

## The effect of derivatives of 1,4-oxathiin on *Puccinia horiana* in *Chrysanthemum morifolium*

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### Abstract

Two oxathiin derivatives with the trade names Plantvax and Vitavax were tested against *Puccinia horiana* on *Chrysanthemum morifolium*. Plantvax was more effective in soil than in foliar treatments. There was little difference between preventive and eradivative soil treatment but the chemical was rather phytotoxic. Vitavax in foliar treatment showed a good eradivative effect without phytotoxicity but repeated sprays were necessary because of low solubility. Vitavax in soil treatment was ineffective.

Derivatives of 1,4-oxathiin have been extensively tested against rust (Hardison, 1966; Powelson and Shaner, 1966; von Schmeling and Kulka, 1966). Therefore, two of the readily available compounds were used in an experiment to control *Puccinia horiana* P. Henn. on *Chrysanthemum morifolium*. The compounds 2,3-dihydro-5-carboxanilido-6-methyl-1,4-oxathiin-4,4-dioxyde (Plantvax, F461-75W) and 2,3-dihydro-5-carboxanilido-6-methyl-1,4-oxathiin (Vitavax, D735-75W) were kindly provided by the United States Rubber Co. as 75% wettable powders. Plants of cv. 'Indianapolis White Giant IV' were kindly provided by Messrs. Konijnenburg & Mark. A spore suspension was used to inoculate the plants (Zandvoort et al., 1968a). Plants were grown singly in 9 cm plastic pots filled with ordinary pot soil. Plants were kept in a conditioned greenhouse at temperatures between 16° and 18°C and high relative humidity.

Plants were sprayed until run-off using a De Vilbiss No. 15 sprayer. Solubility of oxathiin derivatives in water is poor. Therefore, real concentrations may deviate somewhat from the concentrations cited. High concentration equivalents have been obtained by repeated application of lower concentrations with intermittent drying of the foliage. For soil application 10 ml solution was pipetted on the pot soil. High concentration equivalents have been obtained by repeated application of lower concentrations.

Preventive treatment took place 2 days before inoculation. Eradicant treatment was applied on the day when the first chlorotic flecks were observed, 10 days after inoculation. Untreated controls and Mancozeb and Sabithane treatments were added (Bohnen and Schloz, 1967; Zandvoort et al., 1968b).

Infection results were studied by examining the six highest leaves longer than 1 cm at the time of inoculation and recording the percentage of the lower leaf surface covered with rust lesions; leaf records were averaged to plant records and the four plant re-

Fig. 1. Effect of the oxathiin derivates Plantvax and Vitavax on *Puccinia horiana* of *Chrysanthemum morifolium* in soil and foliar applications.

Horizontal: observation days counted from the day of inoculation

Vertical: Percentage of leaf area attacked by rust

Drawn lines: preventive treatments

Broken lines: eradicant treatments

Dotted lines: M: Mancozeb 0.3%

S: Sabithane 0.2%

C: untreated controls

Figures represent concentration equivalents of the active ingredient in ppm.

