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Original Scientific papers

RESULTS OF INVESTIGATION INTO FUNGICIDE EFFECT ON THE GERMINATION OF THE REPRODUCTIVE ORGANS AND THE GROWTH OF *SPHAEROPSIS SAPINEAE* (Fr.) Dyko a Sutton MYCELIUM

by

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Summary

The paper presents the results of investigation of inhibitory and toxical effects of some fungicides on the germination of conidia and the growth of *S. sapinea* mycelium. The effects of Orthocid S—50, Copper protectant —25 (copper oxychloride), Cineb S—65, the combination of Copper protectant —25 and Cineb S—65 in the relation 2:1 and Benlate.

The results of the investigation showed as follows: The greatest inhibitory effect on the germination of conidia was obtained with Orthocid and the presence of this fungicide in the concentration of 0,01%, 100% prevented the germination of conidia (Pycnospores). All the fungicides applied in concentrations higher than 0,3% 100% prevented the germination of pycnospores. A very slight inhibitory effect at 0,01% concentration was obtained with Cineb, Copper protectant, and the combination of the above two fungicides. The greatest inhibitory effect on the growth of *S. Sapinea* mycelia was shown by Benlate, and the minimal amounts of this fungicide in the medium (0,048 mg) prevented the formation of the fungal colony. All the applied fungicides had an inhibitory effect on the growth of the colony, but Cineb and Orthocid had a somewhat weaker effect. Benlate in very small concentrations (0,01%) had a toxic effect on *S. sapinea* mycelium already after 1 minute of exposure. There was no marked difference between Cineb and Copper oxychloride and they had a toxic effect at 1% concentrations and the exposure period od 10 minutes. Orthocid was ineffective and it did not affect the colony of the fungus at the concentration of 1% and exposure time of 15 minutes.

RESULTS OF INVESTIGATION ON FUNGICIDE EFFICIENCY IN THE CONTROL OF *DOTHISTROMA PINI* HULBARY IN AUSTRALIAN PINE PLANTATIONS

by

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Summary

One of the most serious diseases in Austrian pine plantations is "needle blight of pine" caused by the fungus *Dothristroma pini* Hulbary (the perfect stage *Scirrhia pini* Funk and Parker). The first Yugoslav record was made in 1955 (loc. Troglan Bare), in 1961 it emerged in the Deliblato Sands, and already in 1965 it occurred as epiphytotic. According to the latest field data, almost all regions of Australian pine in Serbia have been more or less infected.

Considering the great losses caused by *Dothistroma pini* in *Australian pine (Pinus nigra* Arn.) plantations, it has been decided to set up experiments with various fungicides. Previous preliminary investigations showed that the greatest percentage of infection occurred during May and June, so in order to be economical, we conducted two treatments (beginning of May and beginning of June). The first treatment was aimed at protection of pine needles of the previous vegetation (the most susceptible needles), and the second one was to protect newly-grown needles of the current vegetation. The experiments were set up at two localities in Austrian pine plantations of the Deliblato Sands. The experiments at the locality "Baraka" lasted through the period 1976—1980, and those at the locality "Dragićev Hat" 1977—1983.

The protection was carried out by means of the following fungicides: Orthocid S-50, Copper protectant-25 (copper oxychloride), Cineb S-65, the combination of copper oxychloride and Cineb S-65 in the relation 2:1 and Benlate.

The control efficiency was estimated in three ways: by measuring the diameter at breast height of the treated and the control trees, exactness being 0.1 mm; by measuring the height increment, exactness being 1 cm; by the evaluation of healthy appearance of the tree, marked by indices 1 — 5.

The results of the investigation showed as follows:

— there are no significant differences between growth and diameter increments between the treated and the control trees;

— there are significant differences between the average height increments of the treated and the control trees. The same difference occurs between trees treated with copper protectant-25 and Cineb when compared to the control trees, whereas there is no appreciable difference between the trees treated by Orthocid and the control ones;

— there are significant differences in the evaluation and the healthy appearance of the trees treated with fungicides and the control trees. There are considerable differences between the trees treated with copper protectant-25 and Benlate, as compared to the control trees, whereas these differences are not expressed in case of trees treated with Cineb and Orthocid when compared to the control trees;

— in all the experiments Copper protectant-25 rendered the best results and protection. The protection is satisfactory if the treatment is carried out twice a year, during the critical period of infection.

