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Effect of Certain Insecticides in Controlling *Pesudodendrothrips mori* in Mulberry

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Mulberry plantations are prone to several kinds of insect pests including the thrips, *Pesudodendrothrips mori*. The thrips infestation affects the qualitative and quantitative characters of mulberry leaf, which in turn affects the silkworm cocoon crop. In the present study, four commercial insecticides *viz.*, Rogor, Quinalphos, Confidor and Methyl parathion were tested for their efficacy in the control of *P. mori* thrips. These insecticides were observed to kill 68–80% within 24 hrs *in vivo* and 100% after 12 hrs post-treatment *in vitro*. Confidor (0.05%) and Quinalphos (0.2%) were most effective in controlling the thrips incidence. The insecticide-sprayed mulberry leaves did not show any adverse effect on the rearing of silkworms.

Key words: Insecticides, Mulberry, *Pesudodendrothrips mori*

Introduction

During summer season, the mulberry gardens are left over without pruning and are allowed to grow for developing matured stems for cuttings for vegetative propagation. During this period several insects from different agricultural crop plants migrate to the mulberry plantation for their food and shelter (Naik, 1977). A few of them, such as bugs, mites, thrips, aphids, flies *etc.*, cause stunted growth of plant (Leach, 1997; Hill, 1994). Among these causative agents, thrips were reported to cause severe damage to mulberry leaf production (Sathyaprasad and Manjunath, 1993; Reddy and Narayanaswamy, 1999).

The nymphs and adults of the thrips lacerate the tissue and suck the oozing cell sap from the upper and lower surfaces of the leaves (Rabinson, 2001). Initially white streaks followed by silvery blotches were observed on the infected leaves. Severe infestation results in retarded growth, malformation of leaves with poor nutritive value (Reddy and Narayanaswamy, 1999). The estimated loss is about 40–50% of the total leaf production (Venugopalapillai and Krishnaswami, 1980). It has been reported that most of the mulberry varieties are susceptible for the thrips attack (Naik, 1977) and severe attacks lead to different morpho-physiological changes in the leaves (Das *et al.*, 1994).

Further, besides mulberry, thrips are having a wider host range. Thrip like *Microcephalothrips abdominalis* Crawf is reported to infect the flower heads of the sunflower (*Helianthus annuus*). Cotton flower is infested by nymphs and adults of *T. tabacci* Lind and leaves by *Scrirtothrips dorsalis* Hood. *Thrips tabacci* and *Caliothrips indicus* infest leaves of cabbage and cauliflower. The larvae and adults of chilly thrip, *Scirtothrips dorsalis* (Hood) infest tender leaves of cotton and feed on the sap causing curling of leaves and incase of severe infestation causes heavy curling of leaves and stunting of crop. Jasmine, *Jasminum sambac* also is infected by *T. orientalis* (Bagn) (David and Kumaraswami, 1975). Sripriya *et al.* (2000) have reported the infestation of leaf thrip, *Heliothrips kadaliphilus* on Banana. Some other thrips like *Baliothrips biformis* infests on paddy, *Retithrips syriacus* on Castor and *Caliothrips indicus* on groundnut and cause severe damage to crops (Mani, 1994).

Earlier good numbers of methods were adopted for controlling the mulberry thrips like, cultural, physical, raising of pest-resistant/tolerant varieties, biological and chemical methods (Reddy and Narayanaswamy, 1999) and also through integrated pest-management approach (Singh and

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Saratchandra, 2002). In the traditional areas, since the silkworm rearing is practiced 4–5 times in a year, leaf production has to be made at a faster rate maintaining both the qualitative and quantitative characters. To match the busy rearing schedules, farmers have to maintain the pest-free mulberry garden for which the methods suggested above are time-consuming and impractical. So, the only alternative is to go for the insecticidal spray as a measure of plant protection to contain the thrips.

It is found that, during the summer season in the mulberry farm of Andhra Pradesh State Sericulture Research Institute (APSSRDI), Hindupur (AP), India, heavy infection of the thrips was reducing the leaf quality. Hence, a study was carried out for controlling of thrips incidence by using a few insecticides.

Materials and Methods

The collected thrips from the garden were sent to Acharya NG Ranga Agricultural University (ANGRAU), Hyderabad, India and identified as *Pesudodendrothrips mori*. The study was conducted during the month of January - December, 2002. The infected experimental plot was divided into 5 sub-plots with 200 plants for each of the four insecticides and one was maintained as control.

