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# COMPATIBILITY OF INSECTICIDES AND FUNGICIDES ON THE MORTALITY OF *NILAPARVATA LUGENS* (STALL.) AND ON THE INHIBITION OF *RHIZOCTONIA SOLANI* KUHN.

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*Abstract*: The compatibility of insecticides and fungicides commonly used for the control of insect pest and disease of rice was studied in the laboratory using *Nilaparvata lugens* and *Rhizoctonia solani* as lest organisms. By fixing the proportion of constituents in the insecticidal, fungicidal mixture judiciously, it may be possible to reduce the field dose of insecticide as there was synergism in the insecticidal activities of lower dose of quinalphos when combined with different doses of fungicides. The fungicidal effects of the three fungicides were signifcantly altered when combined with insecticides. Combination with fungicides showed an antagonistic effect at higher levels of captofol, ediphenphos and carbendazim, while at lower concentrations there was enhancement of fungicidal effect.

## INTRODUCTION

Situations arise in fields frequently necessitating the application of insecticide and fungicide at close intervals for the control of pests and diseases. In such situations, use of insecticides and fungicides in combination will reduce the cost and time required for pest control operations. But pesticides thus mixed may show physical, chemical or phytotoxic incompatibility (Sharvelle, 1979). Hence, information on the compatibility of different insecticides and fungicides is essential for adopting the technology in field. Laboratory studies were carried out to assess the compatibility of three insecticides, monocrotophos (Nuvacron 36 EC), quinalphos (Ekalux 25 EC), HCH (BHC 50 WP) and three fungicides, captofol (Foltaf 80 W), ediphenphos (Hinosan 50 EC) and carbendazim (Bavistin 50 WP) using *Nilaparvata lugens* (Stal.) as test insect and *Rhizoctonia solani* Kuhn. as test fungus. The above pesticides are widely used on rice particularly at booting and subsequent stages of the crop.

## MATERIALS AND METHODS

The test insect was reared on paddy (variety TN1) in the laboratory from the initial population collected from the field adopting the rearing technique recommended by Heinrichs *et al.* (1981). One to two day old adult females collected from the stock culture were used for bioassay studies.

Rice plants affected by sheath blight were collected from field and *R. solani* isolated from plants, purified and maintained in the laboratory using hyphal tip transplanting method.

## RESULTS AND DISCUSSION

The fungicides showed some insecticidal effect in the laboratory. The mortalities of *N.lugens* in different doses of captofol, ediphenphos and carbedazim were in the ranges of 13 to 16, 20 to 33 and 8 to 12 per cent respectively. The insecticides showed significant fungicidal effect in the laboratory. The ranges in the per cent inhibition of *R. solani* caused by different doses of monocrotophos, quinalphos and HCH were 42 to 54, 73 to 93 and 80 to 100 respectively (Tables 1 and 2). The insecticidal effect of monocrotophos on *N. lugens* was not altered when used in combination with captofol, ediphenphos or carbendazim in widely

varying proportions. But the results reported earlier from the studies indicated that spraying of monocrotophos in combination with fungicides was more effective than application of insecticide alone in controlling *Aphis craccivora* Koch., *Spodoptera litura* (Fb.), *Aproaeremia* and *Lamprosema* in peanuts (Schiller *el al.*, 1982). The lack of enhancement in the insecticidal effect of monocrotophos when used in combination with fungicides on *N. lugens* observed in the present investigations may be due to the varying response of test organisms to the toxicants.

Quinalphos when used in combination with captofol caused a higher kill of N. *lugens* than when the insecticide was used alone. The variations in the dosage of fungicides used in combinations were significantly altering the enhancement in insecticidal activity significantly. In the case of combinations with ediphenphos also, a synergistic effect was observed. The enhancement was in general positively correlated with dosage of fungicide used in combinations. The insecticidal activity of quinalphos 0.05% and 0.02% was not altered significantly when combined with carbendazim at all the three doses. But the combinations of insecticide at 0.005% and three doses of fungicide showed synergistic effect, but the mortality levels reached around 50 per cent only.

The insecticidal effect of HCH 02% was significantly reduced when combined with captofol while at 0.026% concentration of HCH the mortality of the insect was enhanced when used in combination with the fungicide. HCH 0.2% used alone was found on par with combinations with three doses of ediphenphos while combinations of lower doses of the insecticide with fungicides were significantly superior to the treatments with insecticide alone. There was significant reduction in insecticidal activity of higher dose of HCH. But in combinations with lower dose of HCH synergism was observed. The combinations of HCH and fungicides were found more effective in controlling the insect pest and disease incidence (Chatrath *et al*, 1977 and Olunloyo, 1983). The indications in the laboratory have got to be tested under field conditions.