Laboratory investigations showed that all tested fungicides had a strong inhibitory effect to the germination of *D. pini* conidia.

The strongest inhibitory effect to the growth of *D. pini* mycelia was shown by Benlate, and the effect was rather expressed in case of Copper protectant, Cineb, and Tiozin. The slightest inhibitory effect was shown by Orthocid which in small amounts stimulated the growth of conidia.

The greatest toxicity for *D. pini* mycelium was effected by Benlate which had the lethal effect to the colony of the fungus in the concentration of 0,01% and the exposure period of 1 minute. Out of the remaining fungicides, the good results were obtained with Copper oxychloride which is toxic in the concentration of 0,5% and the exposure of 5 minutes. Slight fungicidal effect was obtained with Orthocid S-50 and Cineb.

EFFICIENCY OF SOME FUNGICIDES IN SUPERVISED CONTROL AGAINST APPLE SCAB

by

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Summary

In the course of the period 1981 — 1985 there was investigated the efficiency of some recent fungicides applied in the »supervised control« in the control on the apple scab in comparison with the standard preventive program.

Under the notion of »supervised control« is understood the curative control of primary infections of Venturia inaequalis with fungicides having a curative and eradicative effect and preventive treatment of secondary infections with protective fungicides.

The curative control is carried out on the basis of the the Mills's table within 24—72 hours after the infection of medium or strong intensity had begun. Since the curative treatment secured also the preventive protection up to 6 days, all the infections achieved within this period were neglected and had not been taken into consideration for treatment.

On the basis of th results obtained one can conclude that the program of »supervised control«, compared with the standard preventive program, has given the same or better results than the standard program of prevention which was based on the phenological method of pest control. In addition, it ought to be emphasized that the »supervised program« of control against the apple scab had each year 2 to 3 sprayings less than the standard preventive program of prevention.

The »supervised control« gave the best results where for the curative control had been used systemic fungicides on the basis of triazole and sterol inhibitors fenarimol, bitertanol, etaconazol, penconazol and miclobutanile.

PELARGONIUM (*PELARGONIUM ZONALE* /L./ AIT.) AS A TEST OF THE PATHOGENICITY OF PHYTOPATHOGENIC *PSEUDOMONADS*

by

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Summary

The infiltration of the suspension of bacteria belonging to the genus *Pseudomonas* in the concentration of 10^7 cells/ml causes necrotic changes on the leaves of pelargonium, inoculated by means of medical syringe. The initial changes take rapidly place, some eight hours after the inoculation, analogously to the tobacco and solanum plants (Fig. 1). On account of this we consider them to belong to the category of hypersensitive reaction which occur in the incompatible relation parasite-host.

There were used different bacteria of the genus *Pseudomonas*, to wit: *Ps. syringae pv. syringae, Ps. s. pv. phaseolicola, Ps. s. pv. glycinea, Ps. s. pv. lachrymans, Ps. s. pv. phaseolicola, Ps. s. pv. pisi, Ps. s. pv. tomato, Ps. gladioli pv. alliicola, Ps. viriflava* and other bacteria, as well as saprophytic isolats of the bacterium *Ps. fluorescens* (Tab. 1).

There can be used younger or older pelargonium plants, prepared at different seasons in the course of the year or their twigs (grafts — scions) and even individual leaves which, separated from the plants like the twigs, are put into smaller or greater Erlenmeyers bowls filled with water.

It follows from the obtained results that the pelargonium, too, in absence of the tobacco plants and solanum plants, can be used as test plants for a rapid test of pathogenicity of phytopathogenic bacteria of the genus *Pseudomonas*.

OCCURRENCE AND DISTRIBUTION OF PHYTOPARASITIC NEMATODES ON ORNAMENTAL PLANTS IN SR OF SERBIA

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On the territory of the SR of Serbia in the course of past years there were observed several species resp. groups of phytoparasitic nematodes on different ornamental plants both in glasshouses and in the field.