Test chemicals

Four different pesticides were used (*viz.*, Rogor, Quinalphos, Confidor and Methyl Parathion) for four sub-plots separately. Rogor (Rallis India Ltd., Mumbai) with the active molecule O-O-dimethyl S-C-N- methylcarbamoylmethyl phosphorodithioate is a systemic insecticide at 0.2% solution to the sub-plot-1. Quinalphos (Parul chemicals Ltd. India) with the active chemical Quinalphos, which is a systemic insecticide, was used at 0.2% to the sub-plot-2. Confidor (Bayer India Ltd., Mumbai), a contact insecticide with the active substance Imidacloprid (17.8% m/m) and N-methyl pyrrolidone (38.4% m/m) was used at 0.05% to the sub-plot-3. Metacid (Bayer India Ltd., Mumbai), a contact type with an active ingredient Methyl parathion was used at 0.2% to sub-plot-4. The control sub-plot was sprayed with normal water because it may interfere the thrips population.

In vitro test

Thrips were collected from the infected leaves from each of the four separate experimental sub-plots. Different concentrations of insecticides were smeared over fresh healthy leaves using cotton swabs. For each insecticide, 200 thrips were placed over the smeared leaf and two replications were maintained for each treatment. The incubation medium was maintained at 25±2°C with 85–90% RH. Mortality data was recorded at different intervals *i.e.*, 4, 8 and 12 hrs after post-treatment of the each insecticide and data was analyzed for statistical significance.

In vivo test

15 day-old garden with just sprouting buds and some young leaves were sprayed with insecticides (as mentioned earlier) to the respective sub-plots. 2 hrs of post-treatment, 5 leaves were collected randomly from 5 different plants in the respective treated plots and brought to the laboratory for further observations. Total numbers of thrips were counted from each individual leaf from both upper and lower side, labeled and kept inside the petri dish under moist condition by keeping wet cotton swab covered with lid. The incubation medium was maintained at 25±2°C with 85–90% RH. Five replications were maintained for each treatment. The number of thrips died from each leaf was recorded at 4 hrs intervals *viz.*, 4, 8, 12 and 24 hrs of post-treatment and the data was analyzed for statistical significance.

Residual effects on silkworm

To determine the residual effects of insecticides, mulberry leaves collected from the treated plots (15 days post-treatment) were fed to APM_1 (polyvoltine breed, APSSRDI, India) silkworms. The rearing was conducted as per the standard rearing conditions (Krishnaswami *et al.*, 1973). Two replications of 300 larvae each were maintained per treatment. For estimating the residual effects of these insecticides on silkworm larvae, different parameters like total larval duration, pupation (%), cocoon weight (g), shell weight (g) and shell ratio (%) were studied. The data was compared with the silkworms fed with un-treated leaves (thrips infected leaves collected from the control sub-plot) at normal rearing conditions.

Results

In vitro assay

The *in vitro* studies reveals that, within 12 hrs of post-treatment of all different insecticides were found to be effective with 100% mortality of thrips. Among 4, 8 and 12 hrs of post-treatments, highest mortality is observed at 8 hrs and total mortality was recorded by 12 hrs post-treatment significantly at 0.05% level (Table 2).

In vivo test the thrips mortality was found to be low at 4 hrs of post-treatment, whereas it increased significantly at 8 hrs of post-treatment. The mortality decreased significantly between 12–24 hrs (Table 1). Total mortality percent was found be highest in Confidor (79.14%) followed

Table 1. *In vitro* exposure of different insecticides in controlling the population of *Pesudodendrothrips mori* at different intervals of time

Name of the insecticide	No. of thrips	4 hrs	8 hrs	12 hrs
Rogor (0.2%)	200	20	97	83
Quinalphos (0.2%)	200	23	109	68
Confidor (0.05%)	200	25	101	74
Methyl parathion (0.2%)	200	14	105	81
CD (5%)		5.127	10.036	11.270

Data represents an average of 3 replications.

by Quinalphos (76.13%), Rogor (69.50%) and Methyl parathion (68.87%) after 24 hrs of post-treatment. So *in vivo* studies, it is observed that, though all the insecticides tested were found to be effective and among them Quinalphos and Confidor were more effective in controlling the thrips.

Residual effects on silkworm

The rearing of silkworms fed with insecticide-treated leaves, it was observed that the growth of silkworms was normal when compared with the worms fed with untreated thrips infected leaves.

