

THE COTONEASTERS OF THE *C. NITIDUS*-JACQUES-GROUP

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ABSTRACT

A revision of the Ser. *Distichi* Yü emend. Klotz is given. 6 new species are described ; 2 varieties are new ranked as species ; 4 species are discussed.

In his revision of the Eastern Himalaya *Cotoneaster* Tse Tsun Yü (1954) gave also a look about *C. nitidus* Jacques (Syn. *C. distichus* Lange) and the closely allied taxa. But without *C. taylorii*, a new species described by Yü, he ranked all taxa as varieties with *C. nitidus*. According to the material (dried and living), what I have examined in last years, I cannot follow Yü. In my papers about the *C. racemiflorus*-Booth-ex-Bosse- and the *C. microphyllus*-Lindley-group (Klotz, 1963 a, b) I discussed the question of the taxonomic value of the numerous small *Cotoneaster*-taxa. I have shown too, that it is impossible, to rank on one hand *C. microphyllus* Lindley and *C. rotundifolius* Lindley as distinct species, and to unite on the other hand two taxa as varieties of one species, which are much more different. In the *C. nitidus*-group I cannot follow Yü, to distinguish on one hand *C. nitidus* Jacques and *C. taylorii* Yü as two distinct species, and to unite on the other hand *C. verruculosus* Diels and *C. nitidus* Jacques as varieties in the same species. The conclusions of Yü are based only on herbarium material, but without examination of living plants, especially those, which are growing under the same conditions (in natural places and also in cultivation), now we are unable to classify such complicated genus as *Cotoneaster* Medikus.

The *C. nitidus*-group is a natural species-group, which includes 13 species distributed in the Central and Eastern-Himalaya, in the Khasia- and Naga-Hills, in the southern Chin-Hills (Mt. Victoria), in the ranges of Northern Burma, and in the ranges of Yunnan. These 13 species are mostly erect to suberect, rarely procumbent shrubs ; the leaves are thickly membranaceous to subcoriaceous and mostly broad-elliptic to suborbicular, rarely more than 25 mm. long, strigilloso-villous rarely glabrous above, and glabrous or nearly so below ; the flowers, solitary or 2-4 united, are always nodding, the hypanthium is mostly glabrous, the petals are upright, and rose- or red-coloured, the number of stamens varies from 10 to 20 ; the pome is broad-ellipsoid to subglobose, mostly bright red or scarlet, and includes 2-4 nutlets.

Like the *C. horizontalis*- and the *C. rubens*-group the *Distichi* are high specialized and may have

arisen from *C. acuminatus*-like ancestors. The most primitive species are *C. simonsii* Baker and *C. khasiensis* Klotz. These are marked by relative large, mostly acute to acuminate leaves, 1-4-flowered inflorescences, and pomes including 3-4 nutlets. On the other hand *C. verruculosus* Diels, *C. cavei* Klotz, *C. sandakphuensis* Klotz, and *C. cordifolius* Klotz are high specialized. Their verruculose branches (except in *C. cordifolius*) the small, often emarginate leaves and always two-nuculate pomes are characters of specialization. These high specialized species may have originated from *C. nitidus* Jacques. Therefore, they are not separated from the *Distichi*, s. str. as a different series. However, I excluded *C. rubens* W. W. Smith and the closely allied species from the *Distichi*, because these are quite different.

Cytogenetical the *Distichi* are characterized by 51 Chromosomes ($=3n$) and Apomixis (see also H. J. Sax, 1954).

Ser. *Distichi* Yü in Bull. Brit. Mus., Bot. 1 : 127. 1954, emend. Klotz, emend. nov.

Frutices decidui vel semisempervirentes, raro sempervirentes, plerumque erecti et ramis divaricatis, rariore suberecti vel procumbentes et ramis irregulariter ramosis ; rami ramulique primo strigilloso-tomentosi vel verruculosi et strigilloso-pilosi, lente glabrescentes. Folia distiche raro spiraliter disposita ; laminis plerumque late ellipticis vel suborbicularibus, ad 25 mm longis, supra primo strigilloso-pilosis, subtus plerumque glabris vel subglabris ; stipulis subulatis plerumque persistentibus. Flores solitarii vel 2-4 coacti, nutantes ; hypanthio glabro vel sparsissime strigilloso-piloso ; petalis erectibus, rubris, raro roseis ; staminibus 10-20. Poma obovato-subglobosa vel ellipsoidea, coccinea, raro aurantiaco-coccinea, plerumque 7-10 mm. longa.

Typus: *C. nitidus* Jacques

Distrib. geogr.: Himalaia centralis et orientalis, Khasia-, Naga- et Chin-Montes, montes Burmae occidentalis et borealis et Sinicae austro-occidentalis.

Clavis specierum

- 1 Rami primo strigilloso-tomentosi vel villosi ; poma plerumque cum 3 vel 4, nuculis 2
- 1* Rami primo verruculosi et strigilloso-pilosi ; poma cum 2 nuculis 11

