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Original Research Article

Waiting Period for Botanical Pesticides Used in Management of Mulberry Thrips, *Psedodendrothrips mori* (Thysanoptera: Thripidae)

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Keywords

Pseudodendrothrips mori, *Bombyx mori* and Waiting period

A B S T R A C T

Bio efficacy of five botanicals *viz.*, tulasi, tobacco, *Lantana camara*, *Clerodendron infortunatum* leaf extracts along with neem seed kernel extract (NSKE) were evaluated against mulberry thrips, *Pseudodentrothrips mori*. Results of the trials showed that NSKE and *Clerodendron* were most effective in recording lower thrips population 11.00 and 11.50 per top three leaves respectively, at 7DAT compared to 42.75 per leaf in the untreated control. The order of efficacy of botanicals was NSKE (5%) > *Clerodendron* (5%) > tulasi (5%)> tobacco (5%) > *Lantana camara* (5%). A bio-assay with botanical- treated leaves on silkworm hybrid PM × CSR 2 showed that no mortality was observed on 5th day for tulasi,

Introduction

Pseudodendrothrips mori (Niwa) (Thysanoptera: Thripidae) has become dominant and regular pest of mulberry in the recent years causing considerable yield loss both quantitatively and qualitatively throughout the year. The mulberry sucking pests were generally managed by using dichlorvos or dimethoate alone or alternatively (Rajadurai and Thaigarajan, 2003). After spraying the insecticides farmers need to wait till the safety period to avoid its hazardous effect on silkworms. The safety periods of dichlorvos and dimethoate @ 2mlL^{-1} each were 10 and 15 days respectively (Dandin *et al.*, 2000). Though newer insecticides with novel mode of action have dominated in the management of sucking insects on other crops and the choice on mulberry is limited owing to the perceived toxicity of chemicals to silkworms. In the light of the above search for alternative way of controlling insects has led to investigation of plant sources of naturally occurring compounds.

Materials and Methods

The field trial was conducted during 2017-2018 on V-1 variety of mulberry at Sericulture unit, Department of Entomology, College of Agriculture, Raichur, UAS, Raichur to evaluate the efficacy of five botanicals *viz.*, tulasi leaf extract, tobacco leaf extract, *Lantana camara* leaf extract, *Clerodendron infortunatum* leaf extract and neem seed kernel extract (NSKE) at 5% dosage against mulberry thrips. The V-1 mulberry was grown as per standard package in paired row system (5'+3')×2'. For each treatment three replications were maintained and each replication consisted of 14-15' paired row length (14-15 plants/replication).

Screening of botanicals against mulberry thrips

Thrips pre-treatment count was taken when there was uniform incidence of thrips on mulberry and different botanicals @ 50mL / L (5%) dosage was sprayed with 500L spray solution per hectare and due care was taken to avoid spray drift to neighbouring treatments. Post treatment thrips counts was made at first, third, fifth, seventh, and tenth day after spray to ascertain the effectiveness of botanicals. The data on pre and post count of thrips were averaged and analysed statistically

Safe/waiting period studies

The botanicals have been used in thrips management were sprayed to labelled mulberry plants date wise and treatment wise for about 10 days on every alternate days to get two days, four days, six days, eight days and ten day old treated leaves on a particular day for feeding to early third instar silkworms to ascertain the safe/ waiting period. The experiment was planned in such a way that when spraying of botanicals to mulberry plants was completed, third instar mulberry silkworms were available for rearing. After the completion of spray when the larvae are ready, sprayed leaves were harvested from treated mulberry plants in a labelled polythene bags (100 guage) treatment, replication and date wise and fed to silkworms (*Bombyx mori)* at three intervals (i.e. morning, afternoon and evening) and next day insecticide wise mortality was recorded. For each treatment, 25 larvae were kept and such four replications were maintained for determination of safe period. In a treatment, if all the worms were healthy and active and if the same trend is maintained in subsequent days, then that treatment (days after spraying) was considered as safe to silkworms.

