stone absolutely round, 1.5 cm. long and broad.
3) Stalks 1.1–1.5 cm. long, attached in the middle of the fruit; fruits oblong, 1.4–1.5 cm. long, 1.2–1.3 cm. broad, 0.9–1.1 cm. thick; stone oblong with contracted upper part, 1.3 cm. long, 1 cm. broad; ripens at the end of September.
4) Stalks 1.0–2.2 cm. long; fruits large, oblique, angular on one side, 1.4–1.6 cm. long, 1.1–1.5 cm. broad, 0.9–1.1 cm. thick; stone oblong, 1.3–1.4 cm. long, 0.9–1.0 cm. broad; large shrub.

Skvortzov did not give either formal descriptions or names of these infraspecific groups the taxonomic status of which remains unclear, since they overlap in some characters, e. g. in length of the fruit stalks.

The facts mentioned above suggest that population studies in *Prinsepia sinensis* might be desirable.

The correct authority for the name of this species is given above. Komarov (1941) uses another authority, *Prinsepia sinensis* (Oliv.) Kom. which stems from the new combination published by him in 1932. This combination was, however, superflouous.

Distribution. *Prinsepia sinensis* occurs in the eastern mountainous and wooded part of Manchuria, in N. Korea and in Ussuriland. It grows mostly on the bottoms

of the valleys in the thickets along streams and mountain rivers, but sometimes also on the mountain slopes in the mixed forests.

Specimens examined. **China.** Manchuria: Near railway station Shit'ouhotzu, forest, *D. Litvinov s.n.* [A]; Er Tieng Tien Tze, *P.H. Dorsett & J.H. Dorsett 3054* [GH]; Hsiaoling, river bottom near station, *P.H. Dorsett 4087* [A]; Er Tsing Tien Tze, in the hills near village, *P.H. Dorsett 3054* [A]; Hsiaoling, along mountain stream, *Skvortzov s.n.* [A]; Hsiaoling, along a stream, *Skovortzov s.n.* [A]; Suifenho stat., forest near a stream, *Skvortzov s.n.* [A]. **U.S.S.R.** Prov. Primorsk: in valle fl. Peischula, *Vassiliev, Volkova & Ivanina*, Herb. Fl. USSR 3626 [A].

Cultivated material. **U.S.A.** Arnold Arboretum: no. 1280–38, *Lily Perry;* no. 16381–B, *E.J.P.;* no. 16381, *C.E.K. & J.P.M.;* no. 824–31, *E.J.P.;* no. 16381 *A. Rehder;* no. 16381–A, *P.S. Green* (voucher specimen for chromosome count); no. 16381. *A.R.;* no. 16381, *C.E.F.;* no. 16381, *A.R.;* no. 4971–1 (16381); s.n., *W.H.J.* seedlings.

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