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- 2 Lamina foliorum apice obtusa, acuta vel acuminata; inflorescentia 1-4-flora 3
- 2* Lamina fol. apice plerumque rotundata, rariore emarginata vel obtusa; flores plerumque solitarii (exclud. in *C. forrestii* et *C. taylorii*) 6
- 3 Lamina foliorum plerumque suborbicularis, apice raro obtusa vel acutiuscula (plerumque rotundata); poma cum 2 nuculis *C. taylorii*
- 3* Lamina fol. plerumque elliptica, late elliptica vel obovata, apice plerumque obtusa, acuta vel acuminata, subtus nervo medio strigilloso 4
- 4 Rami irregulariter ramosi; lamina fol. $\pm$ persistente strigilloso-pilosa; hypanthium primo sparse strigilloso-pilosum *C. simonsii*
- 4* Rami divaricati; lamina fol. subtus mox glabra vel subglabra (excl. nervus medius); hypanthium primo glaber vel subglaber 5
- 5 Lamina fol. supra primo strigilloso-pilosa, lente glabrescens; petiolus 1-2 mm longus; poma coccinea *C. khasiensis*
- 5* Lamina fol. supra mox glabra; petiolus 2-3, 5 mm longus; poma aurantiaco-coccinea *C. marquandii*
- 6 Lamina fol. plerumque obovata vel cuneato-oblanacea, basi cuneata; flores non raro 2-3 coaliti; poma aurantiaco-coccinea *C. forrestii*
- 6* Lamina fol. suborbicularis vel obovata vel elliptica, basi obtusa vel rotundata; poma coccinea 7
- 7 Lamina fol. 4×4.5 , 5×6 mm magna *C. cordifolius*
- 7 Lamina fol. $7 \times 6 - 24 \times 21$ mm magna 8
- 8 Flores plerumque 2-3 coaliti; poma cum 2 nuculis *C. taylorii*
- 8* Flores solitarii; poma plerumque cum 3 nuculis 9
- 9 Lamina fol. $10 \times 7 - 24 \times 21$ mm magna *C. duthieanus*
- 9* Lamina fol. $7 \times 6 - 12 \times 11$ mm magna 10
- 10 Lamina fol. elliptica vel obovato-elliptica, subtus nervo medio strigilloso-piloso; flores subsessiles *C. nagaensis*
- 10* Lamina fol. suborbicularis vel late obovato-elliptica, subtus plerumque glabra; pedicelli 1-4 mm longi *C. nitidus*
- 11 Frutices sempervirentes; folia spiraliter disposita *C. sandakphuensis*

- 11* Frutices decidui vel semisempervirentes; folia disticha 12
- 12 Lamina fol. $8 \times 7 - 14 \times 12$ mm magna; petiolus 2-5 mm longus; petala 3-4 mm longa *C. verruculosus*
- 12* Lamina fol. $3, 5 \times 3, 5-8 \times 6$ (11×7) mm magna; petiolus 0, 5-2 mm longus; petala 2-3 mm longa *C. cavei*

Cotoneaster simonsii Baker in Saunders, Ref. Bot. 1: tab. 55. 1869; Zabel in Mitt. DDG 6: 19. 1897; Schneider, Ill. Handb. Laubholz. 1: 746. 1906; Rehder, Man. cult. Trees Shrubs 2. ed. 349. 1940; Klotz in Wiss. Z. Univ. Halle, Math. 6: 972. 1957.

Syn.: *C. symondsii* T. Moore in Proceed. Hort. Soc. London 1: 298. 1861, nom. nud.

C. simonsii Hooker f. Fl. Brit. Ind. 2: 386. 1878.

C. acuminata var. α *C. simonsii* Decaisne in Nouv. Arch. Mus. Hist. Nat. Paris 10: 175. 1874; Dippel Handb. Laubholz. 3: 413. 1893, pro " α *simonsii*"; Ascherson & Graebner, Syn. Mittel-europ. Flora 6, 2: 6. 1906, pro " β *simonsii*".

Frutex deciduus, erectus, ad 2, 5 m altus, irregulariter ramosus, ramis erecto-patentibus vel arcuatis; rami ramulique primo strigilloso-tomentosi, annotini glabrescentes. Folia distiche disposita; laminis chartaceis, ellipticis vel rhomoido-ellipticis, raro obovato-ellipticis, plerumque acutis, rariore obtusis vel breve acuminatis, mucronulatis, basi obtusis, $9 \times 5.25 \times 17$ mm magnis, supra saturate viridibus, strigilloso-pilosis, subtus $\pm$ persistente strigilloso-pilosis; petiolis 1-3 mm longis, strigilloso-pilosis; stipulis 3-7 mm longis. Inflorescentia 1-3 (-4)-flora; flores pedicellati, hypanthio dentibusque calycis primo sparse strigilloso-villosis, dentes calycis acuti vel obtusi, margine dense villosi; petala erecta, rosea; stamina 15-20. Poma obovato-ellipsoidea, 8-9 mm longa, coccinea, cum 3 vel 4 nuculis.

Hab. in fruticetis semisiccis et rupestribus regionis temperatae Himalaiiae orientalis.

Distr. geogr.: Sikkim, Bhutan occidentalis.

Typus: Non vidi. The characters of the type specimen are well illustrated in tab. 55 of Saunders' Refugium Botanicum (l.c.). The seeds, from which the *C. simonsii*-plant of Baker had been arosen, were collected in the Sikkim-Himalaya not in the Khasia-Mountains.

Spec. visa: Chumbi; leg. Coll. Dr. Kingii, 16. VI. 1884, no. 479 (CAL).—Lachung-Valley; leg. G. A. Gammie, VIII. 1892 (CAL).—Lachung-Valley, 10,500 ft.; leg. J. C. White, 10. VI. 1909, no. 75 (CAL).—Sureil-Bungalow, 5000 ft.; leg. K. Biswas, 30. VI. 1947, no. 7485 (CAL) cult. I examined also a lot of living cultivated plants. These are mostly growing up to 4 m height; the leaves are somewhat larger

(up to 30×20 mm), and the inflorescences are 2-5-flowered, but it is in any case perceptible as true *C. simonsii* Baker.

C. simonsii Baker is closely allied to *C. khasiensis* Klotz, but it is distinguished by its irregular ramification and the more pubescent leaves, hypanthia and calyx-teeth. In its typical combination of characters it belongs to the *C. nitidus*-group, but there are also some resemblances to *C. acuminatus* Lindley and to *C. divaricatus* Rehder & Wilson. It is apparently a transition between the *C. acuminatus*- and the *C. nitidus*-group. Therefore it is in this paper placed at the top of the *C. nitidus*-group.

Cotoneaster khasiensis Klotz, spec. nov.

Syn.: *C. simonsii* Kanjilal et al., Fl. Assam 2: 225. 1938, non Baker, 1869, nec auct. plur.