Study the performance of mulberry silkworm hybrid on botanicals treated leaves to ascertain residual toxicity

The silkworm hybrid, PM × CSR2 was reared on botanicals sprayed leaves after the safe period in order to ascertain the residual toxicity. Newly hatched silkworms were reared on treated leaves after the safe period until spinning. The economic parameters were recorded for all the treatments including control batch, which was separately fed on normal leaves. Three feeds were given at six hour intervals from hatching till the end of fifth instar.

Results and Discussion

Screening of botanicals against mulberry thrips

The results showed that all the botanicals evaluated were effective against thrips. The pretreatment count showed that the population of thrips in all the plots was statistically on par which ranged between 37.75 and 43.75 per top three leaf (Table 1). The thrips population was drastically decreased on a day after spray and gradually declined as days passed up to seven days. Observations made on seventh day of spray showed that NSKE and *Clerodendron* were most effective recording lower thrips population levels of 11.00 and 11.50 per leaf respectively, at 7DAT compared to untreated control (42.75 per leaf). The order of efficacy of botanicals is NSKE (5%) > *Clerodendron* (5%) > tulasi (5%)> tobacco (5%) > *Lantana camara* (5%).

This is in conformity with the finding of Neem oil and Pongamia oil both at 3 per cent acted as antifeedant and interfered in physiological process like moulting which affected the growth of insects and hence the reduced population (Heyde *et al.,* 1984). Further, higher efficacy of neem oil and

pongamia oil at 3 per ecnt against mulberry thrips was reported by Naik *et al.,* (2000) and Sakthivel and Qadri (2010). Furthermore, Subramanian *et al.,* (2010) observed that Neem and Pongamia oil at 3 per cent were the next best to Dichlorvos 0.076 per cent and comparable with the findings Ashoka and Patil (2001) who evaluated five neem products for their bio-efficacy against thrips and opined that neem products gave 40 to 60 per cent control

Safe/waiting period studies

The results of the safe/ waiting period indicated that botanicals exhibited different durations of waiting period for safe feeding of silkworms. A bio-assay with botanical-treated leaves on silkworm race PM × CSR 2 showed that no mortality was observed on 5th day for tulasi, 7th day for tobacco and *Lantana camara*. *Clerodendron* and NSKE was safer to silkworm on 10th day (Fig. 1). Present finding are in comparable with results of Shah *et al.,* (2005) who observed nil mortality on 7th day for neem oil and 10th day for dichlorvos (Table 2). They further reported that the neem insecticides @ 5 ml/l had a safe period of 6-7 days, Subramanian *et al.,* (2010) observed safe period of 7 days for neem and pungum oils. Jayachandran *et al.,* (2012) opined that a minimum of 10 days safety period to silkworms for plant extracts of *Calotropis gigantea* (L.), *Annona squamosa* (L.), *Leucas aspera* (Willd.), *Zingiber officinale* (Roscoe), *Curcuma longa* (L.), *Allium sativum* (L.), *Capsicum annuum* (L.) and *Acorus calamus* (L.) with cow urine. Furthermore Jyothi *et al.,* (2013) opined that nimbicidine had safe waiting period of seven days. The present results of our study are comparable with the results of earlier workers and differences in safe waiting period might be attributed to the differences in products and climate prevailed during experimentation.

Study the performance of mulberry silkworm hybrid on botanicals treated leaves to ascertain residual toxicity

The treated mulberry leaves were fed to silkworms after safe waiting periods of plant extracts and the results indicated that there was no deleterious effect on mulberry silkworms for their growth and development in any of the treatments (Table 3). The larval growth, development, survival, duration and silk technological parameters did not differ significantly with untreated control. This has clearly indicated that the test plant extracts did not have any of the residual toxicity to silkworms after safe waiting period. In support of the current results Ashoka and Patil (2001) opined that neem based insecticides sprayed leaves had no residual toxicity after safe waiting period of three days. Mukhopadhyay *et al.,* (2008) also reported that neem, pongamia oil and nicotine extract had no impact on the economic traits of silkworms after safe waiting period.

