HYPERPARASITES ATTACKING RUST FUNGI IN OKLAHOMA

JACK A. TRAYLOR, Stillwater

Darluca Filum (Biv.) Cast., a fungus which is parasitic on various species of rust fungi, is found fairly commonly in Oklahoma and has been reported from various parts of the United States and abroad.

There are more than a thousand species of rust fungi occurring in North America, and only a very small percentage of these have been recorded as hosts of *Darluca Filum*. Our infection experiments have shown that *D. Filum* may be readily transferred from one rust to another, and it thus is probable that our knowledge of the host range of *D. Filum* is very incomplete.

In the rust collections at Stillwater *Darluca Filum* has been found parasitizing the rust fungus *Puccinia amphigena* Diet. on the grass *Calamovilfa gigantea* (Nutt.) Scribn. and Merr., also on the rust *Uromyces graminicola* (Burr.) from the grass *Panicum virgatum* L. and on the rust *Uromyces peckianus* Farl. on the grass *Aristida oligantha* Michx. Dr. W. W. Ray of the Oklahoma Agricultural Experiment Station has also collected *D. Filum* in Oklahoma on the Lespedeza rust *Uromyces lespedezae* Peck. These rusts appear to be additions to the known host range of *D. Filum* since they were not included as hosts of *D. Filum* in Seymour's *Host Index of the Fungi of North America*. Three hundred specimens of wheat leaf rust were collected in Oklahoma in 1938 and 1939. These were examined and *D. Filum* was found on only one specimen.

The fruiting bodies or pycnidia of *Darluca Filum* appear among the rust spores as large spherical, black, shiny cases occurring in groups. Within these pycnidia are myriads of *Darluca* spores. These are colorless and much smaller than the rust spores, averaging 12—15 by 3—5 microns in size in the Oklahoma collections. They are oblong and straight with one cross wall or septum. According to the published description of *D. Filum* the spores are equipped with bristles at the ends. These were not apparent in the Oklahoma collections in most cases. We are inclined to agree with Adams[1] that the presence of bristles is not a constant character in this species.

We have been able to transfer *Darluca Filum* to leaf rust of wheat, *Puccinia triticina* Erikss., from the grass rust *Uromyces graminicola* on *Panicum virgatum*. On the other hand, we did not succeed in inoculating the wheat rust with *D. Filum* from the rust *Uromyces peckianus* on the grass *Aristida obligantha*, or from the rust *Uromyces lespedezae* on Lespedeza.

Inoculations were made by crushing the *Darluca* pycnidia and making a water suspension of the spores. The suspension was then distributed over the red-rust sori with a glass tube. The spores of *Darluca Filum* germinate in two or three hours under favorable conditions. Under our conditions pycnidia developed on the inoculated rust sori in six days at an average temperature of 65° F.

Our successful infection experiments were limited to inoculations of mixtures of *Darluca* spores and rust urediniospores onto rust pustules. Failure to produce infections of *Darluca* in several cases may have been

due to the age of dried leaves yielding the inoculum, or possibly in some cases to the fact that the *Darluca* may be so inhibitory to rust development that its presence in rust inoculum prevents rust infection and hence inhibits the development of the obligate parasite *Darluca*.

We have observed *Darluca* on a number of native grasses and on Lespedeza, as stated. We have also shown that the *Darluca* may be transferred from a grass to leaf rust of wheat, and Fedorintchik[2] has performed the reciprocal experiment of carrying *Darluca* from wheat to grasses. Thus we see that *Darluca* is prevalent on grass rusts in Oklahoma and that it readily attacks wheat leaf rust. It was collected only once in 300 samples of wheat leaf rust from Oklahoma, but it developed very abundantly on wheat leaf rust in the greenhouse in Stillwater during the spring of 1939 under the conditions of an artificial rust epidemic which were favorable to the growth of both wheat plants and wheat leaf rust. Further work is needed in attempts to initiate *Darluca* epidemics for the biological control of the cereal rusts. Even if it proves impossible to reduce rust in the field by artificial *Darluca* inoculations, our knowledge of this hyperparasite may still be of service in helping us to interpret the rise and fall of the rust populations in nature, just as a knowledge of hyperparasitism in insects throws light on the fluctuations of insect populations.

REFERENCES

[1] Adams, J. F., 1920. *Darluca* on *Peridermium peckii*. Mycologia 12:309-315.

[2] Fedorintchik, N. S., 1939. *Darluca Filum* (Biv.) Cast. (English summary). Rev. App. Mycol. 18:580-581.