Species nova a *C. simonsii* Baker different ramificatio ramulorum disticho, foliis subtus minus pubescentibus, floribus subsessilibus, hypanthio dentibusque calycis glabris vel subglabris, pomis trinuculatis.

Frutex deciduus, erectus, ad 3 m altus, ramis divaricatis ramulisque primo dense strigilloso-tomentosis, annotinis glabratibus. Folia disticha; laminis chartaceis vel subcoriaceis, late ellipticis, acutis vel breve acuminatis, mucronulatis, basi obtusis vel rotundatis, 8×5 , $5 - 20 \times 14$ mm magnis, supra primo strigilloso-villosis, lente glabrescentibus, subtus primo $\pm$ strigilloso-pilosis, lente glabrescentibus, nervo medio margineque persistente strigilloso-piloso; petiolis 1–2 mm longis, strigilloso-pilosis; stipulis oblongo-lanceatis, 2–4 mm longis. Inflorescentia 2–4-flora, raro flores solitarii; flores subsessiles vel breve pedicellati, hypanthio primo glabro vel sparsissime piloso et mox glabrescens, dentibus calycis plerumque acutis; petalis erectis, roseis; staminibus 15–18. Poma obovato-globosa vel obovato-ellipsoidea, 7–8 mm longa; coccinea, cum 3 nuculis.

Hab.: in rupestribus et ad margines silvarum regionis calide temperatae iugi Khasiae.

Typus: Khasia, Laitlyngkot*, 1650 m; leg. C. B. Clarke, 16.V.1886, no. 43, 911; in Herb. Centr. Surv. Bot. Indii Calcuttense (CAL) conservatur.

Spec. Visa: Laitlyngkot, 6500 ft. "a shrub up to 8 ft., with divaricate stiff branches"; leg. U. Kanjilal 25. IX. 1913, no. 2650 (ASSAM).—Laitlyngkot, 6100 ft. "shrub 6–8 ft., fruits $\frac{1}{2} \times \frac{1}{4}$ in. bright scarlet"; leg. U. Kanjilal, 17. XI. 1915, no. 6223 (ASSAM).—Laitlyngkot; leg. H. G. Carter, VI. 1920, no. 1687 (CAL).—Shillong; leg. H. G. Carter, VI. 1920, no. 1687 (CAL).—Laitlyngkot; leg. R. Sharma, I. XI. 1931, no. 9640 (ASSAM).—Dumpep; leg. C. K. Deka, 28. VIII. 1935, no. 13121 (ASSAM).—Sylhet Road; leg. A. Das, 2. X. 1935, no. 12280 (ASSAM).—Laitlyngkot, "large shrub, fruits are red when ripe"; leg. C. Panigrahi, 27. VIII. 1956, no. 3123 (ASSAM).

* The spelling of this place is very different; I prefer that Kanjilal et al. in *Flora Assam* 2: 225, 1938.

This well-marked species was up to this time always referred to *C. simonsii* Baker, and the Khasia-Hills were always cited as home of *C. simonsii* Baker. True *C. simonsii* however, as it is described and illustrated by Baker, l.c., occurs in the Sikkim-Himalaya. *C. khasiensis* Klotz is distinguished from true *C. simonsii* Baker by its ramification of branches which is distichous; by the less pubescent leaves; the mostly subsessile flowers; the glabrous hypanthia and fruits containing always 3 nutlets. *C. khasiensis* Klotz is closely allied to *C. nagaensis* Klotz, from which it differs in its larger obtuse to short acuminate leaves, more pubescent beneath; and its 1–4-flowered cymes. Like *C. nagaensis* it is a local species of the *C. nitidus*-series.

Cotoneaster forrestii Klotz, spec. nov.

Species nostra *C. nitido* Jacques valde affinis, sed foliis majoribus, obovatis vel oblanceatis, basi cuneatis, supra glabrescentibus, subtus primo $\pm$ villosis, pomis aurantiaco-coccineis, plerumque 3- raro 4-nuculatis differt.

Frutex deciduus vel semisempervirens, erectus, ad 3 m altus, ramis divaricatis; rami ramisque primo dense strigilloso-tomentosi, biennii glabrescentes. Folia disticha; laminis tenue coriaceis, obovatis vel cuneato-oblanceatis, raro obcordatis, apice rotundatis vel emarginatis, plerumque mucronulatis, basi cuneatis, 8×5 , $5 - 16 \times 13$ (15 , 5×8 , 5 mm magnis supra primo sparsissime strigilloso-pilosis, mox glabrescentes, subtus nervo medio margineque primo strigilloso-villosis, $\pm$ glabrescentes; petiolis primo strigosius, 2–3 mm longis. Flores non vidi. Poma solitaria vel 2–3 coalita, obovato-subglobosa, 8–9 mm longa, aurantiaco-coccinea, plerumque cum 3 raro cum 4 nuculis.

Hab.: In fruticetis regionis temperatae iugorum Sinicae austro-occidentalis.

Distr. geogr.: Sinica austro-occidentalis (prov. Yunnan).

Typus: Plantae Forrestianae no. 25215, "shrub 8–10 ft. branched from base. Fruits orange red. Amongst scrub and boulder. Alt. 10000 ft. mid. W-Yunnan"; leg. G. Forrest, IX. 1924; in Herb. Hort. Bot. Kewense (K) conservatur.

Spec. visus: Forrest no. 24077; plant. cult. (K).

This species is most closely allied to the following. The differences in the leaf-shape are visible on fig. 1. There are also some small differences in the pubescence of leaves and in the number of nutlets (in *C. marquandii* Klotz always 3). May be these two species are only two extreme forms of one variation-circle, but to give a final answer on this question we need new collections from Southwestern China and Northern Burma.

Cotoneaster marquandii Klotz, spec. nov.

Speciei praecedenti valde affinis, sed foliis ellip-

ticis vel obovatis, apice acuminatis vel cuspidatulis, basi obtusis, subtus minus pubescentibus differt.

