

The Problem of Carnivory in the Common Toothwort (*Lathraea squamaria* L.)

by M. Studnička (Liberecká 36, 466 01 Jablonec n. N., Czechoslovakia)

The genus *Lathraea* of the family Scrophulariaceae is distributed over Europe and Asia and comprises five species. All are parasitic. The most widespread is the Common Toothwort, which is parasitic on the roots of hazel, poplar, alder and other trees. It has an extensive underground network of stems with white, fleshy leaves. In April to May it shoots up inflorescence 4 to 8 inches high above the ground.

It is the underground leaves of the Toothwort which particularly interest admirers of carnivorous plants. Some botanists offer the opinion that these leaves may act as capture organs (Managetta 1897, Heslop-Harrison 1976, and others). Heslop-Harrison writes, "A strange example indeed is seen in root parasites of the genus *Lathraea* of the Scrophulariaceae, where the much reduced leaves of the rhizome have cavities lined with enzyme-synthesizing glands. Insects and other small soil organisms are readily caught in the cavities, suggesting the possibility of a form of carnivory not unlike that of *Genlisea*."

Let me describe the inner arrangement of the leaves of *Lathraea*. Under the epidermis, which is without stomata, there is a thick layer of reserve tissue with starchy grains. There is a richly articulated cavity inside the leaf which ends in a perforation in the lower side. The epi-

dermis at the perforation is smooth but further inside the leaf the walls of the cavity are covered with pestle-shaped glands."

If we dip the cut end of an underground stalk into coloured water, the water is absorbed into the vascular system. The veins carry the coloured solution to the interior of the leaf and the glands expel it into the cavity. In the growing plant the water or water solution expelled by the glands soaks into the earth close to the leaves. This simple experiment demonstrates that the main work of the glands is to eliminate surplus water from the plant. This is essential to enable the plant to absorb constantly new supplies of nutrition (Danert et al. 1973: 270). In most plants water is evaporated from the stomata, but plants growing in a very damp atmosphere often eliminate water in drops by means of glands (so-called hydathodes) like the Toothwort. Tropical plants of the family Piperaceae have the same hydathodes as the Toothwort.

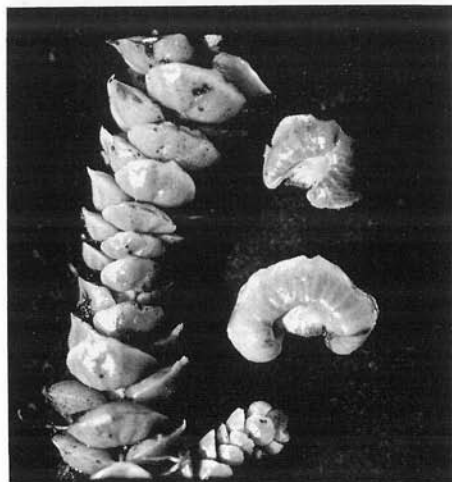
What remains unexplained, however, is the similarity between the leaves of the

(Continued on page 20)

Anatomy of leaves of *Lathraea* and *Genlisea*.

A: Longitudinal section of a leaf of *Lathraea*.
B: Gland of the inside of the leaf. C: Transverse section of the leaf. D: Interior view of a leaf of *Genlisea*. Below the dashed line: the smooth entrance of *Lathraea* in comparison with the neck of *Genlisea* with detentive hairs. (left)

Underground stem of *Lathraea squamaria* and lower side of two leaves. (right)



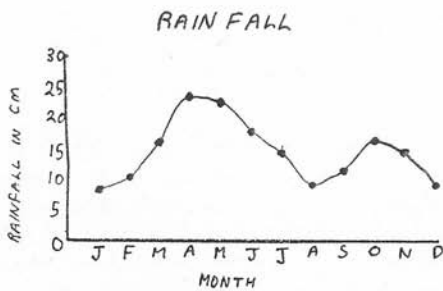


Figure 3

pecially along the shores of Bruce Peninsula so that a rainfall of 15 cm per month during summer is normal. The winter dormancy lasts anywhere between six to eight months.

In cultivating this *Drosera* in my house, *D. linearis* is kept with all my other CP. The plant receives direct sunlight in summer of about 6 hours. The plants are grown in living sphagnum moss in clear plastic cups containing two plants per cup and no drain holes. I keep the medium very wet, to the point where the water is clearly visible at the surface. One can also use peat moss or dried sphagnum as alternatives.

The medium used for seed germination is made up of a 50/50 mixture of

sand and peat with a layer of fine chopped sphagnum on the surface. The seeds are sown on the medium, and then placed in the refrigerator for 4 weeks followed by a freezer treatment for 4 months and finally a two week refrigerator treatment before being placed in an area receiving a minimum of 6 hours of sunlight.

The most difficult factor in dealing with *D. linearis* is the dormancy period. I found that beginning in September, one must place the plants in an area where sunlight is limited to 4 or 5 hours per day, and temperatures are below 18° C. After two weeks of this, the plants can be placed in the refrigerator in their pots which should be only damp, and covered with a plastic bag. This dormancy period should last until late April. The refrigerator temperature is approximately 38° F, and the freezer is about 10° F.

Lighting conditions for seed are the same as for adult plants: full sun in a southern window. The seeds are sealed in a cup with a plastic bag on a damp peat medium. I have not had fungus
(Continued on page 27)

Toothwort (continued from page 17)

Genlisea and those of the *Lathraea* and the question of the secretion of enzymes and the catching of prey. I examined over 100 leaves of the *Lathraea* but nowhere did I find the remains of any prey or living organism. The absence of the ubiquitous protozoa, mites, nematodes and other organisms in the cavities of the leaves is not favourable for animal life and the Toothwort thus protects the inner surface against the harmful influence of organisms from the soil. Maybe the enzyme mentioned by Heslop-Harrison has an effect here.

The trap of *Genlisea* would then differ in principle from the "trap" of *Lathraea* only in the fact that *Genlisea* has a mechanism preventing its prey from escaping which *Lathraea* does not have. Therefore,

the inner part of the hollow leaves of *Genlisea* kills the prey whilst that of *Lathraea* probably repels it.

Despite the similarity between the leaves of *Lathraea* and those of *Genlisea* and the fact that both belong to the related families Scrophulariaceae and Lentibulariaceae, I have not found any signs of carnivory in the Toothwort.

References

- Danert, S. 1973. *Urania Pflanzenreich. Hohere Pflanzen 2.* Leipzig, etc.
- Heslop-Harrison, Y. 1976. Carnivorous Plants a Century After Darwin. *Endeavor* 35/126: 144-122.
- Managetta, G.B. 1897. *Orobanchaceae.* In Engler, A. et Prantl, K., *Die natürlichen Pflanzenfamilien*, vol. 4, sect 3b. Leipzig.

(Received 8/17/81)