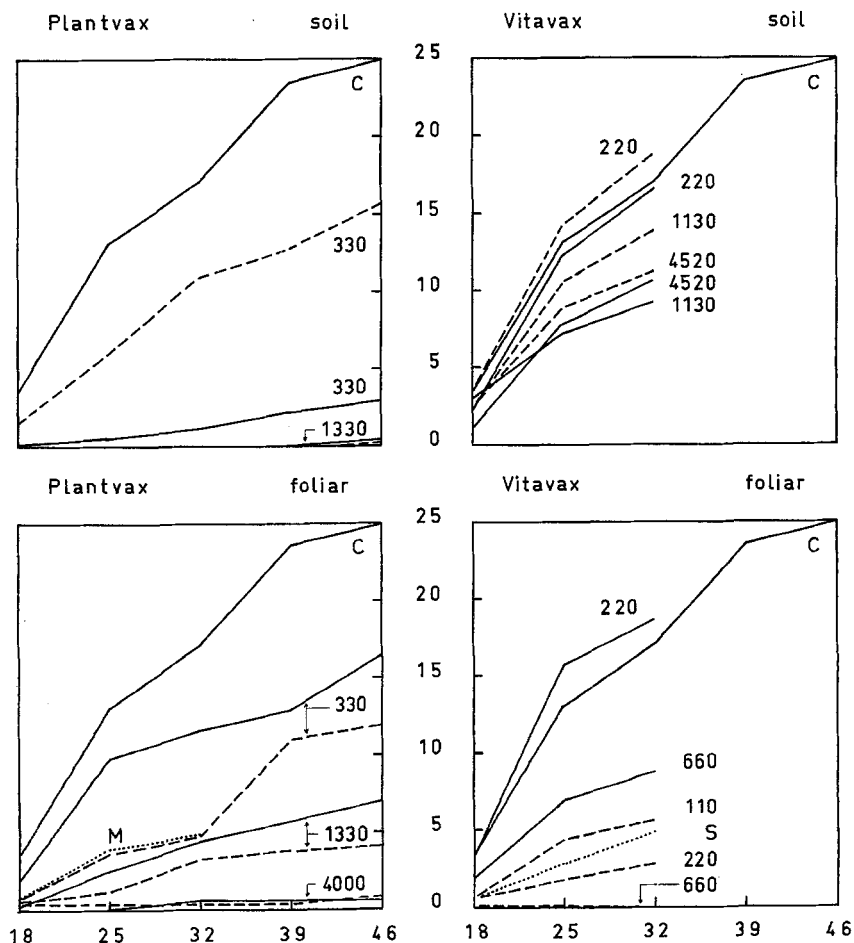


Fig. 1. Effect van de oxathiïne derivaten Plantvax en Vitavax op *Puccinia horiana* van *Chrysanthemum morifolium* bij bodem- en bladbehandeling.

Horizontaal: waarnemingsdagen gerekend vanaf de dag van inoculatie

Vertikaal: percentage van het bladoppervlak aangetast door roest

Getrokken lijnen: preventieve behandelingen

Gebroken lijnen: curatieve behandelingen

Gestippelde lijnen: M: Mancozeb

S: Sabithane

C: onbehandelde controles.

De cijfers geven de concentratie-equivalenten van de actieve stof in dpm.

cords per treatment were averaged to obtain the treatment record. Observations were made 18, 25, 32 and 39 days after inoculation.

Some results are shown in Fig. 1. Preventive soil treatment with Plantvax produced a significant improvement in comparison with other Plantvax treatments. Preventive soil treatment with 1330 ppm (saturated solution) resulted in a few pustules after 46 days; with concentration equivalents over 1330 ppm there were no symptoms after 46 days. At concentration equivalents over 1000 ppm there is little difference between preventive and eradicant soil treatment with Plantvax, both giving nearly complete control. Plantvax as a foliar spray shows only a small difference between preventive and eradicant action. For good control high concentration equivalents (4000 ppm) are needed. Vitavax in soil treatment is ineffective. In preventive foliar treatment Vitavax has little effect. Surprisingly, Vitavax shows a fair to good control of the white rust when used in an eradicant foliar treatment at concentrations much lower than Plantvax. The eradicant effect of Vitavax in foliar application against a rust fungus seems to be hitherto unrecorded.

Plantvax had severe phytotoxic effects, tip-burning and interveinal chlorosis being frequent. Phytotoxic symptoms appeared in all treatments with concentration equivalents over 1000 ppm; they were more severe with soil than with foliar applications; in preventive treatment they appeared 20 days and in eradicant treatment 8 days after application of the chemical. Vitavax being used at low concentrations because of its poor solubility in water shows few phytotoxic symptoms.

Both Plantvax and Vitavax are reported to be systemic fungicides. Curiously, Vitavax penetrates into leaves but it is hardly, if at all, absorbed by roots and/or transported from roots to leaves.

Neither Plantvax nor Vitavax can be used commercially against *P. horiana* because of phytotoxicity and poor solubility. Maybe better formulations can be developed (Dalchow, 1968). Soil treatment with Plantvax could be useful in keeping mother plants free from infection. Foliar application of Vitavax cannot be advised because effective treatment (concentration equivalent to 660 ppm) can be obtained only after three applications of a near-saturated solution with intermittent drying of the foliage.

## Samenvatting

### *Het effect van derivaten van 1,4-oxathiïne op Puccinia horiana bij Chrysanthemum morifolium*

Twee oxathiïnderivaten met de merknamen Plantvax en Vitavax werden op hun preventieve en curatieve werking tegen de witte roest van chrysant getoetst bij bodem- en bladbehandeling. Bij Plantvax was de bodembehandeling het meest effectief, het verschil tussen preventieve en curatieve behandeling was gering, het middel was zeer fytotoxisch. Een herhaalde curatieve bladbehandeling met Vitavax had een goed bestrijdingseffect zonder fytotoxische neveneffecten. Bodembehandeling en preventieve bladbehandeling met Vitavax hadden geen effect. Plantvax noch Vitavax zijn in de gebruikte formulering geschikt voor toepassing tegen de witte roest van chrysant in de praktijk.

## References

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