658. CYTINUS RUBER
Cytinaceae

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Summary. *Cytinus ruber* (Fourr.) Fritsch is described and illustrated. Current knowledge of its phylogeny and systematics is discussed, and its successful cultivation is recorded.

For those who lack green thumbs, even the cultivation of a *Sansevieria* plant in their parlour proves difficult. But when it comes to cultivation challenges, none rival those presented by parasitic plants, i.e. angiosperms that are physically and nutritionally attached to other plants. And in 10 of the 12 lineages of flowering plant parasites, evolutionary forces have removed one of the hallmark features of plants - photosynthesis. These 'holoparasites' include some of the most spectacular productions of the vegetable kingdom, namely *Rafflesia*, some species of which possess the largest flowers in the world. The family Rafflesiaceae has had a rocky taxonomic history for over a century, and revisions continue even today owing to molecular (DNA) data (Nickrent *et al.*, 2004). It now appears that holoparasites once classified together in Rafflesiaceae (in the broad sense) actually reside in four distinct and only distantly related families: Rafflesiaceae (in the strict sense), Apodanthaceae, Mitrastemonaceae, and Cytinaceae. It is the last family, specifically *Cytinus*, that is the subject of this report.

Cytinaceae contains just two genera: *Bdallophyton* of Mexico and Central America and *Cytinus* of the Mediterranean region, the Middle East, northern Africa, southern Africa and Madagascar. Molecular phylogenetic analyses (Nickrent, 2007) indicate Cytinaceae are most closely related to the neotropical family Muntingiaceae (Malvales). This result then leads to the conclusion that this parasitic family originated in the New World.

There are eight *Cytinus* species, although taxonomic boundaries are still not well established. For the Mediterranean region, *Flora Europaea* (Webb, 1993) recognized two species, *C. hypocistis* (with four subspecies) and *C. ruber*. These two species were segregated mainly by flower colour (the former yellow, the latter white) and host. *Cytinus hypocistis* occurs on white-flowered species of *Cistus* and

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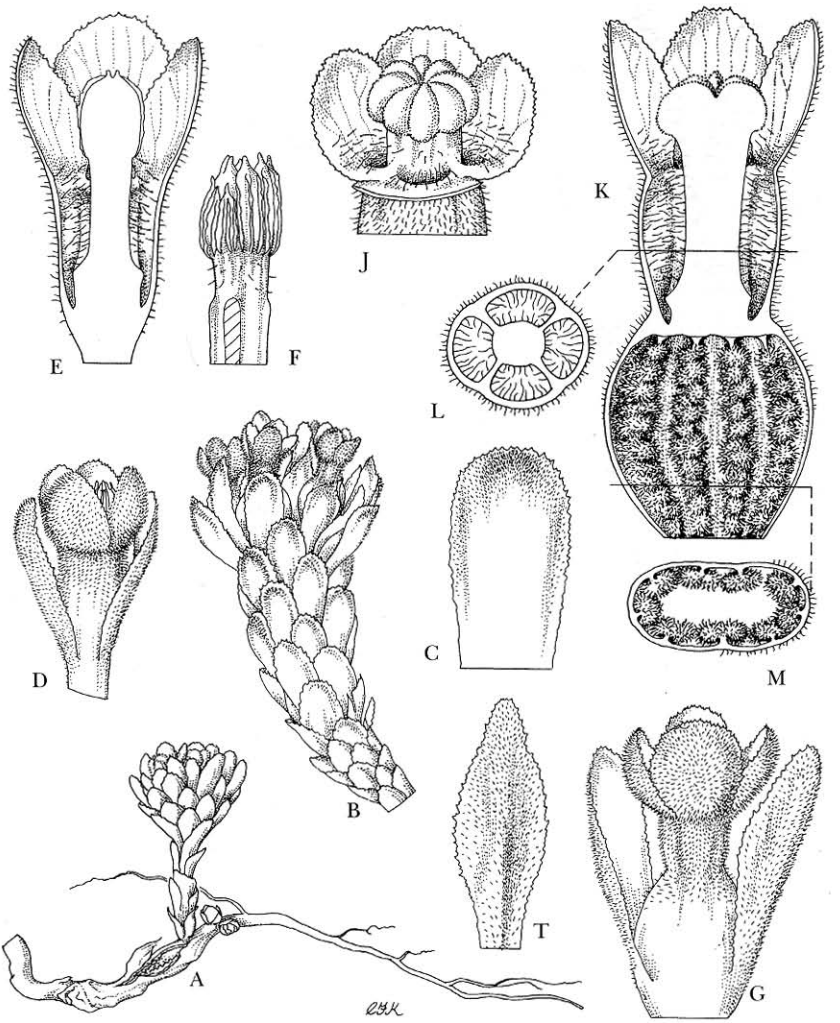
Plate 658 *Cytinus ruber* on *Cistus creticus* CHRISTABEL KING



