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Field Efficacy of Insecticides and Biopesticides against Blossom Apple Thrips in Himachal Pradesh

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ABSTRACT

The present investigations on efficacy of insecticides and biopesticides namely Thiacloprid, Chlorpyriphos, *Beauveria bassiana* and Azadirachtin against blossom thrips infesting apple crops were carried out at the experimental farm of Krishi Vigyan Kendra Shimla, during two consecutive years. The experiment comprised of five treatments *viz*., T_1-Thiacloprid @0.012%, T_2-Chlorpyriphos @0.04%, T_3-*Beauveria bassiana* @0.5%, T_4-Azadirachtin @0.0003% and T_5-Control (water only). Spray was applied at pink bud stage and the data on thrips population were recorded after 3, 5, 7 and 10 days. The thrips population decreased in all the treatments except control. The minimum thrips count was recorded with the spray of Thiacloprid (2.0 thrips/ flower) followed by Chlorpyriphos (2.1thrips/ flower). The treatment with the biopesticides namely *B. bassiana* (4.2 thrips/ flower) and Azadirachtin (4.5 thrips/ flower) were though superior over control (12.0 thrips/ flower) but was not as effective compared to insecticides. The per cent fruit set varied between 38-40 per cent with all treatments except for control (32%). No phytotoxicity symptoms were recorded in any of the treatments.

Key Words: Apple, Thrips, Thiacloprid, Chlorpyriphos**,** *Beauveria bassiana,* Azadirachtin.

INTRODUCTION

Apple is one of the most important temperate fruit crops in terms of land use efficiency with better opportunities for higher returns, friendly environment and employment generation. In India, it is commercially grown in the states of Jammu & Kashmir, Himachal Pradesh, Kumaun and Garhwal hills of Uttrakhand and parts of Sikkim and Arunachal Pradesh (Sharma *et al*, 2018). In Himachal Pradesh, apple cultivation has revolutionized the socio-economic conditions of farmers and is a leading commercial fruit crop being cultivated over 1.13 lakh ha with annual production of 3.7 MT (Anon, 2019). The major biotic factors inflicting huge economic losses are the insect pests, the prominent among them being San Jose Scale (*Quadraspidiotus perniciosus*), Woolly Apple Aphid (*Eriosoma lanigerum*), Stem borer (*Apriona cinerea*) and European red mite (*Panonychus ulmi*) (Sharma and Verma, 2005). Besides these, thrips are economic pests of deciduous fruit trees, which cause direct damage during the fruit development when females oviposit eggs in flower buds and flowers (Pearsall and Myers, 2000). A number of thrips viz. *Thrips flavus*, *T. florum*, *Haplothrips tenuipennis*, *Frankliniella dampfi*, *Taeniothrips rhopalantennalis* etc. are of significance in temperate fruit orchards (Broughton *et al*, 2011; Shellhorn *et al*, 2010). These infest number of temperate fruit crops like apple, pear, peach, plum and apricot.

Thrips are small insects having asymmetrical rasping and sucking mouth parts by which they damage the plant parts. Both nymphs and adults lacerate floral parts and also damage the vegetative buds. The attacked flowers become sickly in appearance and are withered, as a result the fruit set is less and the fruits fall off prematurely. Therefore, the present study was undertaken to evaluate the

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field efficacy of insecticides and biopesticides against blossom apple thrips as the period of flowering coupled with inclement weather makes it very difficult to control the pest and further study their effect on the per cent fruit set in the apple trees of district Shimla.

MATERIALS AND METHODS

The field experiments were carried out to study the efficacy of insecticides and biopesticides namely Thiacloprid, Chlorpyrifos, *Beauveria bassiana* and Azadirachtin against blossom thrips infesting apple orchards in randomized block design at experimental farm of Krishi Vigyan Kendra Shimla at Rohru, during two consecutive years *i.e.* 2017 and 2018. Spray was applied at pink bud stage with insecticides and biopesticides namely Thiacloprid @0.5ml/lt, Chlorpyrifos @2ml/lt, *Beauveria bassiana* @5ml/lt, Azadirachtin @2ml/lt. Control plots with only water spray were maintained simultaneously for comparison. Thrips densities were recorded one day before insecticide spray and at 3, 5, 7 and 10 days after treatment. Pre and post count of thrips was taken by dipping flowers in 70 per cent alcohol and the number of thrips were counted after straining through filter paper.

Per cent reduction in the population of thrips were calculated by the given Henderson & Tilton's formula:

$$\text{Corrected (\%)} = \frac{100 \times [1 - \text{n in Co before treatment} \times \text{n in T after treatment}]}{\text{n in Co after treatment} \times \text{n in T before treatment}}$$

Where, n= Insect population, T= Treated, Co= Control

The effect of insecticides and biopesticides on the per cent fruit set in apple trees was studied by the below given formula:

$$\text{Per cent Fruit Set} = \frac{\text{No. of fruit set}}{\text{No. of flowers}} \times 100$$

RESULTS AND DISCUSSION

Efficacy of insecticides and biopesticides against blossom apple thrips

The data (Table 1) depicted at pink bud stage during the year 2017, that all the chemicals used in the study were significantly superior over the control wherein the thrips population increased from 5.00 (Precount) to 6.20 (3DAS). Thiacloprid proved to be the best chemical in managing the pest wherein the pest population was brought down significantly from 8.00 (Precount) to 2.10 (3DAS) followed by Chlorpyrifos which managed the pest population substantially from 7.33 (Precount) to 2.20 (3DAS). Similar trend was observed during 2018 where Thiacloprid proved to be the best treatment in managing the pest population wherein the pest population was brought down from 7.33 to 2.03. This was followed by Chlorpyrifos which showed the drastic reduction in pest population from 7.00 to 2.18. Both the treatments were equally effective.

