Icones Plantarum Formosanarum

Nec Non Et

Contributiones ad Floram Formosanam. III

Auctore B. Hayata.

5. E. Heinricher: On the question of the species formation in Cytinus Hypocistis together with other remarks.

(received on 17 December 1933. Spoken at the December meeting.)

Cause for the following gives me a small report by G. NICOLAS: Une Variation du *Cytinus Hypocistis* L.[1]). His central point is probably given by the following quotation: [from French] "During an excursion at the end of April in the forest of Baínem I had the occasion to meet a tuft of *Cytinus* (fig. 2, 3, 4) on a stem of *Cistus monspeliensis*. This observation is particularly interesting from the point of view of the biology of *Cystus* [sic. *Cytinus*] considered until now by all botanists as exclusively parasitic on roots; I hasten to add that it acts of a completely exceptional anomaly, that I have observed only on one stand of *Cistus* and who, to my knowledge at least, has never been announced".

The pleasing transmittal (1933) from the year 1912 of the coming report instructed me that NICOLAS was the first to prove that *Cytinus* parasitizes the trunk of *Cistus*, which was so far to me unknown. Two further cases, which I could determine from my education, one in 1927[2], the other in1930[3], show probably that it will hardly concern thereby special rarenesses. NICOLAS reported also on the construction of the flowers and brought a correct indication concerning the number of stamens and carpels, correctly opposite that of HAYEKS[4] work that appeared in 1912 "About the floral biology of *Cytinus Hypocistis* L", which indicated 5 stamens; however NICOLAS seems to have surveyed the floral nectary discovered by HAYEK. Admittedly the conditions of androecium and gynoecium were treated my report "Note on the flower of *Cytinus Hypocistis* L." (Ber. d. D. Bot. Ges., Bd. XXXV, 1917, 5 p., 1 Taf.).

In contrast, as shown with NICOLAS in Fig. 1 and 2 the illustrated plants to step out sharply: in 1 the inflorescences sit on long stalks, in 2 however fully sessile, woke in me the question of whether or not this could be expression of a species specific curiousity [specialization] separating within *Cytinus*. The question, however, is actually answered in the negative by the fig. 1 and 2, since for both as a host plant is mentioned *Cistus monspeliensis*, which is considered as a host of the

Subspec. *ochraceus* (= Var. *aurantiaca*), with which also the indication agrees “flowers yellow”. I am in this connection not completely convinced nevertheless because of discrepancy with my observations.

In 1917 R. v. WETTSTEIN published "Studies on the Systematic Arrangement of *Cytinus Hypocistis* L." (Ber. d. D. Bot. Ges., Bd XXXV, 13 p., 1 Taf.), in which he accepts 5 Subspecies and they are hypothetically linked with parasitism of different *Cistus* species. In addition he particularly considered size and shape of the flowers, the covering bracts and the prophylls. The condition of the inflorescence is not mentioned. NICOLAS hardly thought of further fragmentation from *Cytinus*. He explained the change in the arrangement of the inflorescence which can be put forward outward by the thallus of the parasite conditionally by the more or less powerful endophyte, which they would have to master, in order to bring it to the light, he says: “Because I noted many times on this species that the length of this organ (the peduncle) depends on the depth of the roots which support it, or more exactly thickness of the ground layer that it must cross to arrive at the light.” That sounds completely captivating, however, according to my experience cannot convince me.

My plan to possibly grow *Cytinus* from seeds failed first because of the unsuccessful efforts to attain these [seeds] or fruits. In the summer of 1883, since I stayed as a young private lecturer of the University of Graz in the Würzburger Institute with ULIUS v. SACHS, I found there SPIRIDION MILIARAKIS, who later achieved Professor of Botany in Athens, and who since that time was connected to me in a friendly manner. I expressed to M. my desire for seeds of *Cytinus*, first in addition, of the *Cytinus* populated around potted *Cistus* plants. MILIARAKIS corresponded willingly to my solicitation. He had in the spring 1913 in Athens excavated 3 plants and had continued to maintain them in pots in his garden. The dispatch was delayed, because owing to the war between Bulgaria and Greece all Greek ships were used for the war. On 21 April it was announced to me the send off of the Austrian ship Lloyd. Unfortunately the plants were dead when they reached me in Innsbruck, they were obviously desiccated. MILIARAKIS had in addition procured seed for me from a farmer who noticed shrubs with set fruits and later made the delivery. Thus come the result of my tests, which I owe MILIARAKIS, my related publication[1] which unfortunately however I did not experience again.