Cytinus ruber. A, inflorescence and buds on root of host, × 1; B, mature inflorescence, × $^{2}/_{3}$; C, scale leaf, × 2; D, male flower, × 2; E, male flower, l.s., × 3; F, androecium, × 3; G, female flower, × 2; H, bracteole from female flower, × 2; J, female flower from above, × 3; K, female flower, l.s., × 3; L, t.s. through upper part of flower, × 3; M, t.s. gynoecium, × 3. Drawn by Christabel King from: A, from *A.W. Trethowy* 491, Tangier 1931; B, from *Davis* 50160, Libya 1970; C–M, from *Thomas Birch Wolf*, Algiers 1857, all at K.

Garrigue on limestone, in southwest Turkey, Mugla, with the lighthouse on the headland west of Cnidos, with *Cistus parviflorus*: habitat of *Cytinus hypocistis* probably on the white-flowered *Cistus salviifolius*. *C. creticus* also occurs here in quantity. Photograph: Martyn Rix.

Halimium whereas *C. ruber* occurs on pink-flowered *Cistus* (Strid & Tan, 1997; Villar, 1997). At least 10 subspecies of *C. hypocistis* have been named, and indeed 2 of these (*C. hypocistis* subsp. *kermesinus* and *C. hypocistis* subsp. *clusii*) are considered synonymous with *C. ruber*. That all these taxa are closely related was shown by the recent AFLP study (de Vega *et al.*, 2008) where *C. ruber* was no more differentiated genetically than three subspecies of *C. hypocistis*. The other species of *Cytinus* occur in South Africa and Madagascar, regions where

the new species *C. visseri* (see Plate 659) has recently been described (Burgoyne, 2006) and new ones are likely to exist.

There is growing interest in cultivating parasitic plants, not only because they are curious and even attractive, but also because many are threatened and require conservation effort. Culturing these plants requires knowledge of their life history as well as that of their host. In the early 1900s, Heinricher succeeded in cultivating *Cytinus hypocistis* from seeds (Harms, 1935). Flowering plants were obtained only after three years from the initial soil inoculation, thus highlighting the protracted life cycle of the parasite.

While on a trip to southern Portugal in April 1992, the first author observed several populations of *Cytinus* (Govaerts, 1994, 1995). On Cabo de São Vicente, *C. hypocistis* subsp. *hypocistis* could occasionally be seen among the vast stands of *Cistus palhinhae*. When following the coast northward, *C. hypocistis* subsp. *macranthus* was commonly found in the dunes where the Ribiera de Aljezur reaches the sea. Every plant of *Halimium commutatum* was carrying a large number of *Cytinus* flowers at its base. *Cytinus ruber* was found growing on *Cistus creticus* along a path north of Lagos. Because potted plants of *Cistus creticus* were already available, the opportunity existed to try cultivating the parasite. Unopened capsules from the previous season were located and transported back to Belgium.

Another observation the first author would like to share occurred during his annual summer holiday in Southern France. In July 1991 I visited an area north of Nîmes that had burned three years earlier and that now had a surprising amount of regrowth. There were a large number of young *Arbutus unedo*, a species quite rare elsewhere in the surrounding area, as well as a particularly large number of fruiting *Cytinus hypocistis* subsp. *hypocistis* on regrown, as well as on young, plants of *Cistus*. Although I had visited the surrounding area regularly in past years, I had previously never observed any *Cytinus*. All this suggested to me that fire may play a role in the germination of *Arbutus* as well as of *Cytinus*. This may also explain my success in cultivation given that charcoal was added as part of the potting mixture.

