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SHORT COMMUNICATION

THIELAVIOPSIS BASICOLA, A FACTOR IN THE CHERRY REPLANT PROBLEM IN THE NETHERLANDS[1]

Thielaviopsis basicola,
een factor in het herbeplantingsprobleem van de kers in Nederland

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It has long been known in the Netherlands that young cherry trees planted on sites previously occupied by cherry often exhibit very poor growth. Previous work (HOESTRA & OOSTENBRINK, 1962) has shown that in some cases the endoparasitic nematode *Pratylenchus penetrans* Cobb is one of the factors involved, especially on light soils, but most Dutch cherry orchards are situated on heavier soils where this nematode is less prevalent. Severe replant problems may occur on such soils which have little or no *P. penetrans* infestation.

The cherry replant problem is known in other countries. Several authors have emphasized the specificity of such problems to related species of plants (FASTABEND, 1955; THOMPSON, 1959; OOSTENBRINK & HOESTRA, 1961). Pome fruit and stone fruit have their own replant problems and there may even be specificity within these groups.

The replant problems of apple and cherry were reproduced in the greenhouse with young seedlings planted in 500–700 ml pots. In one pot experiment, cherry *(Prunus avium)* and apple seedlings (*Malus pumila* 'Bittenfelder') were planted on both apple and cherry soils taken from apple and cherry orchards. Cherry grew poorly on cherry soil and well on apple soil. Apple grew well after cherry, but poorly after apple. When cherry followed cherry and apple followed apple growth was much better when the soil was fumigated before planting with the radical soil sterilant chloropicrin, but when the soil was treated with the nematicide DD (dichloropropene and dichloropropane mixture) there was only a slight improvement in growth. These results illustrate the specificity of the two replant problems and the existence of injurious factors other than nematodes.

The root systems of the seedlings were examined under a microscope about ten weeks after planting. Chlamydospores of *Thielaviopsis basicola* (Berk. & Br.) Ferr. were detected on root systems of cherry seedlings grown in untreated and DD-treated cherry soil. In further investigations the carrot disk method designed by YARWOOD (1946) was used to isolate the fungus from the roots and soil of non-fumigated pots. A high infestation of the roots was found on cherry grown on cherry soil only. The standardization of YARWOOD's method recommended by TSAO (1962) permitted quantitative comparison of the four series of soil samples. In this technique the area of the carrot disks covered with sporulating fungus is used as an index of the *Thielaviopsis* concentration in soil. A certain

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rate of infestation was found in all four series of samples, but to a different degree (Table 1). The infestation level of cherry soil is highest after growing cherry. The figures for the apple soil suggest that an originally slight infestation may increase when cherry is grown.

Inoculation trials were carried out with apple and cherry. Seedlings were inoculated in two series of six replicates each. The roots were dipped in a suspension of chlamydospores and endoconidia from a culture originally isolated from cherry soil. The remaining liquid was poured over the surface of the soil. A twice autoclaved apple soil was used in this test. After six weeks a very poor growth was observed of the inoculated cherry seedlings, in contrast to the vigorous growth of the control plants. The latter had healthy root systems with a great number of root hairs. Root systems of inoculated plants were small and dark brown and root hairs were entirely absent. There was no difference between inoculated and control plants of apple seedlings and no indication of parasitism by the fungus. *Thielaviopsis basicola* could be reisolated from inoculated pots only.

Another inoculation experiment in the greenhouse was carried out with one-year-old *Prunus avium* trees in four-litre pots filled with a steamed garden soil rich in organic matter. The newly formed shoots were measured two months after planting and inoculating the trees. Of 15 control trees the length of the young shoots was 26.4 cm per tree whereas 18 trees grown in the inoculated soil had an average shoot length of 11.5 cm. Sporulating mycelium of *T. basicola* was found on roots of inoculated trees in association with large brown lesions.

These results demonstrate the pathogenicity of *T. basicola* to cherry. There are also indications that the cultivation of cherry may cause an increase in the infestation level of this fungus in the soil. *T. basicola* is known to be pathogenic to tobacco, cyclamen and several other crops, mostly annual, and also to citrus (TSAO & VAN GUNDY, 1962). It is interesting to note that JOHNSON (1916) found it fairly safe to conclude from his tests that Rosaceae are generally immune from attack by *T. basicola*. On the other hand, MOORE (1959: 388) lists *T. basicola* as a parasite of *Prunus pissardii nigra*.

Apple is resistant under greenhouse conditions. The fungus was not generally found in soils from apple orchards but was repeatedly isolated from cherry

TABLE 1. YARWOOD's carrot disk method applied to soil from pot experiment. Percentage of carrot disks covered with sporulating mycelium of *Thielaviopsis basicola*. Average of twelve disks after twelve days of incubation at 18°C.
Peenschijfmethode van YARWOOD, toegepast bij grond, afkomstig van een potproef. Bedekking van de schijfjes in procenten met sporulerend mycelium van Thielaviopsis basicola. *Gemiddelde van twaalf schijfjes na twaalf dagen incubatie bij 18°C.*

	After growing *Na de teelt van*	
	cherry seedlings *kersezaailingen*	apple seedlings *appelzaailingen*
Soil from cherry orchard *Grond uit kerseboomgaard*	79	38
Soil from apple orchard *Grond uit appelboomgaard*	13	5

soils. From the results hitherto obtained, especially as regards the susceptibility of cherry and the resistance of apple, it is concluded that *Thielaviopsis basicola* is involved in the cherry replant problem in the Netherlands. It is clear, however, that more work needs to be done on the biology of the fungus, especially under field conditions, in order to establish the importance of this factor.

SAMENVATTING

Het aaltje *Pratylenchus penetrans* kan bijdragen tot het optreden van herbeplantingsmoeilijkheden bij kers op lichte grond. Op zwaardere gronden komt dit aaltje veelal niet in schadelijke aantallen voor; toch kunnen ook hier ernstige herbeplantingsmoeilijkheden optreden. Bodemmoeheidsverschijnselen bij meerjarige gewassen zijn meestal specifiek voor verwante soorten, bijv. voor steenrespectievelijk pitvruchten. In potproeven is het bestaan van deze specificiteit en van factoren die naast aaltjes verantwoordelijk zijn voor moeheidsverschijnselen bij appel en kers nog eens aangetoond.

Op wortels van kersezaailingen, die geteeld waren op grond afkomstig uit een kerseboomgaard, werden chlamydosporen van *Thielaviopsis basicola* (Berk. & Br.) Ferr. gevonden. Met deze schimmel werden inoculatieproeven gedaan, waaruit duidelijk de pathogeniteit ten opzichte van kers bleek. Bovendien zijn er aanwijzingen dat de teelt van kers tot een toeneming van de besmettingsgraad van de grond leidt (tabel 1). Appel bleek resistent te zijn tegen de schimmel.

Deze gegevens wijzen er op dat *T. basicola* een rol speelt bij het herbeplantingsprobleem van kers. Nader onderzoek zal echter moeten uitwijzen hoe groot de betekenis van deze factor onder praktijkomstandigheden is.

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