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Bioefficacy of Insecticides against Rice Leaf Mite, *Oligonychus oryzae* Hirst

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The bioefficacy of insecticides against the rice leaf mite,*Oligonychus oryzae*, Hirst (Acarina: Tetranychidae) was studied under laboratory and field conditions at PAJANCOA and RI, Karaikal. The lab study revealed that among the 11 treatments, methyl demeton 25 EC at 0.42 per cent concentration was superior against nymph and adult mites. Novaluron 10 EC and dicofol 18.5 EC were on par with methyl demeton 25 EC. All the three concentrations of profenofos 50 EC, hostothion 40 EC, mit 50 EC, propargite 57 EC and milbemectin 1 EC were on par with each other. The LC_{50} values of profenofos, hostothion were 0.002 and 1.165 respectively. Thus methyl demeton followed by novaluron exhibited more ovicidal, nymphicidal and adulticidal effects. Among the acaricides, methyl demeton 25 EC at 1000 ml/ha and novaluron 10 EC at 1000 ml/ha were the best treatments in reducing the population of mite and were equally effective at 1,3,7 and 14 days after treatment, followed by milbemectin under field condition. Botanicals did not achieve effective control compared to insecticides, but they were less effective against the rice mite.

Keywords: insecticides, rice leaf mite, botanicals, entomopathogens.

Other than insect pests, the rice mite is becoming serious in recent times. Mites being microscopic are least studied and are less understood by researchers as well as by farmers, especially in India. Of the several species of mites reported so far on rice, the rice leaf mite, *Oligonychus oryzae* Hirst (Acarina; Tetranychidae) infests the leaves (Rao and Prakash, 1995). This mite has been reported to cause economic damage to the crop in Raichur district of Karnataka (Anon., 1998) and Kanyakumari and Vellore districts of Tamil Nadu (Anon., 2000). This mite was found to have reported potentiality to become a severe pest of rice (Misra and Israel, 1968).

In Karaikal region, rice leaf mite occurs throughout the year and causes damage in different seasons. Bioefficacy of different acaricides, botanicals and entomopathogens was not studied against the rice leaf mite. Hence the present investigations were taken up to find out a suitable insecticide to manage this pest effectively.

Materials and Methods

Bioassay of insecticides under laboratory condition

Bioassay of different acaricides against rice mite was conducted in the laboratory at different concentrations (Table 1). In each treatment, ten mites were used. Leaf bits of rice were cut in uniform length and dipped in various concentrations of acaricides.

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Table. 1 Laboratory bioassay of insecticides against *Oligonychus oryzae* Hirst on Rice

S.No.	Insecticide	Conc. (%)	Nymph and Adult-Mortality (%)
1	Profenofos 50 EC	0.24	84.67
2	Profenofos 50 EC	0.024	83.33
3	Profenofos 50 EC	0.0024	76.67
4	Hostothion 40 EC	0.3	84.67
5	Hostothion 40 EC	0.03	73.33
6	Hostothion 40 EC	0.003	66.67
7	Methyl demeton 25 EC	0.24	99.30
8	Methyl demeton 25 EC	0.024	93.10
9	Methyl demeton 25 EC	0.0024	83.70
10	Mit 50 EC	0.24	84.67
11	Mit 50 EC	0.024	76.67
12	Mit 50 EC	0.0024	70.00
13	Propargite 57 EC	0.24	83.30
14	Propargite 57 EC	0.024	80.00
15	Propargite 57 EC	0.0024	76.70
16	Milbemectin 1 EC	0.1	83.30
17	Milbemectin 1 EC	0.01	78.30
18	Milbemectin 1 EC	0.001	72.30
19	Novaluran 10 EC	0.24	97.80
20	Novaluran 10 EC	0.024	91.30
21	Novaluran 10 EC	0.0024	80.70
22	Dicofol 18.5 EC	0.65	94.40
23	Dicofol 18.5 EC	0.065	86.70
24	Dicofol 18.5 EC	0.0065	83.70
25	Control	-	-

One set of leaf bits were dipped in sterile water. Leaf bits were air dried in laboratory and in a each leaf bit ten adult mites were released. Leaf bits were kept in petriplates over a bed of moist cotton and closed. Mortality count was taken at different intervals in all concentrations of acaricides. Data obtained were subjected to statistical analysis. This was analyzed using Abbott's formula (Regupathy and Dhamu, 2001).

Evaluation on the bio efficacy of pesticides, botanicals & mycopathogen against rice mite

A field trial was conducted with 13 treatments replicated three times with the ruling rice variety ADT 36 at the wetlands of Eastern farm, PAJANCOA & RI, Karaikal during *Rabi* 2008 to evaluate the bioefficacy of insecticides against rice mite. The size of experimental plot was 20 m^2 and the details of the treatments are given in Table 3.