Frutex deciduus, erectus, ramis divaricatis; rami ramulique primo strigilloso-tomentosi, biennii glabrescentes. Folia disticha; laminis subcoriaceis, ellipticis, late ellipticis vel late obovato-ellipticis, acuminatis vel cuspidatulis, basi plerumque obtusis, 10×6 , $5-19 \times 12$, 5 mm magnis, supra primo sparsissime strigilloso-pilosis, mox glabrescentibus, subtus nervo medio margineque sparse strigilloso-piloso; petiolis 2-3, 5 mm longis, sparse strigilloso-pilosis; stipulis subulatis, 3-4 mm longis. Flores non vidi. Poma 1-3 coalita, globosa, 7-8 mm magna, aurantiaco-coccinea, cum 3 nuculis.

Typus: Plants cult. in hort. Lord Aberconway, Bodnant, Tal-y-cafu, N-Wales, sub Kingdon-Wards no. 6788; in Herb. Hort. Bot. Kewense (K) conservatur.—Kingdon-Waris no. 6788 is also cited as type-specimen of *C. cordifolius* Koltz (see p. 212). It seems not clear if Kingdon-Wards no. 6788 (the seeds collected on 24th of October 1926 only) was heterogenous or if there was a confusion in the Garden of Lord Aberconway, but it is out of doubt, that the differences between the type-specimen of *C. cordifolius* Klotz and that of *C. marquandii* Klotz do not allow to unite them in one species. I examined much material of all cultivated *Cotoneaster*-species, but I did not find any case of such significant distinctions within one species.

In its character-combination *C. marquandii* Klotz is most closely allied to *C. forrestii* Klotz.

Cotoneaster nitidus Jacques in Journ. Soc. Imp. Centr.

Horticult. 5: 516. 1859; Exell in Journ. Bot. 68: 299. 1930; Klotz in Wiss. Z. Univ. Halle, Math. 6: 966. 1957.

Syn.: *C. rotundifolia* Baker in Saunders, Ref. Bot. 1: tab. 54. 1869, excl. ill. flor.; Hooker f. Fl. Brit. Ind. 2: 386. 1878, excl. syn.; Hemsley in Bot. Mag. 131: tab. 8010. 1905, excl. syn. et ill. flor.; Bean, Trees Shrubs Brit. ed. 7, 524. 1950, non Lindley, 1829, nec auct. plur.

C. disticha Lange in Bot. Tidsskr. 13: 19. 1882; Schneider, Ill. Handb. Laubhölzk. 1: 745. 1906, s. str.; Rehder & Wilson in Sargent, Pl. Wils. 1: 154. 1912; Yü in Bull. Brit. Mus., Bot. 1: 127. 1954, s. str.

C. rupestris Charlton in Gard. Chron. II. 13: 598. 1882.

Species Jacquesii *C. horizontalis* Decaisne valde affinis, sed ramis densiore pubescentibus, foliis supra strigilloso-villosis, subtus glabris, floribus pomisque nutantibus, hypanthio glabro, pomis duplo majoribus differt.

Frutex deciduus vel semisempervirens, erectus, ad 2 m (raro ad 4 m) altus, ramis divaricatis, erecto-patentibus; rami ramulique primo strigilloso-tomentosi, annotini glabrescentes. Folia disticha;

laminis subcoriaceis, late obovatis vel suborbiculatis, rotundatis et mucronulatis, raro apiculatis, basis late cuneatis vel obtusis, $7 \times 6-12 \times 11$ ($13 \times 9, 5$) mm magnis, supra nitidis, flavescente strigilloso-villosis, subtus glabris vel subglabris; petiolis 1,5-2,5 mm longis, sparse strigilloso-pilosis, glabrescentibus; stipulis ad 3,5 mm longis, $\pm$ persistentibus. Flores solitarii, raro bini, nutantes, $\pm$ pedicellati; hypanthio dentibusque calycis glabris; dentes calycis rotundatis vel obtusis; petalis erectis, rubris; staminis 12-18. Poma obovato-subglobosa, 9-11 mm longa, coccinea vel kermesina; cum 2-4, plerumque cum 3 nuculis.

Hab.: In rupestribus, silvis et fruticetis semisiccis regionis temperatae Himalaiae orientalis et iugorum Burmae borealis occidentalisque et Sinicae austro-occidentalis.

Distr. geogr.: Nepal orientalis, Sikkim, Bhutan, Assam borealis et orientalis, Burma borealis et occidentalis, Yunnan borealis et occidentalis.

Typus: Non vidi.

Spec. visa: Eastern Nepal, Arun Valley, 8600 ft. "on rocks on open ground; petals pink, filaments white (?)" leg. J.D.A. Stainton, 25. V. 1956, no. 430 (BM).—Sikkim, Lachen, reg. temp. 9-11000 ft. leg. J. D. Hooker, 31. VII. 1849 (CAL; K).—Sikkim Himalaya; leg. J. D. Hooker, 6.IX.1864 (K).—Sikkim, Lachung Valley; leg. A. Gammie, IX.1892 (CAL).—Sikkim, Lachen, 7000 ft. leg. G. H. Cave, 2. XI. 1909, no. 3071 (DARJEEL).—Bhutan, 7600-9500 ft. leg. Griffith, 1837/8 (K).—Manipur, summit of Soriphari, 10000 ft. leg. G. Watt, 17.I. 1882, no. 5977 (CAL).—Burma, top of Mt. Victoria, 10085 ft. leg. C. B. Smales, 19.I.1915, no. 48 (CAL).—E. Manipur, Sirhoi, "in exposed places at least, this shrub is deciduous, but in sheltered situations it is evergreen. Alt. 7000 ft." leg. F. Kingdon-Ward, 15.IV.1948, no. 17283 (BM; NY).—W-Yunnan, "shrub 3-5 ft. Branches almost prostrate, fruits scarlet, on stony slopes and cliffs. Alt. 10000 ft." leg. G. Forrest, 1924/25, no. 25 186 (K).—NW-Yunnan, "shrub of 2-4 ft. Flowers pinkish. Open rocky situations inside valleys on the eastern flank of the Tali Range. Lat. $25^{\circ} 40'$ N. Alt. 8000-9000 ft." leg. G. Forrest, VI./VII. 1906, no. 4465 (K).—NW-Yunnan, "in dumetis mont. Tsang prope Tali, frut. latus, c. 1 m altus, fruct. nitidi, lateritii; alt. circ. 3000 m" leg. C. Schneider, X. 1916, no. 2795 (K).—Yunnan; leg. G. Forrest, 1917/19, no. 18298 (CAL).—Planta cult. in horto Landboho jskolen Haunia; leg. J. Lange, 22.VI. 1881 (K; C) Holo-et Isotypus *C. distichi* Lange.