In the year 1914, at Pfingsten, I could finally observe *Cytinus* in a natural location, Cigale on the island Lussin, plentifully, both in the form Var. *kermesina*, but more sparce as Var. *aurantiaca*. At first could I observe 2 pot cultures over the years in Innsbruck. (the potted plant of the Var.

aurantiaca was unfortunately withered; the root system of the *Cistus* had been hurt too much when digging.) In addition still came the plants obtained by sowing seed. In all cases we dealt with plants only with sessile constructed inflorescences, like it, in contrast to fig. 1 of NICOLAS and in KERNERs Pflanzenleben (Leipzig, 1887, Bd. I, S. 183) for *Cytinus* portrayed very well in the pictures on Taf. VIII of my paper (Ber. d. D. Bot. Ges. 1917).

I received the first pedicellate [stalked] inflorescence of *Cytinus* in about 1910. Students had undertaken a field excursion with the Minerologist who had also visited Elba. With S. Pierro they collected for me some material of *Cytinus*, thereby they found 3-4 cm long pedunculate inflorescences; also the preparations could be made for the exhibits Taf. IX (Ber. d. D. Bot. Ges. 1917[6]), and also shows that with *Cytinus* the procedure found by me works satisfactorily, which the nigrescence [blackening] of objects and alcohol prevents [7]. Whether the floral shoots had been more or less covered by earth, I did not experience. Important in this connection, however, is that I had the opportunity, one year later, in the spring to see in the Graz Botanical garden the first living plant of *Cytinus*. It should have originated from Istrien [and] was on a weaker *Cistus* in a relatively small pot. The only inflorescences were not pedunculate, 3-4 cm long and had broken through the covering earth layer, but were freely broken out from a root, which had reached the earth border. Under the plants that MILIARAKIS sent me, was a particularly strong *Cistus*, that also had the parasite on it. I searched for it as much as possible to retrieve it for the Botanical museum. Where the *Cytinus* sat, whether on the trunk or on the root, remained uncertain; it possessed however several inflorescences 4-5 cm in length. Whether it was covered with earth eludes my memory. The question, which interests me today, was not yet posed at that time by me. It, as with the fragmentation of the *Cytinus* in Subspecies generally, could be solved only by systematic investigation of plants from seeds. I would like to take the liberty [to suggest] how to execute such attempts. Firstly it might be recommendable to first limit the variation for there is some probability that its existence is already present: with the variation, that which AMBROS R. v. HARACIC[8] differentiated as Var. *kermesina* and Var. *aurantiaca*. They correspond to WETTSTEINs Subspec. *kermesina*, second the his *ochracea*.

The procurement of host plants for 3 the additional WETTSTEIN subspecies (*Cistus symphytifolius* var. *Vaginatus* for 3., *Halimium* species for 4. finally *Cistus parvifolius* for 5) could be difficult.

For infection purposes one should every 1-2 years supply seed drawn from plants of surely determined *Cistus* species. So from *Cistus villosus* and *C. albidus* for the Subspec. *kermesina*; for

these also of *Cistus populifolius*, from my seed sowings I had success on these 3 species [9]. Of course one should also include in the attempt the species that these 2 subspecies occur on. Those are *C. ochraceus*: the white flowered species *Cistus monspeliensis* and *C. salvifolius*. As for the pigment content, which upon drying leads to the yellow coloring of the flowers, as I referred to and expressed in an earlier report, can be involved with orange of the covering bracts.