Table. 2 Relative toxicity of insecticide to nymph and adults of rice mite, *Oligonychus oryzea* Hirst

S.No	Insecticide	Regression equation	LC_{50}	Fiducial Limit	
				Lower limit	Upper limit
1	Profenofos 50 EC	Y=0.146x+5.116	0.000201	$1.967 X10^{-15}$	$3.127 X10^{29}$
2	Hostothion 40 EC	Y=0.295x+4.074	1.165	$7.34 X10^{-06}$	18515.7
3	Methyl demeton 25 EC	Y=0.737x+2.672	1.315	0.0123	140.94
4	Mit 50 EC	Y=0.248x+4.418	0.263	$5.59 X10^{-09}$	12375
5	Propargite 57 EC	Y=0.112x+5.235	$9.48X10^{-06}$	$2.79 X10^{-46}$	$3.22 X10^{35}$
6	Milbemectin 1 EC	Y=0.181x+4.887	0.0056	$1.88 X10^{-17}$	$1.68 X10^{12}$
7	Novaluran 10 EC	Y=0.519x+3.558	0.8276	0.0011	$5.99 X10^{16}$
8	Dicofol 18.5 EC	Y=0.286x+4.552	0.218	$2.42 X10^{-14}$	$1.97 X10^{10}$

Results and Discussion

Bioassay of insecticides against the rice mite, O. oryzae

Amongst the treatments, methyl demeton 25 EC at higher (0.24 %) concentration was found to be superior against nymphs and adults (Table 1). Novaluron 10 EC and dicofol 18.5 EC were on par with the concentration of methyl demeton 25 EC.

Relative toxicity for nymph and adult stages

Relative toxicity for nymph and adult stages showed that the estimated LC_{50} values for profenofos, and milbemectin were 0.002 and 0.0056, respectively (Table 2).

Efficacy of insecticides, botanicals and mycopathogen against rice leaf mite

Among the insecticides, methyl demeton 25 EC @ 1000 ml/ha and novaluron 10 EC @ 1000 ml /ha recorded the minimum mite population of 0.94 and 1.00 per leaf, respectively and were on par with each other at 1, 3, 7 and 14 DAT, followed by milbemectin 1 EC @ 450 ml /ha (Table 3). The standard check, dicofol 18.5 EC @ 2700 ml /ha recorded the mite population of 1.20 per leaf. Milbemectin 1 @ 450 ml /ha, being a new molecule, was found to be superior than dicofol, since it recorded 1.13 mites per leaf, which was lower than dicofol 18.5 EC @ 2700 ml / ha.

Methyl demeton ≥ profenofos ≥ hostothion ≥ mit ≥ propargite ≥ milbemectin ≥ novaluron ≥ dicofol ≥ NSKE ≥ onion extract + neem oil + soap ≥ garlic extract + neem oil + soap ≥ *Hirsutella thopmsonii* ≥ control.

Bioassay of insecticides against rice mite Oligonychus oryzae Hirst under laboratory condition

Methyl demeton, novaluron and dicofol had more acaricidal effect. It was reported by Naik *et al.,* (2005) that dicofol 0.05 % was conducted against *Tetranychus cinnabarinus* using residual leaf-disc dip method. Dicofol showed effective ovicidal, nymphicidal and adulticidal actions.

Effect of treatments on mite population

Among the insecticides methyl demeton 25 EC and novaluron recorded minimum mite population and were equally effective at 1, 3, 7 and 14 days after treatment, followed by mill bemectin. The standard check, dicofol also effectively controlled the mite population. However, hostothion 40 EC was on par with dicofol. It was reported by Dhooria and Butani (1982) that dicofol 18.5 EC was the most effective against *Eutetranyhus orientalis* Klein. In the present investigation a maximum reduction in population was noted up to 14 days after treatment. Milbemectin, a new acaricide, was found to be superior than dicofol. Propargite, mit and profenofos were also equally effective in reducing the rice mite population.