Aphelenchoides ritzemabosi (chrysanthemum foliar nematode) was observed on chrysanthemum, zinnia, saintpaulia, primula, cineraria, gloxinia, gerber, hydrangea and carnation.

Ditylenchus dipsaci (stem nematode) on carnation, narcissus, hyacinth, tulip, gladiolus and hydrangea.

Pratylenchus spp. (root-lesion nematode) on carnation and roses.

Meloidogyne spp. (root-knot nematodes) on cyclamen, primula, saintpaulia and carnation.

Heterodera fici (fig cyst nematode) on the rubber-plant.

ECONOMICALLY IMPORTANT NEMATODE SPECIES OF THE GENUS *HETERODERA* IN THE S. R. OF SERBIA

by

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Summary

In the paper are presented the results of four years' investigations of phytoparasitic nematodes, belonging to the genus *Heterodera* in the S. R. of Serbia. By the analysis of the samples, collected in 65 localities have been established the following economically important species: *Heterodera schachtii, H. trifolii, H. avenae, H. cruciferae, H. carotae, H. humuli, H. fici* and *H. götingiana.* It was calculated also the average number of cysts per sample, which can be seen from the tables. Of all the species stands out by its presence and its numbers the beet eelworn *(H. schachtii)* which has been recorded in 23 localities. The highest number of this nematod's cysts (44.8) per sample has been established in 1983 at Ćuprija and great damages on the sugar beet may be expected from this species.

CONTROL OF THE APPLE CLEARWING MOTH (*SYNANTHEDON MYOPIFORMIS* Berkhausen) ON DWARFING ROOTSTOCKS OF THE APPLE TREE

by

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Summary

The following of the biology of the small apple clearwing moth (*S. myopiformis*) and the experiment of controlling have been carried out in the apple orchard "Vorbis", size 120 ha. The apple trees are 12 years old with the bases M 9 and grafted low, near the soil and at the height of 40 cm. The trees are formed in the two-row Pilar system. The apple orchard is situated in the plain along the river Sava, at a distance of 60 km from Belgrade.

The small apple clearwing moth occured in greater numbers in the orchard, particulary on the high grafted rootstocks. In this locality are frequent freezings of the bark and the damages caused by the frost and the small apple clearwing moth leads to a yield reduction and age of exploitation and partly to the thinning. The aim of the work was to investigate the possibilities of controling *S. myopiformis* on the higher grafted rootstocks.

The caterpillars of *S. myopiformis* are activated with the circulation of the apple saps or, most frequently between March 10 and March 20. The swarming of moths occurs between the first half of May and the end of August (Graph 1). After the emergence the moths feed additionally on the flowers and most frequently on the sambucus (*Sambucus nigra, far. Sambucaceae).* At the top of the swarming we found 10 and more moths per flower.

The females lay eggs (Fig. 1) on the burk surface, on the callus of re-grafting and of adventitious roots, on the damages of various origin. With the high rootstocks most frequently are attacked the calluses of the adventitious roots. After the hatching the caterpillars move freely and look for the place where they could pierce into the tree. At younger stages they make shallower galleries in the bark, and later, particularly shortly before winter, they penetrate deeper up to the wooden part of the trunk (Fig. 2). When the trees are re-grafted the caterpillars can enter also into the wooden part of the graft twigs (Fig. 3). The apple clearwing moth has a one-year generation, but its development is extended over two calendar years. It hibernates as catepillar at different stages (Fig. 3).

In the experiment of controlling the trees were sprinkled twice: on June 19 and on July 18. The insecticides (Tab. 1) were used in somewhat larger doses with the addition of 2 l of Mapin oil on 100 l water.

The experiment was set on Idared — grafted at the height of 40 cm. There were sprinkled 100 trees according to the treatment at a height up to the first branches (80—100 cm) and the efficacy of insecticides was determined by counting the exuviae from the soil up to 80—100 cm in autumn 1984, 1985 and 1986.

In autumn 1985 there were found in the check 163 exuviae of *S. myopiformis* at a height up to 1 m. In relation to the check, Lebaycide 50 has shown a rather important penetrating effect on the catepillars in the shallower part of the bark.