I examined also some dried and living cultivated plants. These are mostly in all parts stronger than plants growing under natural conditions.

C. nitidus Jacques was rather common in gardens of Western Europe during last century. At first it was distributed under the name *C. rotundifolius*. Later and up to this time it was named *C. distichus*

Lange, but the legitime binom is *C. nitidus* Jacques (see Klotz, 1957).

Within the Distichi *C. nitidus* Jacques covers the widest area. In this area it is rather variable. The

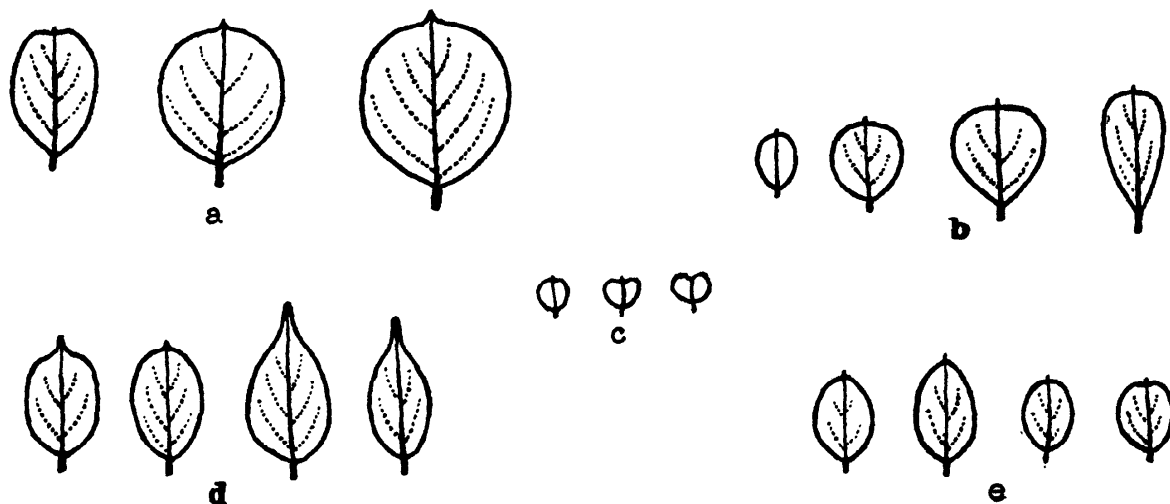


Fig. 1. Leaf shapes of: a. *Cotoneaster duthieanus* (Schneider) Klotz; b. *C. forrestii* Klotz; c. *C. cordifolius* Klotz; d. *C. marquandii* Klotz; e. *C. nagaensis* Klotz.

size and the shape of leaves are the most variable characters. In some cases I referred the cited material with hesitation to this species. Two specimens, collected in the Sikkim Himalaya near Lachen by a collector of Dr. Prain (CAL), constitute to some extent a transition between *C. nitidus* and *C. simonsii* Baker. Their existence demonstrates the close relations between these two species.

Cotoneaster taylorii Yü in Bull. Brit. Mus., Bot. 1:129, 1954.

Species *C. nitido* Jacques valde affinis, and foliis obtusis raro acutiusculis, inflorescentiis 2-3-floris differt.

Frutex deciduus, erectus, ad 3 m altus, ramis irregulariter ramosis; rami ramulique primo strigilloso-tomentosi, annotini glabrescentes. Folia disticha; laminis subcoriaceis, suborbicularibus vel late ovatis, apice rotundatis vel acutiusculis, basi rotundatis, raro late cuneatis, 10×9 – 12×10 mm magnis, untrunque primo sparse strigilloso-pilosis, subtus mox glabris; petiolis 2-3 mm longis, sparse strigilloso-pilosis; stipulis 1-2 mm longis. Inflorescentia 2-3-flora; flores 3-5 mm longe pedicellati, hypanthio glabro, dentibus calycis late triangularibus, obtusis, marginibus villosulis; petalis erectis, rubris, 3 mm longis; staminis 10 (?)*; cum 2 carpellis.

Hab.: In margine fluminis regionis subalpinis Tibetiae austro-orientalis.

Distr. geogr.: Tibet austro-orientalis.

Typus.: Subtus Kongbo Nga La, Takpo, 3750 m,

* I examined a lot of *Cotoneaster*-flowers in nearly all known species, but I did not find any species or branch with generally 10 stamens per flower. I suppose, that Yü examined only one flower.

"shrub or small tree of 3 m, along stream; calyx dark crimson, lobes fringed with hairs, petals dark red with white margin"; leg. Ludlow, Sherriff & Taylor, 13.V.1938, no. 4246; on Herb. Mus. Brit. (BM) conservatur.

This taxon is closely allied to *C. nitidus* Jacques. It seems to be only an ecospecies within true *C. nitidus*. Its differences to the type may have been originated by the special conditions near streams.

Cotoneaster duthieanus (Schneider) Klotz, stat. nov.

Syn.: *C. disticha* var. *duthieana* C. Schneider, Ill. Handb. Laubholz. 1:745. 1906; in Repert. spec. nov. reg. veg. Fedde 3:218. 1906; Yü in Bull. Brit. Mus., Bot. 1:128. 1954.