It will be not less important to have certainty as to which *Cistus* species fruits were harvested by their attached *Cytinus*. Like that it was with my attempts where I did not designate a *Cistus* species, of which through MILIARAKIS sent harvested fruits. Success thereby remained limited to only the upbringing. Note it must always remain [possible] that the seeds can also belong to a hybridization of two species, since pollination via long-snouted insects is effected and the two forms can actually exist next to each other, *C. kermesinus* beside *aurantiacus* on Lussin. One will thus have to consider, if it is necessary, whether the characteristics have penetrance, or whether the dominant or recessive one prevails.

Most promisingly tests [attempts] were accomplished by Institutes, where *Cytinus* is well represented and where large distances do not occur; so e.g. in Athens, or of Institutes in the colonial areas of France, Italy and Spain.

With respect to changes in the coloring condition of flowers – like the covering bracts; about this in my report in der Ber. d. D. Bot. Ges. 1917, S. 1910 one find some remarks.

I must further still mention another point, which is not completely clear also in the paper by NICOLAS, or which perhaps I did not correctly understand. In the illustrations [Abbildungen?] 3 and 4 NICOLAS brings from the *Cistus* trunk in Fig. 2 sessile inflorescences, increases from 2 sides, to the illustration. He means that "30 the surface of this body in a yellow-orange cluster of flowers, that a meticulous examination allows one to attribute 8 separate individuals" (closed of me, H.) and here seems to see not separate inflorescences but rather plants arising from separate seeds. Now very doubtfuly it seems to me this contains a question that will hardly be solved with certainty. Certainly proceeding with the means available, in the thallus development period that first takes place in a root in the host plant and arrives before floral development. Certain thallus stages become sick and die, others are strong and form new inflorescences. Dispersion of the thallus resulting from a primary infection certainly takes place repeatedly. Further development of my plants was repeated to pursue, whereas new infections by seeds was impossible[10].

Finally I want to state that in 1933 a further success resulted from sowing seeds in 1913. Except on seedlings also for old *Cistus* plants of different species of seeds were designed. Again it was

such from *Cistus populifolius*, with which on a root, which affected the ground surface, a weaker floral construction of *Cytinus* had appeared. 20 years after the sowing, while the first 2 germinated after 3 years, 3 in 14 had taken place! Doubting further success, the cultures were left open in 1921 and are the proof or 3 and 4. To attribute germinating only to the fact that coincidentally the host plants escaped removal.

Innsbruck, in December 1933.

Footnotes

1. Bulletin de la Société d'Histoire naturelle de l' Afrique du Nord. Quatrième année. No. 8, 15. Nov. 1912. The largest part five sides around seizing small script four photographs take, which become effective the bad paper because of less good. The Verf. is Professeur à la Faculté of the Sciences de Toulouse.
2. "Zur Aufzucht der Rafflesiacee *Cytinus Hypocistis* L. aus Samen" (Ber. der Deutsch. Bot. Ges., Bd. XL V).
3. "Über das Aufsteigen des *Cytinus Hypocistis* im Stamme der Wirtspflanze *Cistus"* (Beiträge zur Biologie der Pflanzen, Bd. XIX, Breslau 1931). Here an admission particularly clearly pointing conditions added.
4. Österr. Bot. Zeitschr., LXII. Jahrg.
5. Ber. der Deutschen Bot. Gesellsch. LII.
6. Ber. d. D. Bot. Ges., Bd. XXXV, 1917; 8 S., 1 Taf.
7. Zeitschr. f. wiss. Mikroskopie, Bd. IX, 1892.
8. H. was a good connoisseur of the Flora of Lussin, where he worked as Professor at the nautical school.
9. The two first species belong the Sect. I, *Erythrocistus*, *Cistus populifolius* (after DE of CANDOLLES Prodromus Bd. I, S. 266) however the Sect. II, *Ledonia*, whose species are called white-flowered I found pale reddish.
10. See in "Beiträgen zur Biologie der Pflanzen" [contributions to the biology of the plants] (Bd. 19, S. 26) illustration brought.