Cultivation. In April of 1992, seeds of *Cytinus ruber* were sown on three potted (17 cm) *Cistus creticus* plants. The top layer of gravel as well as some of compost below was removed, thus exposing the main root. Seeds were sprinkled on the entire surface of the host roots and

then covered with a 2 cm layer of 50:50 charcoal:compost mixture and topped off with a thin layer of horticultural grit.

The pots were left outside in Belgium over the summer and kept frost-free during the winter. In February 1994, the first inflorescences appeared in all three pots and the individual flowers started opening about 3–4 weeks later. The inflorescences were removed after flowering so as not to exhaust the host plants. The following year (February 1995) additional inflorescences appeared in one of the pots. Despite removing the parasite after flowering, it was clear that the 30 cm high *Cistus* hosts were suffering. It is possible that too many seeds were sown on one *Cistus* plant or perhaps it was too small to support the expanding parasite. In 1998 nearly the entire pot surface was filled with *Cytinus*. The last *Cistus* eventually died in 1999.

Cytinus ruber (Fourr.) Fritsch, Excursions fl. Oesterreich , ed. 3: 69 (1922). Type: [Illustration of] '*Hypocistis rubra*' in Clusius, Rar. Stirp. Hispan. Hist.: 135 (1576).

Hypocistis rubra Fourr., Ann. Soc. Linn. Lyon , n.s., 17: 148 (1869).

Cytinus hypocistis subsp. *clusii* Nyman, Consp. Fl. Eur.: 645 (1881).

Cytinus clusii (Nyman) Gand., Fl. Cret.: 92 (1916), nom. superfl.

Cytinus hypocistis var. *kermesinus* Guss., Fl. Sicul. Syn. 2: 619 (1844). Types: 'ad radices *C. villosi*, vel cretici passim in Sicilia = et in Alicuri, Felicuri, Maretimo, Pantellaria'. Syntypes: NAP

Cytinus hypocistis subsp. *kermesinus* (Guss.) Arcang., Comp. Fl. Ital.: 612 (1882).

Hypocistis kermesina (Guss.) Kuntze, Revis. Gen. Pl. 2: 563 (1891).

Hypocistis hypocistis var. *kermesina* (Guss.) Linding., Abh. Auslandsk., Reihe C, Naturwiss. 8: 258 (1926), nom. inval.

DESCRIPTION. *Holoparasitic monoecious perennial herb without chlorophyll*, consisting of an endophytic part within the host plant and an emergent, fleshy stem 5–12 cm tall. *Scale-leaves* densely imbricate, ovate-oblong, ciliate, deep crimson or bright red, somewhat fleshy, 10–30 mm long. *Inflorescence* a single condensed, thick, terminal spike with male flowers central and female flowers lateral. *Flowers* 5–10(–19), subsessile, each subtended by 2 usually pubescent bracteoles of the same colour as the leaves. *Perianth* simple, 12–15 mm long, ivory-white or pale pink, slightly exceeding the bracteoles, minutely pubescent, tubular-campanulate, divided above into four ovate, subacute lobes somewhat shorter than the tube. *Male flowers* with 8–10 uniseriate, sessile anthers at the apex of the staminal column. *Pollen* grains individual (not in tetrads). *Female flowers* with a broadly ellipsoid, sulcate inferior ovary, 5–6 × 4–5 mm; style cylindrical, stout, ca 3 mm long; stigma capitate. Placentae 8–10, branching out from the inner surface of the ovary. *Fruit* a subglobose white berry to 10 mm diam.; *seeds* numerous, minute, embedded in a viscid pulp.

DISTRIBUTION. Southern Europe to Georgia, Israel, north-western Africa.

HABITAT & ECOLOGY. Parasitic on pink-flowered species of *Cistus*. In open maquis as well as pine and mixed woodland, s.l. to 500 m.

PHENOLOGY. Flowering February to June. Pollination primarily by ants (de Vega *et al.*, 2009). Fruiting between August and November.

CONSERVATION STATUS. This species is widespread and common wherever pink-flowered *Cistus* grows. The species is therefore recorded as LC (Least Concern).

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