Conclusion of the study is as follows:

It is evident from the results that, bioassay of botanicals *viz.,* tulasi, tobacco, *Lantana camara*, *Clerodendron* and NSKE, phytoformulations (@ 5%) foliar spray was found to be effective in reducing the trhrips population under field condition. These phytoformulations were safe to silkworm feeding from 5, 7 and 10th day after spray respectively for tulasi, tobacco and *L.camara* and NSKE and *Clerodendron* in order. While, *Lantana* leaf extract at 5 per cent was not much effective against thrips, but significantly superior over control and The rearing performance of silkworms by treated leaves after the safety period did not affect the growth and survival parameters of the silkworm.

Table.1 Bio-efficacy of botanicals on mulberry thrips, *Pseudodendrothrips mori* under **field conditions.**

Treatments	Doses	No. of thrips / top 3 leaves					
		1DBS	1DAS	3DAS	5DAS	7DAS	10DAS
T_1 - Tulasi leaf extract	5%	39.00 (6.32)	16.50 (4.18)^{bc}	15.50 (4.06)^{bc}	17.25 (4.27)^{bc}	16.50 (4.18)^{bc}	18.50 (4.38)^{bc}
T_2 - Tobacco leaf extract	5%	37.00 (6.16)	15.25 (4.03)^{bc}	14.50 (3.93)^{bc}	15.75 (4.09)^{bc}	17.00 (4.24)^{bc}	18.25 (4.27)^{bc}
T_3 - *Lantana camara* leaf extract	5%	44.50 (6.74)	20.75 (4.66)^{b}	21.25 (4.71)^{b}	21.50 (4.73)^{b}	22.50 (4.84)^{b}	22.75 (4.87)^{b}
T_4 - *Clerodendron* leaf extract	5%	37.75 (6.22)	12.75 (3.70)^{bc}	12.00 (3.60)^{c}	12.75 (3.70)^{c}	11.50 (3.53)^{c}	13.50 (3.67)^{cd}
T_5 - NSKE	5%	43.75 (6.68)	13.25 (3.77)^{bc}	13.25 (3.77)^{bc}	12.50 (3.67)^{c}	11.00 (3.46)^{c}	11.50 (3.53)^{d}
T_6 - Control		42.50 (6.54)	44.50 (6.74)^{a}	43.25 (6.65)^{a}	43.75 (6.68)^{a}	42.75 (6.61)^{a}	42.25 (6.57)^{a}
C.V (%)		9.69	18.70	18.34	15.67	13.79	12.36
S.Em±		0.30	0.39	0.37	0.33	0.29	0.26
CD @ 5%		NS	1.13	1.09	0.95	0.83	0.76

DAS: Days after spraying
*Figures in the parentheses are √X+1 transformed values.
Figures in the column followed by same letters are not-significant at p=0.01 by DMRT

