PREDATORY FUNGI AND THEIR UTILISATION IN NEMATODE CONTROL

BY

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The utilisation of natural enemies for the control of plant parasites has long attracted attention. If cheap and effective means of increasing the fungi, bacteria and viruses that attack plant parasites could be found, this method of control would be more rational than the employment of chemicals. Moreover, the biological means of control involves no toxic hazards to man as is often the case with chemicals. Especially promising is the use of micro-organisms which live as saprophytes in the soil but are capable, when there is an accumulation of harmful insects or nematodes, of resorting to the parasitic mode of life and of destroying some of the harmful organisms. Such are the so-called predatory fungi and among them is a group of soil fungi which destroy nematodes. These fungi develop special trap mechanisms by which the nematodes moving in the soil are caught. The first description of fungal traps was given by Voronin (1869) and Sorokin (1872, 1876). A more thorough study of predatory phenomena in fungi was made in France at the Pasteur Institute and in the U.S.A. in Drechsler's laboratory. In the U.S.S.R. the first comprehensive investigations of predatory fungi were initiated by F. F. Soprunov (1947, 1950). Recently investigations have also been undertaken by the Moscow and Azerbaijan Plant Protection Stations.

Predatory fungi are widespread in the soils of the Soviet Union. They have been isolated from the soils of the extreme South and from the central zone of the U.S.S.R., e.g. Turkmenia and the Moscow region.

Soprunov and Galiulina (1951) have shown that the majority of predatory fungi found in the U.S.S.R. belong to the Hyphomycetes, are mainly distributed among the genera Trichothecium and Arthrobotrys, and to a lesser degree the genera Dactylaria and Dactylella. Certain forms of predatory fungi, isolated from the soil of Turkmenia,
have proved to be new species, viz. *Trichothecium pravicovi* (Sopr. & Gal.), *T. globosporum* (Sopr. & Gal.), *Arthrobotrys oviformis* (Sopr. & Gal.), *A. kirghizica* (Sopr. & Gal.).

Predatory fungi widespread in other places of the earth were also found, e.g. *Arthrobotrys oligospora* Fres., *A. longispora* Pr., *Dactylaria brochophaga* Dr., *Dactylella hembicoides* Dr. and others. Predatory fungi of the genera *Trichothecium* and *Arthrobotrys* have a morphological resemblance to the saprophytic species of the same genera, but differ from these in their ability to form ring-traps and in certain other physiological peculiarities. For instance, they decompose animal protein more rapidly than the saprophytes.

Experiments have been carried out on the application of predatory fungi for control of the root-knot nematode (*Meloidogyne marioni* Cornu), chiefly under indoor conditions, where the root-knot nematode causes damage in certain localities, mainly in cucumber and tomato cultivation. These experiments were first made by Soprunev (1947) in Turkmenia. Predatory fungi were grown on plant media in Erlenmeyer flasks, maize and oat flakes or wheat bran being best suited for this purpose. Conidia of the fungus are sown on the medium and kept at 25-30° C, until the fungus grows through the entire thickness of the substratum. After that the contents of the flask are removed, dried and then ground into powder. If this powder is kept in a cold dry place the fungus retains its viability for not less than a year.

In the initial experiments, fifteen days prior to sowing cucumbers, ground medium containing the mycelium of predatory fungi was introduced into a flower pot with nematode-infected soil. Such powder usually contains large amounts of conidia. A count of galls on cucumber roots showed that, in the pots into which predatory fungi had been introduced, the number of galls was considerably lower. The controls averaged 23 galls/plant, while the pots into which predatory fungi had been introduced averaged 0.6 galls/plant. Soprunev's experiments have shown that the greater the population density of nematode larvae in the soil, the more effective are the predatory fungi. The action of predatory fungi is reduced in conditions of excess moisture. Under favourable circumstances the predatory fungi remain active up to one month. Soprunev has also demonstrated that the addition of ammonium carbonate heightens the effectiveness of predatory fungi.

In 1953 experiments were conducted by N. M. Sveshnikova and by E. I. Kondakova (unpublished) under the direction of the author.