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Evaluation of chemical insecticides and botanicals against various stages of spiralling whitefly, (*Aleurodicus dispersus* Russell) on mulberry

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Abstract : Synthetic chemicals and plant products were evaluated against spiralling whitefly (SWF) eggs and nymphs. Ovicidal action was higher in dichlorvos (89.38 per cent) followed by malathion (88.06 per cent) and phosalone (82.96 per cent). Plant products *viz.*, Neem oil (NO)B, Neem oil (NO)A, Neem seed kernel extract (NSKE) and Neem oil (NO) + Pungam oil (PO) - C registered the mortality percentage of 59.27, 53.36, 52.08 and 50.99 respectively. Fish oil rosin soap (FORS) and higher in malathion treatment (93.10 per cent) followed by phosalone (90.63 per cent) and dichlorvos (90.42 per cent). *(Key words : Aleurodicus dispersus, Mulberry, Insecticides, Eggs and Nymphs).*

Spiralling whitefly (SWF) is a new exotic pest in India causing damage to mulberry crop. Several aleyrodid workers developed different management practices for the suppression of the pest which include mechanical, physical and chemical methods.

Mulberry is the sole food plant for silkworm and frequent use of pesticides to control the pests is detrimental to silk worm because the synthetic chemicals are highly toxic to silkworm. In the present study, the efficacy of various soft pesticides, botanicals and FORS was evaluated against the eggs and nymphs of the SWF.

Materials and Methods

Ovicidal action

Ovicidal action of insecticides against SWF eggs was studied in a randomized replicated trial (RBD) with three replications laid out in a five years old mulberry garden (Kanva 2) in field No. 69 of Eastern Block (Tamil Nadu Agricultural University Campus). Recommended dosages of various chemicals (Table 1) were sprayed over the leaves with spirals of SWF, using a hand sprayer @ 200 l/ ha. After a week, the sprayed mulberry leaves were excised from the crop and 1cm 2 area was marked. Total leaf area was scanned under 40x magnification for egg mortality. Five samples were observed for each replication and each treatment. Observation on per cent egg mortality/hatching were recorded. Brown or black eggs were considered as dead eggs.

Nymphal mortality

To study the efficacy of various synthetic and botanical insecticides against first and second instar nymphs of SWF, a randomized replicated trial (RBD) was laid out in a five year old mulberry garden (Kanva 2) in field No.69 of Eastern Block (Tamil Nadu Agricultural University Campus). Nine chemicals were sprayed (Table 1) using a high volume sprayer @ 200 Lha^{-1}. Control plot was sprayed with water.

The mortality of first and second instars nymphs was observed on one day, three days and five days after spraying. Five samples were observed @ 100 nymphs per treatment. Brown or black coloured nymphs were recorded as dead individuals. Duncan's Multiple Range Test (DMRT) was applied for comparing treatment means (Heinrichs *et al.*, 1981).

Results and Discussion

Ovicidal action of insecticides against SWF

The data on the ovicidal action of different insecticides on SWF eggs are presented in the Table 1.

The ovicidal action was higher in dichlorvos (89.38 per cent), followed by malathion (88.06 per cent) and phosalone (82.96 per cent). All the three treatments statistically registered uniform level of toxicity. Insecticides *viz.*, Neem oil (NO) B, Neem oil (NO) A, Neem and kernel extract (NSKE) and Neem oil + Pungam oil (NO + PO) C inflicted the per cent mortality of 59.27, 53.56, 52.08 and 50.99 respectively. Higher level of ovicidal action was recorded in synthetic chemicals because of these chemicals having several auxiliary compounds which might have influenced in dissolving the waxy covering over the eggs in spirals. In the absence of above materials in botanicals, they might have exerted little effect over synthetic compounds. Efficacy of organophosphorus insecticides against whitefly immature stages was earlier reported by many workers (Jayaraj *et al.*, 1986; Sellammal, Murugesan and Chelliah, 1981; El-Bashir, 1974).