Botanicals and *Hirsutella thompsonii* were moderate in their efficacy as compared to the synthetic acaricides. However, the efficacy of onion extract + neem oil + soap 1 per cent, garlic extract + neem oil + soap 1 per cent, NSKE 5 per cent and *Hirsutella thompsonii* were statistically on par with dicofol 18.5 EC. The result of botanicals was in accordance with the findings of Ramarethinam and Marimuthu (1998), who suggested neem oil spray

Table.3 Efficacy of pesticides in the management rice mite population (Nymph + Adult) after treatment

Pesticide	Dose	Pre treatment count	Number of mites per leaf				Over all mean	% ROC
			1st DAT	3rd DAT	7th DAT	14th DAT		
Profenofos (Carina 50 EC)	1000 ml/ha	4.00 (1.99)	1.90 (1.34)^{c}	1.57 (1.24)^{b}	0.93 (0.94)^{de}	1.00 (0.96)^{bcd}	1.35 (1.15)^{cd}	68.46
Hostthion (Triazophos 40 EC)	1250 ml/ha	4.23 (2.06)	1.73 (1.31)^{c}	1.20 (1.09)^{bc}	0.93 (0.96)^{de}	0.90 (0.95)^{bcd}	1.19 (1.08)^{cde}	72.19
Methyl demeton (Metasystox 25 EC)	1000 ml/ha	4.73 (2.17)	1.20 (1.09)^{d}	1.00 (0.99)^{cd}	0.87 (0.93)^{e}	0.67 (0.81)^{d}	0.94 (0.96)^{f}	78.04
Mit (Novathion 50 EC)	1000 ml/ha	4.10 (2.02)	1.93 (1.39)^{c}	1.00 (1.00)^{cd}	1.20 (1.10)^{bcde}	0.97 (0.98)^{bcd}	1.28 (1.12)^{cde}	70.09
Propargite (Omite 57 EC)	1000 ml/ha	4.17	2.07 (2.04)	1.07 (1.43)^{c}	1.130. (1.02)^{cd}	93 (1.06)^{cde}	1.30 (0.96)^{bcd}	69.63 (1.13)^{cde}
Milbemectin (Milbetnock 1EC)	450 ml/ha	5.00	2.07 (2.23)	0.80 (1.44)^{c}	0.90 (0.89)^{d}	0.73 (0.92)^{e}	1.13 (0.84)^{cd}	73.60 (1.03)^{def}
Novaluron (Omite 57 EC)	1000 ml/ha	4.47 (2.06)	1.17 (1.08)^{d}	0.93 (0.96)^{cd}	0.97 (0.98)^{de}	0.93 (0.96)^{bcd}	1.00 (1.00)^{ef}	76.64
Dicofol (Kelthane 18.5 EC)	2700 ml/ha	4.27	1.63 (2.06)	1.23 (1.28)^{c}	1.07 (1.11)^{bc}	0.87 (1.03)^{cde}	1.20 (0.93)^{bcd}	71.96 (1.09)^{cd}
Onion extract + neem oil + soap	1%	4.63 (2.15)	1.90 (1.37)c	1.17 (1.07)^{bcd}	1.43 (1.19)^{bcd}	1.20 (1.09)^{b}	1.43 (1.19)^{cd}	66.59
Garlic extract + neem oil + soap	1%	3.73 (1.92)	3.00 (1.73)^{b}	1.60 (1.26)^{b}	1.80 (1.34)^{b}	1.03 (1.01)^{bcd}	1.86 (1.34)^{b}	56.54
NSKE	5%	4.47 (2.17)	1.67 (1.29)^{c}	1.17 (1.08)^{bcd}	1.40 (1.15)^{bcde}	1.13 (1.05)^{bc}	1.34 (1.16)^{cd}	68.69
Hirsutella thompsonii	2%	4.47 (2.11)	2.03 (1.43)^{c}	1.20 (1.09)^{bc}	1.67 (1.29)^{bc}	1.07 (1.03)^{bc}	1.49 (1.21)^{bc}	65.19
Control	-	4.70 (2.17)	5.67 (2.30)^{a}	4.60 (2.14)^{a}	3.83 (1.96)^{a}	3.00 (1.73)^{a}	4.28 (2.05)^{a}	-
CD (0.05%)	-	-	NS	0.19**	0.19**	0.26**	0.21**	0.10* -

Figures in the parentheses are √X+0.5 transformed values DAT - Days After Treatment

Mean values followed by same letter in a column are not significantly different * Significant at 5 % level and ** Significant at 1% level; NS – Non Significant

at the rate of 25-30 ml /litre of water to control coconut perianth mite *Aceria guerreronis* Keifer. A mixture of 2 per cent neem oil and garlic was another measure to control *Aceria gurreronis* Keifer as reported by Nair and Koshy (2000) and Fernando *et al.* (2000). Ramarethinam *et al.* (2000) studied the effects of neem oil emulsion in combination with the spores of *Hirsutella thomsonii* Fisher against coconut perianth mite. The extract of neem leaves proved effective on sugarcane web mite *Schizotetranychus andropogoni* Hirst than that of garlic (*Allium sativum* L.) which was reported by Omprakash *et al.* (1986).

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