Species *C. nitido* Jacques valde affinis, sed ramis ramulique primo minus pubescentibus, foliis majoribus, supra glabris vel subglabris, subtus sparsissime strigilloso-pilosis, pomis minoribus differt.

Frutex deciduus, erectus, ramis divaricatis; rami ramulique primo strigilloso-villosi, lente glabrescentes. Folia disticha; laminis membranaceis, suborbicularibus vel late ellipticis vel obovato-suborbicularibus plerumque rotundatis et mucronulatis vel apiculatis, raro subacutis, basi rotundatis vel obtusis, 10×7 – 24×21 mm magnis, supra glabris vel subglabris, subtus sparsissime strigilloso-pilosis; petiolis 1.5-4 mm longis, subglabris. Flores non vidi. Poma subglobosa, 7.5×6 mm magna, coccinea, cum 3 nuculis.

Hab.: In silvis regionis temperatae vel subalpinis Himalaiae centralis et orientalis.

Distr. geogr.: Kumaun, N. Burma, Yunnan.

Typus: Kumaun, "Birch forest near Naffi in the Kutti Valley, 12-13000 ft.; leg. J. F. Duthie,

11.IX. 1884; in Herb. Hort. Bot. Kewense (K) conservatur. Isotypus (CAL).

I refer this species with some hesitation to the *Distichi*, because the young branches are less pubescent, the leaves are membranaceous, glabrous above and pubescent beneath and the pomes are rather small. It belongs perhaps to the *C. horizontalis*-*C. adpressus*-group, but to answer this question we need new collections from Kumaun.

Cotoneaster nagaensis Klotz, spec. nov.

Species nova a *C. nitido* Jacques differt foliis plerumque ellipticis vel obovato-ellipticis, supra minus pubescentibus, subtus nervo medio persistente strigilloso, floribus pomisque subsessilibus.

Frutex, deciduus vel semisempervirens, erectus, ramis divaricatis; rami ramulique primo $\pm$ strigilloso-villosi. Folia disticha; laminis subcoriaceis, ellipticis vel obovato-ellipticis, raro late obovato-ellipticis, rotundatis vel emarginatis, mucronulatis, basi obtusis, $7 \times 6 - 13 \times 8$ (9×4.5) mm magnis, supra primo strigilloso-pilosis, $\pm$ glabrescentibus, subtus primo sparse strigilloso-pilosis, $\pm$ glabrescentibus, nervo medio persistente strigilloso; stipulis subulatis, ad 4 mm longis, $\pm$ persistentibus. Flores solitarii, nutantes, breve pedicellati vel subsessiles; hypanthio ab initio glabro. Poma subglobosa, 7-8 mm magna, coccinea, cum 3 nucleis.

Hab.: In fruticetis et rupestribus regionis temperatae montii Nagaensis.

Typus: Assam, Naga-Montes, prope Kohima, 10000 ft.; leg. C. K. Deka, 1.IX. 1937, no. 15452; in Herb. Reg. Or. Surv. Bot. Indii Shillong (ASSAM) conservatur.

Spec. visa.: Naga-Hills, Kohima, Top of Chukka-forts, 7200 ft.; leg. D. Prain, XII. 1886 (ASSAM).—Manipur, NE-Hill no. 18700 ft.; leg. G. Watt, 19.IV. 1882, no. 6565 (K; CAL).

This taxon is closely allied to *C. nitidus* Jacques, but differs by its mostly elliptical leaves which become glabrous or nearly so above and have a persistent pilose midrib below and by its smaller pomes. These differences allow us, to rank it as a new species besides *C. nitidus*. It represents a local combination of characters within the *Distichi* and is a rather young species.

Cotoneaster cordifolius Klotz, nom. et stat. nov.

Syn.: *C. distichus* var. *parvifolius* Yü in Bull. Brit. Mus., Bot. 1:129. 1954, pro maj. part.

Species nostra valde similis *C. nitido* Jacques, sed foliis tenuioribus minoribusque, supra glabrescentibus, floribus minoribus differt.

Frutex deciduus, ad 2 m altus, ramis divaricatis erecto-patentibus vel patentibus; rami ramulique primo strigilloso-tomentosi, annotini glabrescentes dense distiche foliati. Folia laminis membranaceis, orbicularibus vel cordatis, apice rotundatis vel emarginatis, plerumque mucronulatis, basi rotundatis vel late cuneatis, $4 \times 4 - 5.5 \times 6$ mm magnis,

supra primo sparsissime strigilloso-pilosis, mox glabris, nitidis, subtus glabris vel subglabris; petiolis 0.5-1 mm longis. Flores solitarii, nutantes; hypanthio dentibusque calycis glabris, dentes calycis rotundatis; tricarpellatis.

Hab.: In fruticetis regionis temperatae Himalaiae orientalis et iugorum Sinicae austro-occidentalis.

Distr. geogr.: Burma borealis et Yunnan boreo-occidentalis.

Typus: Burma borealis, Seinghku Wang, alt. 2700-3000 m, "shrub of 3-6 ft. more or less erect, with long stiff widely divaricating branches, and very small leaves, giving an odd leggy but not unpleasant effect. Flowers not open. In dense tangle-wood thickets on the ridge and precipitous slope below"; leg. F. Kingdon-Ward, 29.V. 1826, no. 6788; in Herb. Hort. Bot. Kewense (K) conservatur.

On the label of the type specimen F. Kingdon-Ward writes about the pomes; "Berries brilliant scarlet; a fine sight in fruit, 24.X. 1926", but there is no fruiting specimen. I suppose, that F. Kingdon-Ward at the 24th of October 1926 only collected seeds, from which—after sent to England—arose the below cited cultivated specimen of *C. cordifolius*.

