

A RELATION BETWEEN STEM INFECTION BY *PHOMA SOLANICOLA* AND *DITYLENCHUS DIPSACI* ON POTATO¹

Een verband tussen stengelaantasting door Phoma solanicola en Ditylenchus dipsaci bij aardappel

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In a recent review of *Phoma* species on potatoes BOEREMA & VAN KESTEREN (1962) conclude, that *Phoma solanicola* Prill. et Delacr. only attacks weak or injured plants. The following observations indicate a relation between the fungus *Phoma solanicola* and the stem eelworm, *Ditylenchus dipsaci* (Kühn).

In a crop rotation field near Hagestein (province of Zuid-Holland) on heavy clay soil, ten crops have been grown since 1959 following a fixed rotation system (OOSTENBRINK, 1959). Besides potatoes also oats, wheat, peas, beets, grass-clover, marigolds, onions and red clover were grown and fallow was included. Early in the season of every year each plot was sampled and the numbers of active and cystforming nematodes and of stem eelworms estimated (OOSTENBRINK, 1960).

The field harbours a nematode population comprising different genera: *Pratylenchus*, *Paratylenchus*, *Tylenchorhynchus*, *Trophurus*, *Heterodera* and *Ditylenchus*. The main *Ditylenchus* species is *Ditylenchus dipsaci*. The population of this species was high on the potato, pea, oats and onion plots and low on the red clover, fallow and wheat plots.

In 1962 symptoms of infestation by the stem nematode were found in potatoes, variety 'Loman 53-123,' early in the season. These symptoms comprised small, deformed shoots with crinkling and swelling of stems. Laboratory investigation confirmed that diseased tissues harboured high numbers of stem eelworms.

During July quite another type of stem infestation occurred, caused by a *Phoma*-like fungus. The fungus was isolated from infected stems and identified as *Phoma solanicola* by the Mycology Section of the "Plantenziektenkundige Dienst". Infected stems showed characteristic oval or oblong, brownish, often sharply bordered, sunken patches of dead tissue, particularly at the base. Slight attack induced curling and withering of leaves; severe attack caused a sudden collapse of the plant as soon as the base of the stem was embraced by the *Phoma* patch.

It was already evident from observations in the field that the fungus damage varied between plots. Counts of the number of diseased plants showed that the most severe attack occurred after crops, which were already known to be efficient hosts for the stem nematode. A strong regression of the percentage of

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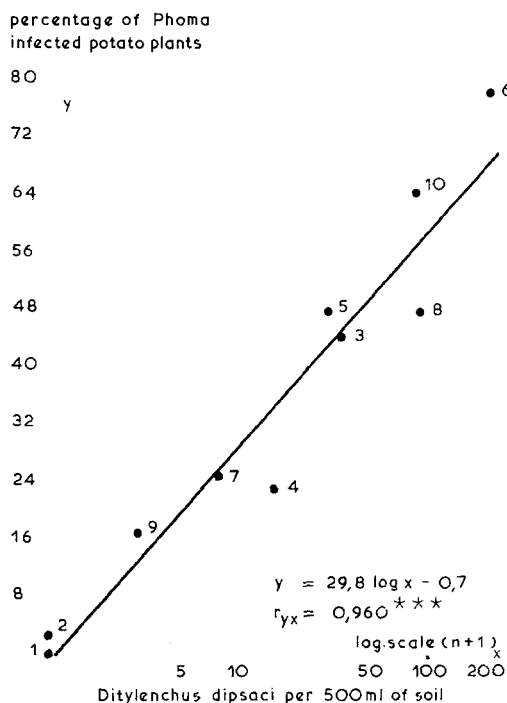


FIG. 1.
Percentage of *Phoma* infected potato plants on 27 July 1962 plotted against preplant soil infestation of *Ditylenchus dipsaci*. Potato followed ten different crops of 1961 (1 = red clover; 2 = fallow; 3 = onions; 4 = marigolds; 5 = grass-clover mixture; 6 = potatoes; 7 = beets; 8 = peas; 9 = wheat; 10 = oats). Statistical data: r = correlation coefficient; *** = probability more than 99.9%.

Phoma-infected plants on the logarithm of the preplant number of nematodes per 500 ml of soil appeared to be present (fig. 1).

Each of the fore-mentioned two related factors shows a negative relation with the weight of stalks and of tubers of the crop at harvest time (26 September 1962). The corresponding linear equations and correlation coefficients are recorded in fig. 2 and are summarized below as follows:

Regression	Correlation coefficient
Percentage <i>Phoma</i> infected plants on <i>Ditylenchus</i> :	0.960 (P 99.9%)
Stalk weight on <i>Ditylenchus</i> and <i>Phoma</i> infection respectively:	-0.880 and -0.937 (P 99.9%)
Tuber weight on <i>Ditylenchus</i> and <i>Phoma</i> infection respectively:	-0.813 and -0.855 (P 99.9%)

These data suggest that the stalks of the potato plants are damaged by *D. dipsaci* and that this may have increased susceptibility of the plants or caused entry-ports for the fungus. The attack has evidently caused early die-back of the plants and deficient tuber formation.