Table.2 Silkworm larval mortality due to feeding of botanicals treated leaves

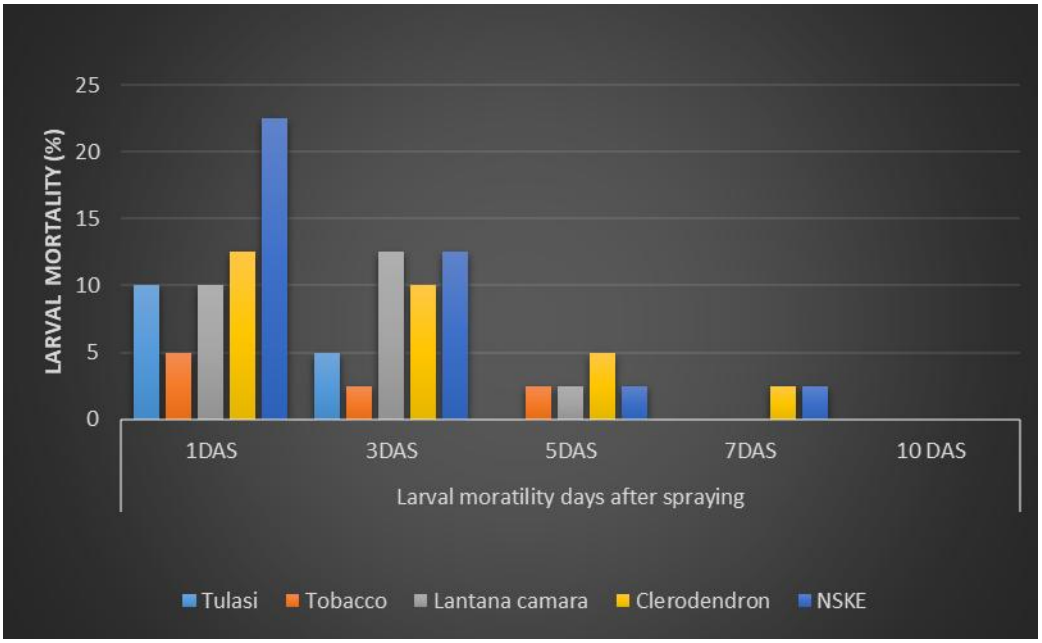
Treatment	Doses	Larval moratility (%)				
		1DAS	3DAS	5DAS	7DAS	10 DAS
Tulasi leaf extract	5%	10.00 (3.31)^{b}	5.00 (2.44)^{b}	0.00 (1.00)^{c}	0.00 (1.00)^{b}	0.00 (1.00)^{a}
Tobacco leaf extract	5%	5.00 (2.44)^{c}	2.50 (1.87)^{c}	2.50 (1.87)^{b}	0.00 (1.00)^{b}	0.00 (1.00)^{a}
Lantana camara leaf extract	5%	10.00 (3.31)^{b}	12.50 (3.67)^{a}	2.50 (1.87)^{b}	0.00 (1.00)^{b}	0.00 (1.00)^{a}
Clerodendron leaf extract	5%	12.50 (3.67)^{b}	7.50 (3.31)^{a}	5.00 (2.44)^{a}	2.50 (1.87)^{a}	0.00 (1.00)^{a}
NSKE	5%	22.50 (4.84)^{a}	12.50 (3.67)^{a}	2.50 (1.87)^{b}	2.50 (1.87)^{a}	0.00 (1.00)^{a}
Control	0%	0.00 (1.00)^{d}	0.00 (1.00)^{d}	0.00 (1.00)^{c}	0.00 (1.00)^{b}	0.00 (1.00)^{a}
CV(%)		11.48	11.78	10.69	8.77	0.00
S.Em±		0.15	0.14	0.07	0.05	0.00
C.D @ 5%		0.48	0.42	0.22	0.15	0.00

DAS: Days after spraying
*Figures in the parentheses are √X+1 transformed values.
Figures in the column followed by same letters are not-significant at p=0.01 by DMRT

Table.3 Effect of botanicals on larval, cocoon and pupal parameters

Treatments	Doses	Weight of 10 larvae (g)	Effective rate of rearing (%)	Weight of 10 cocoons (g)	Cocoon shell ratio (%)	Filament length (m)	Denier	Weight of 10 pupae (g)	Moth emergence (%)	No. of eggs /laying
Tulasi leaf extract	5%	22.79	96.75	10.14	16.72	540.94	2.67	8.23	97.06	429.00
Tobacco leaf extract	5%	22.01	92.25	9.87	17.00	573.38	2.89	8.14	92.89	418.00
Lantana camara leaf extract	5%	21.89	91.50	9.61	15.67	515.44	2.85	7.95	92.21	410.00
Clerodendron leaf extract	5%	22.21	93.75	10.09	17.10	546.94	2.82	8.24	94.26	414.75
NSKE	5%	22.77	92.75	9.74	16.54	528.19	2.90	8.00	93.26	415.00
control		23.94	99.00	9.70	17.34	533.25	2.70	8.1225	99.22	429.25
C.V (%)		7.38	3.52	3.66	8.20	4.69	7.09	0.16	1.64	9.94
S.Em±		0.83	1.66	0.18	0.60	14.36	0.11	3.89	3.46	4.74
CD @ 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS

Fig.1 Silkworm larval mortality due to feeding of botanicals treated leaves (5%)



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