The treatment with the biopesticides namely *B. bassiana* (4.52 thrips/ flower) on 3DAS decreased from 6.00 thrips/ flower in Precount and Azadirachtin (4.42thrips/ flower) on 3DAS reduced the thrips pest from 5.66 thrips/ flower in Precount. These treatments were though superior over control (6.20 thrips/ flower) on 3DAS but were not as effective as the insecticides. (Table 1) The present findings were in agreement with those of Abid *et al* (2019) who reported Thiacloprid as the best insecticide in managing the pest population of thrips followed by Chlorpyrifos at pink bud stage at their recommended doses.

The data (Table 2) revealed that the pest population was reduced drastically by 79.00 per cent with Thiacloprid (3DAS) during the year 2017 followed by Chlorpyrifos which reduced the pest population by 76.16 per cent. *B. bassiana* and Azadirachtin reduced the thrips pest population to 39.13 and 37.68 per cent respectively during year 2017. The data during the year 2018 also followed

Table1. Field efficacy of insecticides and biopesticides against blossom apple thrips

Treatment	Pre Count	Mean number of thrips per flower (days after spray) in 2017				Pre Count	Mean number of thrips per flower (days after spray) in 2018			
		3	5	7	10		3	5	7	10
Thiacloprid (0.012%)	8.00	2.10	2.50	4.38	8.47	7.33	2.03	2.25	4.05	8.08
Chlorpyriphos (0.04%)	7.33	2.20	2.60	4.40	8.52	7.00	2.18	2.40	4.53	8.15
Beauveria bassiana (0.5%)	6.00	4.52	4.77	6.43	10.60	5.66	4.10	4.40	6.23	10.50
Azadirachtin (0.0003%)	5.66	4.42	4.88	6.40	10.43	5.33	4.08	4.60	6.38	10.55
Control (Water only)	5.00	6.20	6.40	7.80	11.73	4.66	6.00	6.31	7.43	11.88
CD (p=0.05%)	NS	0.99	0.92	0.48	0.64	NS	0.98	0.42	0.52	0.62

the same trend and Thiacloprid proved to be the best treatment in managing the pest population with 78.55 per cent followed by Chlorpyrifos with 75.88 per cent reduction in the thrips pest population, whereas *B. bassiana* and Azadirachtin reduced the thrips pest population to 43.76 and 40.64 per cent respectively during the year 2018. These findings were in agreement with Abid *et al* (2019) who reported of 84 and 74 per cent reduction in thrips population when Thiacloprid and Chlorpyrifos was applied at their recommended doses, respectively.

From the table 3 it was evident that Thiacloprid has the maximum per cent fruit set in the apple trees *i.e.,* 40.00 per cent and 39.70 per cent during the years 2017 and 2018, respectively. The per cent fruit set ranged from 38-40 per cent with all other treatments except control where it was 32 per cent.

Table 2. Per cent reduction in pest population of blossom apple thrips after the spray of insecticides and biopesticides during 2017 and 2018.

Treatment	Per cent reduction in pest population of thrips over control							
	*DAS 2017				*DAS 2018			
	3	5	7	10	3	5	7	10
Thiacloprid (0.012%)	79.00	74.74	55.81	14.40	78.55	76.17	57.10	14.47
Chlorpyriphos (0.04%)	76.16	71.52	51.50	06.00	75.88	73.38	49.81	10.00
Beauveria bassiana (0.5%)	39.13	35.65	13.50	-*	43.76	39.65	14.61	-*
Azadirachtin (0.0003%)	37.68	30.39	09.00	-*	40.64	33.00	07.00	-*

*Increase in the thrips population. *DAS- Days after spray

Table 3. Effect of the insecticides and biopesticides on the per cent fruit set in the apple trees during 2017 and 2018.

Treatment	Per cent Fruit Set	
	2017	2018
Thiacloprid (0.012%)	40.50	39.83
Chlorpyriphos (0.04%)	39.83	39.10
Beauveria bassiana (0.5%)	39.00	38.20
Azadirachtin (0.0003%)	38.21	38.03
Control (Water only)	32.00	31.00
CD (p=0.05%)	2.206	1.740

CONCLUSION

Results showed that Thiacloprid was superior over all other treatments except for Chlorpyrifos where it was at par with Thiacloprid at recommended doses. However, the highest per cent fruit set in apple trees was observed with Thiacloprid (40%). Hence, Thiacloprid @ 0.012 per cent may be used for the management of apple blossom thrips in apple.

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