Other (crop rotation) effects may have been of importance particularly on tuber yield. Nevertheless the correlation coefficients indicate the dominant role of the combined attack of *Ditylenchus dipsaci* and *Phoma solanicola*. The data of fig. 2 show, that a severe attack can cause a yield reduction of more than 50%.

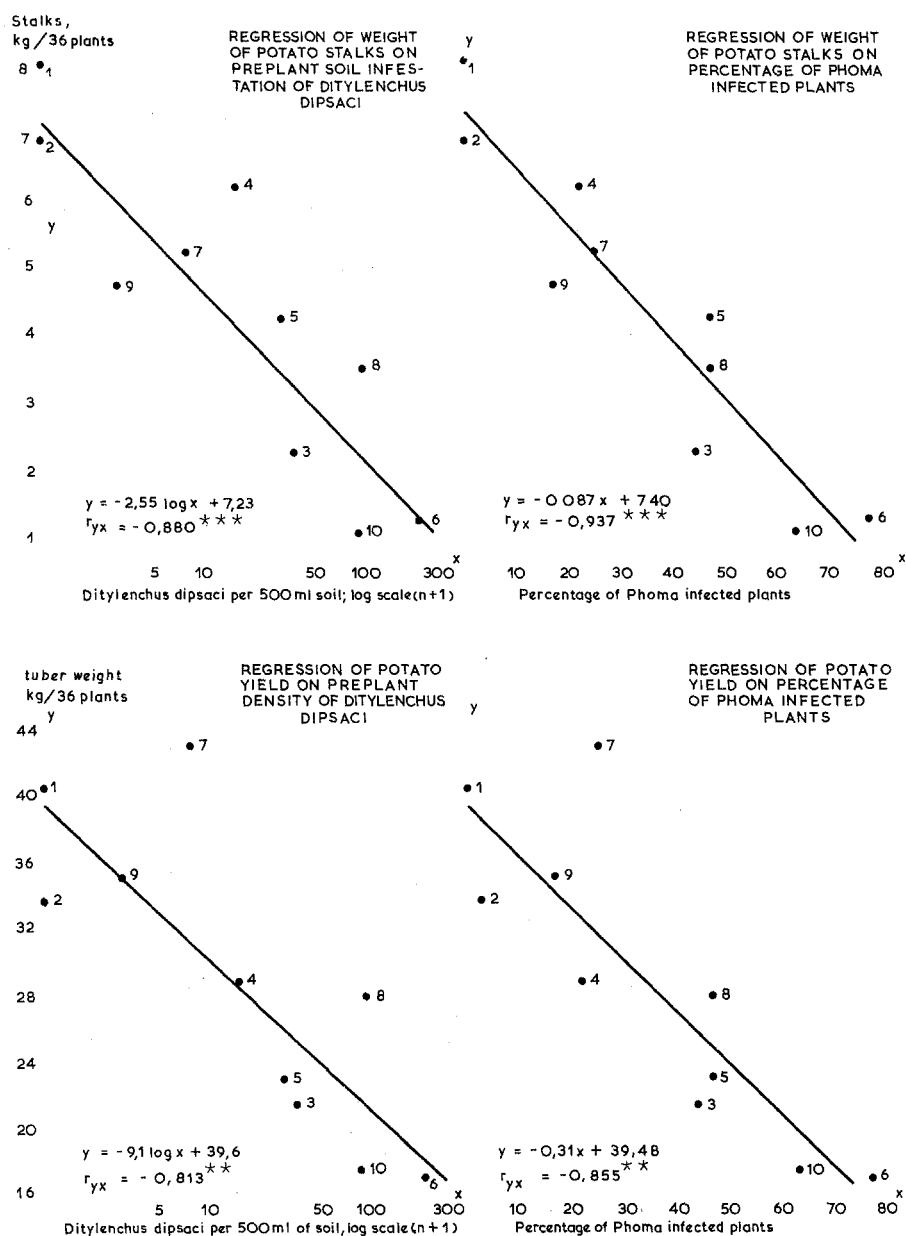


FIG. 2. Weights of potato stalks and tuber yield 1962 plotted against preplant population of *Ditylenchus dipsaci* and percentage of *Phoma* infected potato plants. In explanation of numbers see fig. 1. Statistical data: *** and ** = probabilities more than 99,9 and 99% respectively.

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SAMENVATTING

Stengelaantasting door *Phoma solanicola* Prill. et Delacr. werd waargenomen in aardappelveldjes van een vruchtwisselingsproefveld te Hagestein. De mate van aantasting varieerde met de voorvrucht en werd vastgelegd door het percentage aangetaste planten te bepalen. In het voorjaar waren reeds tellingen verricht van wortel- en stengelaaltjes in de grond. Er bleek een duidelijk verband te bestaan tussen het aantal stengelaaltjes in de grond in het voorjaar en het percentage door *Phoma* aangetaste planten in de zomer. Het is waarschijnlijk, dat de aaltjes de planten hebben verzwakt of ingangspoorten hebben gemaakt voor de schimmel.

Er werden eveneens regressies gevonden van loof- en knolopbrengst op het aantal stengelaaltjes in het voorjaar in de grond en op het percentage door *Phoma* aangetaste planten. Deze aantasting door *Ditylenchus dipsaci* en *Phoma solanicola* kan ernstige schade veroorzaken; bij zware aantasting was de opbrengstreductie meer dan 50%.

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