Total larval duration: All the groups shown similar total larval duration, but highest are recorded in control with 8 hrs more than the minimum in Rogor and Methyl parathion (22.04 days).

Pupation (%): Minimum pupation was recorded in Quinalphos (90%) whereas, highest was recorded in Rogor (98.824%) followed by Methyl parathion (97.436 %) and Confidor (96.639%) when compared to the control (95.395%).

Cocoon weight (gm): Interestingly, all the treated groups shown to have less cocoon weight than the control. The highest was found in Rogor (1.332 gm) followed by Confidor (1.252 gm), Methyl parathion (1.216 gm) and Quinalphos (1.156 gm). Whereas, in the control it was recorded (1.345 gm).

Shell ratio (%): In case of Quinalphos treatment, highest SR% (19.723) was recorded followed by Confidor (18.131) and Methyl parathion (16.941) and compared to the control of (16.579), whereas with Rogor treatment there was a decrease in SR% (15.015) (Table 3).

Discussion

In the present study, heavy incidence of thrips was found in the mulberry garden, during the summer season leading to severe damage to the quality and quantity of leaf production. Earlier, different trials were made using various insecticides in controlling the different species of thrips like spraying of 0.02% DDVP or 0.5% Rogor (Anonymous, 1975; Kariappa and Narasimhanna, 1978), mineral oil and Parathion combination (Cappellozza and Mitto, 1987), Metasystox, Rogor and Nuvacron (Radha *et al.*,

Table 2. Effect of different insecticides in controlling the population of *Pesudodendrothrips mori* (%) at different hours of exposures *in vivo*

Name of the chemical	No. of thrips	4 hrs	8 hrs	12 hrs	24 hrs	Total dead	Dead %
Distilled water (Control)	224	0	0	0	0	0	0.00
Rogor (0.2%)	215	6.21	38.45	12.01	12.84	148	69.50
Quinalphos (0.2%)	220	1.52	45.11	16.19	13.30	161	76.13
Confidor (0.05%)	244	2.29	44.91	17.08	14.86	189	79.14
Methyl parathion (0.2%)	258	1.49	33.03	10.98	23.37	176	68.87
CD (5%)		0.632	4.021	1.256	3.121		

Data represents an average of 5 replications.

Table 3. Effect of different pesticides on the rearing performance of APM_1

Name of the insecticide	Total larval duration	No. of larvae	No. of cocoons harvested	Pupation (%)	Cocoon weight (g)	Shell weight (g)	Shell ratio (%)
Confidor	22.06	300	290	96.639	1.252	0.227	18.131
Rogor	22.04	300	296	98.824	1.332	0.200	15.015
Methyl parathion	22.04	300	292	97.436	1.216	0.206	16.941
Quinalphos	22.08	300	270	90.000	1.156	0.228	19.723
Control	22.12	300	286	95.395	1.345	0.223	16.579

Data is based on two replications of 300 larvae each per treatment.

1978) and several other insecticides were used for mulberry thrips (Sharma, 1989; Anonymous, 1990; Ali, 1991). In the present study, all the commercial insecticides tested were found to be quite effective both *in vivo* and *in vitro*. Among them Confidor and Quinalphos were found to be most effective with 79.14% and 76.13% mortality of thrips, respectively *in vivo* tests (Table 1). All the insecticides tested were effective with 100% mortality within 12–24 hrs of post-treatment *in vitro* studies (Table 2). Both the studies reveal that 8 hrs of exposure to insecticide caused maximum mortality in thrips. These results are in agreement with the earlier reports (Reddy and Narayanaswamy, 1999) on thrips control.

Reddy and Kotikal (1988) have reported a safe period of 8 to 12 days with Endosulfan, Monocrotophos or Dimethoate. In the present study, it was found that no residual effect of insecticides was observed during larval period and pupation. The pupation rate, qualitative and quantitative characters of the cocoons were found to be higher in treated batches than the silkworms fed with the un-treated thrips infected leaves (Table 3). This might be due to the effectiveness of the insecticides to kill the thrips population in the garden, indirectly improving the quality of leaves.

The foliar spray of systemic insecticide such as Confidor, Rogor, Quinalphos and Methyl parathion on 15th day after pruning or at the time when the buds are just opening and leaves are being formed is recommended for the effective control of thrips infestation. This will aid in maintaining the entire garden free from thrips and to produce better quality mulberry leaves.

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