Fish oil rosin soap and pungam oil recorded

Table 1. Ovicidal action of insecticides against the eggs of *A. dispersus*

Treatment	Concentration dose (%)	Mean per cent mortality*
Dichlorvos	0.08	89.38[a]
Malathion	0.1	88.06[a]
Phosalone	0.07	82.96[a]
Neem oil (NO) A	3	53.56[bc]
Neem oil (NO) B	3	59.27[b]
Neem oil + Pungam oil (C)	3	50.99[bc]
Pungam oil	3	39.78[d]
Neem seed kernel extract (NSKE)	5	52.08[bc]
Fish oil rosin soap (FORS)	4	47.79[cd]
Days mean		62.66

Means followed by a common letter are not significantly by different at 5% level DMRT.
*Corrected mortality (Abbott's)

Table 2. Effect of insecticidal spray on SWF nymphal mortality

Treatment	Dose (%)	Mean per cent mortality*			Treatment Mean
		1 DAS	3 DAS	5 DAS	
Dichlorvos	0.08	89.73[b]	90.47[a]	91.06[a]	90.42[a]
Malathion	0.1	95.49[a]	94.40[a]	89.40[a]	93.10[a]
Phosalone	0.07	88.52[a]	92.95[a]	90.43[a]	90.63[a]
Neem oil (NO) A	3	38.52[c]	38.89[b]	36.37[c]	37.92[b]
Neem oil (NO) B	3	40.57[c]	37.43b[c]	36.59[c]	38.20[b]
Neem oil + Pungam oil (C)	3	40.39[c]	32.71[c]	37.62[c]	36.91[b]
Pungam oil	3	24.19[d]	24.09[d]	25.76[d]	24.66[c]
Neem seed kernel ectract (NSKE)	5	24.38[d]	23.13[d]	24.12[d]	23.88[c]
Fish oil rosin soap (FORS)	4	40.98[c]	40.98[b]	45.33[b]	42.43[b]
Days mean		53.64	52.77	52.96	53.13

In a column, means followed by a common letter are not significantly different at 5% level by DMRT.

Comparison of significant effect	LSD(5%)	LSD(1%)
2-T*D	4.877	6.451

*Corrected mortality (Abbott's)

DAS - Days after spray.

less than 50 per cent mortality with a mean mortality value of 47.79 and 39.78 per cent respectively. Fish oil rosin soap (FORS) mainly acts as a physical barrier and has apshyxiant action against sedentary stages of homopteran species. Low level of ovicidal action in FORS treatment is attributed to the inability of the physical poison to disolve the wazy coating on the eggs and to form thin film of layer around chorion of SWF eggs. Among botanicals, neem oil formulations were found more effective than others. Neem oil acts as a more sensitive compound to homopterous insects (Schmutterer, 1990). Similar effect of neem products was observed by Kavitha Kirubavathy *et al.* (1999).

Nymphal mortality of SWF

The effect of insecticides on SWF nymphal

mortality is set out in Table 2. The mean nymphal mortality was higher in malathion (93.10 per cent) followed by phosalone (90.64 per cent) and dichlorvos (90.42 per cent). All the three treatments were on par in their efficacy. Chemicals like FORS, NO(B), NO(A), NO+PO(C), PO and NSKE recorded uniform toxic level and they recorded 42.43, 38.20, 37.93, 36.91, 24.66 and 23.88 per cent mortality respectively.

Analysis of the interaction effect indicated that mean mortality level in different period did not show much variation. Synthetic chemicals inflicted higher percentage of mortality than plant products and they were uniform in their efficacy from 3 days after spraying. Synthetic chemicals, *viz.*, malathion, dichlorvos and phosalone caused higher nymphal morality of first and second instar nymphs and they were on par in their efficacy.

Fish oil rosin soap was moderate in its efficacy. First two nymphal stages are not clothed with waxy secretion and FORS has the ability to act on these stages in a better way than on egg stage. Palanidurai (1996) documented the efficacy of FORS in suppressing the population of sedentary pests. Even during the rainy days, Singh and Rao (1979) observed higher whitefly nymphal mortality (83.0 per cent) in FORS spray.

An analysis of interaction between botanicals and post treatment mortality indicated low level of mortality in all the botanical formulations, which ranged from 24.12 to 45.33 per cent on 5 days after spraying. This might be attributed to higher photodegradation nature of the plant products and often warrants repeated spraying (Schmutterer, 1990). Persistence of toxicity by botanicals for an ephemeral period of five to seven days in mulberry ecosystem was earlier reported by Dhahira Beevi (1989).

Present study indicated that dichlorvos was effective against egg and nymphal stages of SWF. Botanicals exerted moderate influence in inflicting mortality in the immature stages.

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