In autumn 1985 we found 265 exuviae on the same trees, Mapin oil and Vydate L (used on June 19 only) did not show any insecticide effect. The least number of exuviae, 9 only were found on the trunks which had been sprinkled with Lebaycide 50, which represents an efficiency of 96,61 p.c. (Tab. 1). Actelic 50 and Oleoecalux have shown an efficiency above 80 p.c.

Considering that the development cycle of *S. myopiformis* lasts two calenadr years and the popylation is slowly renovated, the control can be effected up to the height of 1—1,5 m every 4—5 years.

ACTIVITY OF HEXYTHIAZOX AND CLOFENTEZINE AGAINST *TETRANYCHIDAE* AND PREDATORS IN APPLE ORCHARDS

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Summary

Activity of acaricides hexythiazox and clofentezine against *Tetranychidae* was investigated in:

a) micro-trials with application of fungicides in apple protection. Treatments had 4 replications, with 5 trees per treatment. Dates of acaricide application and dozes of active substance are illustrated in Tab. 1 and 2, respectively;

b) a macro-trial with application of fungicides in apple protection. The trial was set up with a total number of 1000 trees, i.e. 250 trees in each treatment. Since this trial represented a certain ecological entity, in addition to *Tetranychidae*, the incidence of predators was also observed. Acaricides were used at the onset of hatching of *P. ulmi* larvae (Tab 3);

c) a macro-trial where apple was treated with both fungicides and insecticides (Tab. 4).

Development of phytophagous mites and predators, and efficiency of acaricides were estimated by examining 100 randomly chosen leaves of Red Delicious under biocular and with the beating method employed. Sampling was carried out once in 1—20 days during the season, whilst in Obrenovac it lasted from the beginning of hatching of *P. ulmi* larvae till the end of growing period when winter eggs were laid. In order to determine the second and third application, the tolerance levels were used as follows: April and May 60% of infected leaves, June and July 50%, and August 60% of infected leaves.

Results of the experiment conducted in the region of Maribor (Tab. 1) reveal that hexythiazox maintained the population of *P. ulmi* below the tolerance levels until July, whereas other acaricides did so till June.

In the presence of both *P. ulmi* and *T. urticae* (Tab. 2), once hexythiazox and clofentezine had been applied, the overwintering females of *T. urticae* restored feeding and egg laying, however, hatching of larvae from such eggs did not occur.

In the macro-trial performed in Obrenovac with the trees treated with tetrasul, the population of *P. ulmi* was quickly replenished, so that already in June apple leaves were subject to bronzing (Tab. 3). Further

check-ups showed that the population level of *P. ulmi* abruptly decreased; before the vegetation was over it increased again, so that 2339 winter eggs were laid. *T. urticae* and *A. schlechtendalli* were also present, however, their population was soon diminished. In June and particularly in July, a higher population of predators *S. punctillum* (Fig. 1) and Orius bugs (Fig. 2), and individual specimens of *A. andersoni* (Fig. 3) were found. The decrease in population density of phytophagous mites gave rise to migrations of *S. punctillum* and Orius bugs, polyphagous predators, as well as to increasing population of *A. andersoni*. Therefore, relations between phytophagous mites and predators were established, but also interrelationship among predators existed.

On the apple trees which had been treated with hexythiazox and clofentezine, the population of *P. ulmi* slowly renewed, and with the occurrence of predators in June and July its population density remained lower than tolerance levels throughout the growing period. Due to migration of Orius bugs from the orchard, the population density increased so that a larger number of winter eggs were laid. On these plots, *T. urticae* was discovered in a somewhat higher population, however, *A. schlechtendalli* was not identified at all. The number of predators correlates well with the presence of phytophagous mites.

In the experiment where apple crop was protected by means of both fungicides and insecticides (Tab. 4), after hexythiazox had been applied, overwintering females of *T. urticae* were densely populated and caused bronzing of the first two apple leaves. Renewal of *P. ulmi* and *T. urticae* populations was observed in July, whereas tolerance levels were exceeded in August. When hexythiazox is applied in summer, the population density of *T. urticae* decreases only slowly, for which reason this acaricide is not to be recommended for spraying alone over summer months.