

SHORT COMMUNICATIONS

INFLUENCE OF COPPER AND ZINC ON THE INCIDENCE OF POTATO SCAB¹

De invloed van koper en zink op het optreden van aardappelschurft

K. C. BASU CHAUDHARY

Institute of Phytopathological Research (IPO), Wageningen²

Common scab of potato caused by *Streptomyces scabies* has long been recognised as a widespread disease of the tubers of great economic importance. Copper and zinc compounds have been used to control the disease by HOOKER & KENT (1950), MADER & BLODGETT (1935), MORTVEDT *et al.* (1964), TURNER (1957), etc. The present investigation was carried out to study how these inorganic elements affected the incidence of the disease.

In a greenhouse experiment potato plants of the variety 'Bintje' were grown in pots in a mixture of fine silver sand and perlite supplied with Hoagland solution without either copper or zinc. These two elements were given separately in two doses of 100 and 1000 ppm in the nutrient solution once a week.

The sand and perlite were chemically analysed and it was found that there was no trace of zinc either in sand or in perlite but that copper was present in perlite at the rate of 1 mg per kg.

Isolate No. 80 of *Streptomyces scabies* from the culture collection of the Mycology Department of the I.P.O. was cultured in potato-peptone broth for two weeks, then harvested and thoroughly mixed with the sand-perlite mixture at the rate of 4 g per kg of the mixture, after which the tubers were planted. For each treatment there were five pots. At the end of the experiment, scab percentage was calculated according to the method of VAN EMDEN & LABRUYÈRE (1958) and "population" density of *S. scabies* in the substrate was determined for each treatment by the dilution method. The results of the greenhouse experiments are summarized in Table 1.

The effect of zinc was negligible but with copper a worthwhile reduction in scabbiness was obtained.

Another observation made in the case of the copper treatment was that root development was poor in comparison with that of the control, especially when 1000 ppm were applied.

Copper and zinc compounds constitute important ingredients of several fungicides. Spraying with Bordeaux mixture gave a partial control of scab (MADER & BLODGETT, 1935). MORTVEDT *et al.* (1964) attributed the decrease in the scab index when copper sulphate was supplied in nutrient solution, to its effect on the physiology of the host and not to any direct effect on the parasite. However, in the present investigation this view could not be fully confirmed. No doubt the element affected the physiology of the plant, but the decrease in the

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² Present address: Botany Department, Agra College, Agra, India.

TABLE 1. Influence of copper and zinc on the incidence of potato scab and the "population" density of *Streptomyces scabies*.
De invloed van koper en zink op het optreden van aardappelschurft en de „populatie-dichtheid” van Streptomyces scabies.

Treatment	Mean scab percentage	"Population" density of <i>S. scabies</i> in the substrate (× thousand per g of soil)
Control	30.84	710
Zinc 100 ppm	29.04	656
Zinc 1000 ppm	26.06	586
Copper 100 ppm	18.23	315
Copper 1000 ppm	12.78	225

<i>Behandeling</i>	<i>Gemiddelde percentage schurft</i>	<i>„Populatie”-dichtheid van S. scabies in het substraat (× 1000 per g grond)</i>
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scab percentage was not entirely due to poor root development. It would seem that the reduction in scabbiness was at least partly due to the direct effect of the element on the "population" density of *S. scabies*, as is clear from Table 1. Of the two mineral elements used in this experiment copper gave better results than zinc and can be recommended for further trial on a larger scale.

The phytotoxic effect of copper on potato plants could possibly be overcome by applying the element some time well before planting the tubers and a trial in this direction would be worthwhile.

SAMENVATTING

Naar aanleiding van literatuurgegevens werd de invloed van koper en zink op het optreden van aardappelschurft nagegaan. Daarbij werd gebruik gemaakt van een mengsel van zilverzand en perlite, beide zinkvrije materialen, terwijl koper alleen in perlite aangetoond kon worden in een hoeveelheid van 1 ppm. Een schurftisolatie van het IPO werd door deze kunstmatige grond gemengd. Een bepaalde hoeveelheid van beide metalen werd al of niet eens per week met de voedingsvloei-stof gegeven.

Aan het einde van de potproef werden door middel van de verdunningsmethode de aantallen *S. scabies* in de potten bepaald. De resultaten van de proef zijn in tabel 1 weergegeven.

De invloed van zink was niet belangrijk; koper gaf daarentegen een duidelijke reductie van de schurftaantasting, maar tevens bij hoge concentratie een slechte wortelontwikkeling. Gezien de dichtheid van het organisme in het substraat is er sprake van een directe invloed van het koper op het pathogeen.

Het resultaat van deze proef maakt het waard om koper op grotere schaal als schurftbestrijdingsmiddel te beproeven. Het fytotoxisch effect kan daarbij misschien vermeden worden door het enige tijd vóór het planten toe te passen.

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