This species is most closely related to *C. nitidus* Jacques, but it differs by its much smaller, differently shaped, thinner leaves often emarginated at the apex; the smaller flowers and the more spreading habit; perhaps also the smaller pomes. I examined also cultivated material from Kingdon-Wards no. 6788. In this the leaves are larger (up to 10×8 mm), and rather different from those of cultivated *C. nitidus* Jacques. Yü writes about *C. cordifolius*: "It bears some superficial resemblance to *C. horizontalis* var. *perpusillus* C. K. Schneider, but can be easily distinguished from that plant by the shape of its leaves, by the appressed hairs on its upper leaf-surface, and by its glabrous calyx tube," but he cites Forrests no. 23492 as a specimen of *C. cordifolius*, and this no. is true *C. horizontalis* var. *perpusillus*. He also cites Forrests no. 18188 as a *C. cordifolius*-specimen, but this differs, by its verruculose branches and branchlets, its thicker leaves and longer petiols, from *C. cordifolius* and belongs to *C. cavei* Klotz.

Cotoneaster verruculosus Diels in Not. Bot. Gard.

Edinburgh 5:272. 1912; Klotz in Wiss. Z. Univ. Halle, Math. 6:974. 1957.

Syn.: *C. distichus* var. *verruculosus* (Diels) Yü in Bull. Brit. Mus., Bot. 1:128. 1954.

Species a *C. nitido* Jacques differt ramis ramulisque primo verruculosus non tomentosis, foliis apice plerumque emarginatis, petiolis longioribus, pomis binuculatis.

Frutex deciduus vel semisempervirens, ad 1.5 m altus, ramis erecto-patentibus, divaricatis vel irregulariter ramosus; rami ramulique primo $\pm$ dense

yerruculosi et strigilloso-pilosi, annotini verruculosi, cinereo-brunnei. Folia disticha; laminis subcoriaceis, orbicularibus vel late ellipticis vel late obovatis, apice plerumque emarginatis et mucronulatis, $8 \times 7 - 14 \times 12$ mm magnis, supra nitidis, sparsissime strigilloso-pilosis, subtus glabris; petiolis tenuis, 2-5 mm longis; stipulis oblongis, persistentibus, margine ciliatis. Flores solitarii, nutantes; hypanthio dentibusque calycis glabris; petalis erectibus, rubris vel roseis, 3-4 mm longis. Poma obovato-subglobosa, 8 - 10 mm longa, coccinea, cum 2 nuculis.

Hab.: In fruticetis et rupestribus siccis regionis calide temperatae iugorum Sinicae austro-occidentalis et Burmae borealis.

Distr. geogr.: Yunnan occidentalis et boreo-occidentalis, Burma borealis.

Typus: Yunnan boreo-occidentalis, "prostrate shrub of 2-4 ft. Flowers white*. On rocks and humus-covered boulders in dry situations, side valleys on the eastern flank of the Tali-Range. Lat. $25^{\circ} 40'$ N. Alt. 8-10000 ft. June-July 1906"; leg. G. Forrest, no. 4427; in Herb. Hort. Bot. Edinburghense conservatur.

Spec. visa: "Shrub 3-5 ft. fruits scarlet-crimson. Amongst scrub on rocky slopes. Alt. 11 - 12000 ft. N. E. Upper Burma"; leg. G. Forrest, 1924/25, no. 25966 (K).—Planta cult. ex sem. no. 30904, leg. G. Forrest in Sinica austro-occidentalis (K).—I examined also some living plants cultivated in the Botanical Garden of Halle/Saale. In habit and foliage these are closely allied to *C. nitidus* Jacques, but in their verruculose, less pubescent branches and in their pomes, including always 2 nutlets, they are quite different.

Cotoneaster cavei Klotz, spec. nov.

Syn: *C. distichus* var. *parvifolius* Yü in Bull. Brit. Mus., Bot. 1: 129. 1954. p.p.

Species nostra *C. nitido* Jacques valde similis, a quo ramis verruculosi, foliis non raro emarginatis, floribus minoribus, pomis minoribus binuculatis differt. *C. cavei* a *C. verruculoso* Diels differt foliis, floribus pomisque minoribus.

Frutex deciduus, ad 0,8 m altus, ramis divaricatis erectis vel erecto-patentibus; rami ramulique primo strigilloso-pilosi et verruculosi, annotini verruculosi. Folia disticha; laminis chartaceis, ellipticis, late ovato-vel obovato-ellipticis vel orbicularibus, rotundatis vel emarginatis, plerumque mucronulatis, basi obtusis vel rotundatis, $3,5 \times 3,5 - 8 \times 6$ (11×7) mm magnis, supra primo sparse strigilloso-pilosis, subtus pallide viridibus, nervo medio primo sparsissime strigoso; petiolis 1-2 (-4) mm longis, primo strigosis; stipulis oblongis, 2-3 (-4) mm longis. Flores solitarii, nutantes; hypanthio dentibusque calycis glabris; petalis erectis, rubris, 2,5-3 mm

longis; staminis 12-15. Poma ellipsoidea, coccinea, 8-9 mm longa, cum 2 nuculis.

Hab.: In rupestribus et fruticetis semisiccis (Rhodoreto-Cotoneasteretum, Roso-Rhodoretum lepidotae) regionis temperatae Himalaiae orientalis.

Distr. geogr.: Sikkim-Yunnan boreo-orientalis.

Typus: Sikkim-Himalaia, prope Kalapokhri, 3200 m, in rupestribus; leg. G. Klotz, 28. V. 1963; in Herb. Centr. Surv. Bot. Indii Calcuttense (CAL) conservatur.

Spec. Visa. Sikkim-Himalaia, supra Kalapokhri in fruticetis semisiccis (Rhodoreto-Cotoneasteretum); leg. G. Klotz l. VI. 1963 (HAL).—Inter Kalapokhri et Sandakphu, in fruticetis semisiccis (Roso-Rhodoretum lepidotae); leg. G. Klotz, l. VI. 1963 (HAL).—Yunnan boreo-orientalis, plantae Forrestianae no. 18188, "Cotoneaster spec. aff. microphylla Wall."; leg. G. Forrest 1917-1919 (K).