The results showed that the fungicidal effect of the three fungicides were significantly altered when combined with insecticides. Combination of fungicides showed an antagonistic effect at higher levels of captofol, ediphenphos and carbendazim, while at lower concentrations there was an enhancement of fungicidal effect. Quinalphos in combination with captofol 750 and 250 ppm showed significantly higher fungicidal effect than the treatments with corresponding doses of fungicide alone. In the case of ediphenphos and carbendazim also the insecticides when combined with lower doses of fungicides showed synergistic effect while with higher doses there was either lack of synergism or antagonistic effect.

The fungicidal effect of HCH was very high, inhibition of *R. solani* caused by three doses used in the experiment being 100, 100 and 80% respectively. Though the three doses of three fungicides showed a range in the percentage inhibition of *R. solani* in the laboratory, their combination with varying doses of HCH used in the experiment gave 100% inhibition of the fungus. The insecticide is known to have fumigant effect and hence the fungicidal property observed in the laboratory may

Table 1. Effect of combining insecticides and fungicides on the mortality of *N. lugens* as observed in the laboratory

| Treatments | | Sophos | | | Quinalphos | | | HCH | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.03% | 0.007% | 0.002% | 0.05% | 0.02% | 0.005% | 0.2% | 0.051% | 0.026% |
| Mixtures of insecticides and fungicides | | 60 | 57 | 28 | 77 | 47 | 26 | 71 | 40 | 25 |
| Captafol 2000 ppm | 18 | 68 | 48 | 27 | 85 | 93 | 67 | 55 | 53 | 35 |
| Captofol 750 ppm | 16 | 60 | 48 | 28 | 97 | 87 | 65 | 40 | 40 | 38 |
| Captofol 250 ppm | 13 | 61 | 50 | 25 | 88 | 85 | 63 | 42 | 42 | 37 |
| CD (0.05) | 1 | | | 6.6 | | | 9.9 | | | 6.7 |
| Edifenphos 1000 ppm | 13 | 72 | 57 | 48 | 94 | 92 | 59 | 75 | 75 | 68 |
| Edifenphos 500 ppm | 30 | 73 | 60 | 37 | 85 | 84 | 55 | 82 | 74 | 65 |
| Edifenphos 200 ppm | 30 | 78 | 58 | 42 | 79 | 80 | 55 | 72 | 68 | 60 |
| CD (0.05) | 2 | | | 7.5 | | | 10.5 | | | 6.7 |
| Carbendazir 5 ppm | 21 | 43 | 53 | 35 | 72 | 50 | 45 | 67 | 62 | 40 |
| Carbendazim 2.5 ppm | 13 | 45 | 57 | 37 | 73 | 58 | 52 | 63 | 60 | 33 |
| Carbendazim 1 ppm | 12 | 45 | 62 | 33 | 70 | 55 | 52 | 48 | 62 | 45 |
| CD (0.05) | | | | 6.0 | | | 9.5 | | | 6.5 |

CD given are for comparing mortalities used by different levels of each insecticide/fungicide and their combinations

Table 2. Effect of combining insecticides and fungicides on the Inhibition of *R. solani* as observed in the laboratory (mean %)

| Treatments | | Monocrotophos | | | Quinalphos | | | HCH | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.03% | 0.007% | 0.002% | 0.05% | 0.02% | 0.005% | 0.2% | 0.071% | 0.026% |
| Mixtures of insecticides and fungicides | | 54 | 42 | 45 | 93 | 84 | 73 | 100 | 100 | 80 |
| Captafol 2000 ppm | 100 | 89 | 86 | 86 | 100 | 100 | 100 | 100 | 100 | 100 |
| Captafol 750 ppm | 76 | 77 | 59 | 59 | 99 | 100 | 100 | 100 | 100 | 100 |
| Captofol 250 ppm | 49 | 76 | 54 | 62 | 96 | 100 | 88 | 100 | 100 | 100 |
| CD (0.05) | | | | 5.4 | | | 6.3 | | | 2.5 |
| Ediphenphos 100 ppm | 100 | 100 | 88 | 69 | 88 | 84 | 85 | 100 | 100 | 100 |
| Edipenphos 50 ppm | 77 | 100 | 84 | 50 | 84 | 76 | 71 | 100 | 100 | 100 |
| Ediphenphos 20 ppm | 47 | •93 | 85 | 56 | 100 | 70 | 66 | 100 | 100 | 100 |
| CD (0.05) | | | | 5.9 | | | 5ll | | | 5.0 |
| Carbendazim 5 ppm | 100 | 59 | 48 | 39 | 100 | 100 | 100 | 100 | 100 | 100 |
| Carbendazim 2.5 ppm | 75 | 100 | 66 | 39 | 100 | 100 | 90 | 100 | 100 | 100 |
| Carbendazim 1 ppm | 49 | 100 | 71 | 48 | 100 | 100 | 85 | 100 | 100 | 100 |
| CD (0.05) | | | | 3.8 | | | 1.7 | | | 2.2 |

CD given in the table are for comparing inhibition caused by different doses of each insecticides/fungicides and their mixtures

not be equally high under field conditions. Since the insecticide at the chosen levels gave high inhibition of the fungus the effect of combining the same with fungicides on the fungicidal effect could not be assessed from the data.

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