This new species is closely allied to *C. nitidus* Jacques, but differs in its verruculose, less pubescent branches, its smaller flowers and pomes, including 2 nutlets, and in its often emarginate leaves. Along with *C. sandakphuensis* Klotz it occurs on rocks and in semidry scrubs (together with *Rosa sericea*, *Rhododendron lepidotum*, *Rhododendron arboreum*, *Daphne cannabina*, *Berberis concinna*, *Viburnum stellulatum*) on southern and south-eastern slopes of the Rimbick- and Singalela-Range in the Sikkim-Himalaya. From this species, however, it is easily distinguishable by its erect to suberect branches, the distichous, thinner leaves, and the larger pomes.

C. cavei Klotz seems most closely allied to *C. verruculosus* Diels. The differences between these two taxa are quantitative only (*C. cavei*-shrubs are only half in height, they have smaller, thinner leaves, smaller flowers and pomes and shorter petioles), but these differences are quite significant in each case and connected with generally different areas. Both species may have arisen from the same ancient Cotoneasters, which were distributed from the Sikkim-Himalaya to Southwestern China and were perhaps closely allied to the recent *C. nitidus* Jacques.

I collected some seeds to bring this interesting taxon into cultivation and to have the possibility of cytogenetical examination.

Cotoneaster sandakphuensis Klotz, spec. nov.

Syn.: *C. microphylla* var. *glacialis* Cowan & Cowan, Trees North Bengal 63. 1929, non Hooker f. 1878.

Species nostra *C. verruculoso* Diels valde affinis, sed habito procumbens, foliis spiraliter dispositis, laminis foliorum, floribus pomisque minoribus differt.

Frutex sempervirens vel semisempervirens, procumbens vel suberectus, ad 0,5 (plerumque 0,2 - 0,3) m altus, irregulariter densissime ramosus, ramis primo pilosis et dense verruculosi, annotinis glabris, verruculosi, atropurpureis. Folia plerumque spira-

*This is perhaps an error; flowers of *C. verruculosus* Diels are never white.

liter disposita; laminis tenue coriaceis, $\pm$ suborbicularibus, plerumque emarginatis et calloso-mucronulatis, basi rotundatis, raro obtusis, $4 \times 3 - 9 \times 7$ mm magnis, supra lucidis, primo sparsissime strigiloso-pilosis, saturate viridibus, subtus glabris; petiolis 1.5 - 3.5 (- 5) mm longis, glabris. Flores solitarii, nutantes; hypanthio glabro, dentibus calycis triangularibus, acutis, glabris; petalis erectis, rubris; Staminis 12-15. Poma ellipsoidea vel subglobosa, 6 - 7 mm magna, coccinea, cum 2 nuculis.

Hab.: In rupestribus et fruticetis semisiccis (Rhodoreto-Cotoneasteretum) regionis temperatae et in pascuis fruticetisque regionis subalpinis Himalaiae orientalis.

Distr. geogr.: Sikkim-Himalaia.

Typus: Sikkim-Himalaia, prope Sandakphu, in fruticetis via Rimbick; leg. K. Biswas, 9. X. 1941, no. 5721; in Herb. Centr. Surv. Bot. Indii Calcuttense (CAL) conservatur. Isotypus in Herb. Arb. Arnold. (A) conservatur.

Spec. visa: Tonglu, leg. C. King, VII. 1875 (CAL).—Tonglu, leg. C. King, 20. IX. 1875, no. 2548 (CAL).—Sandakphu, 11000 ft. leg. C. King, IX. 1875, no. 1122 C (CAL).—Phallut, 12000 ft. leg. Coll. C. Kingii, 1888 (CAL).—Phallut, 10500 ft. leg. S. Kurz (CAL).—Phallut, 11-12000 ft. leg. J. H. Lace, 31. V. 1902, no. 2267 (CAL).—Phallut, leg. Ribu, X. 1908, no. 364 (CAL).—Supra Kalapokhri, 11000 ft. in fruticetis semisiccis (Rhodoreto-Cotoneasteretum); leg. G. Klotz, 28. V. 1963 (HAL).—Inter Sandakphu et Phallut, 11500 ft. in pascuis; leg. G. Klotz, 31. V. 1963 (HAL).—Subtus Sandakphu, 11300 ft. in fruticetis semisiccis; leg. G. Klotz, 1. VI. 1963 (HAL).—I examined also living plants in the "locus classicus" near Sandakphu, in the neighbourhood of Kalapokhri and between Sandakphu and Phallut, cultivated plants in the Ghosh-Nursery, Darjeeling and in the Garden of Mr. Madan, Darjeeling. Plants under natural conditions are always procumbent and very densely branched, whilst pot-plants in cultivation are mostly suberect. I collected a lot of seeds to bring this interesting taxon into cultivation and to examine the genesis of the different habits under different conditions.

I refer the cited material from the Sikkim-Himalaya without any hesitation to a new species, be-

cause the combination of characters is quite different from all known Cotoneasters. In *C. sandakphuensis* Klotz are united some characters of the *C. nitidus*-group with those of the *C. microphyllus*-group. In its verruculose branches, the suborbicular leaves, the nodding flowers with a glabrous hypanthium and glabrous calyx-teeth, and in the erect, red-coloured petals it is a member of the *C. nitidus*-group, but in its irregular ramification, the non-distichous, evergreen, above shining leaves it is similar to *C. microphyllus* Lindley. Perhaps it is a hybrid between members of these two very different species-groups. I hope to find out the true character of *C. sandakphuensis* by cytogenetical analysis after return to my country.

Closely related to *C. nitidus* Jacques is also *C. apiculatus* Rehder & Wilson in Sargent, *Plantae Wilsonianae* 1:156. 1912, from southwestern China; but except some cultivated plants in the Botanical Garden of Halle I did not see any material of this species. Its taxonomical relations to *C. nitidus* Jacques and other species of this group I shall discuss in a further paper.

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