



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2020; 8(1): 1107-1109

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Received: 01-11-2019

Accepted: 03-12-2019

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Comparative effect of synthetic and botanical insecticide against woolly apple aphid, *Eriosoma lanigerum* (Hausmann) on apple in cold arid zone of Kargil, Ladakh, India

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Abstract

Woolly apple aphid, *Eriosoma lanigerum*, is an important pest of apples that infests both the aerial and root parts of the tree. It is a new pest to Kargil and have been entered from Kashmir. No insecticide have been used in Kargil to control any insect on apple except for codling moth. Comparison for chloropyriphose and neem oil were evaluated at three location of District Kargil location of the District Kargil. Both the test insecticide, neem oil and chloropyriphose were proved best in reduction of *Eriosoma lanigerum* population density. The study revealed that there is no significant differences between chloropyriphose 20 EC (Dursban 20 EC) and neem oil in reduction of *Eriosoma lanigerum* population density. In T₁ reduction of *Eriosoma lanigerum* population density ranged from 0.88 – 1.11 colony⁻¹ in the three different orchards, while it was ranged from 1.55-1.88 colony⁻¹ in treatment T₂ compared t to control where it was noticed ranged from 46.77- 54.44 colony⁻¹. The per cent reduction over check was ranged from 96.21%- 9.04%.

Keywords: Woolly apple aphid, synthetic insecticides, botanical insecticides, *Eriosoma lanigerum*

Introduction

Apple (*Malus pumila*) is the most important temperate fruit of the northern western Himalayan region. In India it is predominantly grow in Jammu and Kashmir and Himachal Pradesh. The Kargil District of Jammu and Kashmir also known for its unique quality apple “Karkitchoo” and only pest of this apple was codling moth (*Cydia pomonella* L.)^[1, 2], but over the past decade the insect pest densities have been increased in Kargil. This may be due to climate change. One of the serious insect pest in the District is Woolly aphid, *Eriosoma lanigerum*, on apple that infest both aerial and root parts of the apple tree^[3,4] which weakens the tree vigor, prevent wound from healing and transmit perennial apple canker disease^[3,4], also contributed the development of sooty mold^[5]. As the lack of awareness about the use of insecticide among the farmer of this district has created a need to test the insecticide for the management of woolly apple aphid on apple.

The trial under an OFT (on farm testing) were conducted in the apple growing areas of the region viz, Pashkum, Poyen and Manji during 2017-18 and 2018-19. The aim of the trial was to compare the efficacy of neem oil with chlorpyriphose 20 EC and to control woolly aphids in apple.

Materials and methods**Experimental Field**

This research was conducted at five highly infested orchards of three different locations viz. Minjee, Pashkum, and Poyen under an OFT (On Farm Testing) by Krishi Vigyan Kendra, Kargil. The experiment was laid out in Randomized Block Design and repeated for three times.

Insecticide application

The insecticide used in the experiment were chlorpyriphose 20 EC @ 1ml /lit and neem oil @ 5ml / lit on the highly infested tree in August with foot pump sprayer in all the selected orchards when the pest reached to economic threshold level.

Data collection

The experimental plant were tagged and observed daily for appearance and measuring the population density of *Eriosoma lanigerum* from each orchard of different location. Each experimental orchard consisted of a single tree with three woolly apple aphid (WAA) colonies/ linear shoot. Data population of *Eriosoma lanigerum* were assessed by counting the number of live aphids. The *Eriosoma lanigerum* were collected in the container with the help of fine camel hair brush and counted on white paper. Pre-treatment data were recorded one day before application of insecticides. Post-treatment data were recorded after two days of insecticide application and then at 7 interval.

Data analysis

The data collected were individually subjected to ANOVA technique by using OP statistics.

Result and Discussion

Effect of chlorpyriphose and Neem oil on the population density of woolly apple aphid (WAA), *Eriosoma lanigerum* at Poyen Orchard

Both the insecticides were proved significantly effective for reduction of woolly aphid in apple. Result of the two years experimentation revealed in Table 1 before and after treatment at Poyen. One day after treatment the woolly apple aphid population were recorded significantly lower in the chlorpyriphose treated tree (2.33 waa colony⁻¹) followed by neem oil treated tree (4.00 waa colony⁻¹) and the higher in the control (36.33 waa colony⁻¹). After fifteen days the population density of WAA was reduced to 0.00 waa colony⁻¹ in T1 and 0.33 waa colony⁻¹ in T2. The overall mean of WAA population was lower in T1 (0.88 waa colony⁻¹) followed by T2 (1.77 waa colony⁻¹) and higher in control (46.77 waa colony⁻¹). The per cent reduction over control was 96.77 in T1 and 96.21 in T2 which are at par with each other.

Table 1: Mean population of *Eriosoma lanigerum* colony⁻¹ of apple linear shoot at Poyen

Treatment	Dosage	Pre-treatment	Post-treatment				Percent over reduction
			1 day	7 days	15 days	Overall mean	
Chlorpyriphose(T ₁)	1ml/lit.	36.33	2.33	0.33	0.00	0.88	96.77
Neem oil(T ₂)	5ml/lit	36.66	4.00	1.00	0.33	1.77	96.21
Check (T ₀)	-	37.33	36.33	47.00	57.00	46.77	-----
CD	-	NS	1.90	1.98	2.79	15.19	-----

Effect of chlorpyriphose and Neem oil on the population density of woolly apple aphid (WAA), *Eriosoma lanigerum* at Pashkum Orchard

The result of experiment at Pashkum orchard presented in Table 2 showed that after one day treatment the pest population density was significantly reduced in T1 (2.00 waa colony⁻¹) and T2 (3.33 waa colony⁻¹) while it was recorded before treatment (45.00 waa colony⁻¹) and (44.66 waa colony⁻¹) respectively. After 15 days of treatment it was observed that

the population density of WAA was recorded 0.33 colony⁻¹ in T1 and 0.66 colony⁻¹ in T2, whereas, it was recorded 65.33 colony⁻¹ in control. The overall mean of WAA population was recorded 1.11 colony⁻¹ and 1.88 colony⁻¹ in T1 and T2 respectively, which were significantly at par with each other, while it was recorded higher in control (54.44 colony⁻¹). The per cent reduction over control were recorded 97.96 was recorded in T1 and 96.55 was in T2.

Table2: Mean population of *Eriosoma lanigerum* colony⁻¹ of apple linear shoot at Pashkum

Treatment	Dosage	Pre-treatment	Post-treatment				Percent over reduction
			1 day	7 days	15 days	Overall mean	
Chlorpyriphose(T ₁)	1ml/lit.	45.00	2.00	1.00	0.33	1.11	97.96
Neem oil (T ₂)	5ml/lit	44.66	3.33	1.66	0.66	1.88	96.55
Check (T ₀)	-	43.33	43.66	54.33	65.33	54.44	-
CD	-	NS	2.63	4.24	3.63	16.83	-

Effect of chlorpyriphose and Neem oil on the population density of woolly apple aphid (WAA), *Eriosoma lanigerum* at Minjee Orchard

Table 3 shows the result of population density of WAA at Minjee orchard. It was observed that population density of WAA before treatment were 43.33 colony⁻¹, 42.33 colony⁻¹, 43.00 colony⁻¹ in T1, T2, T3 respectively. After one day treatment minimum population was recorded in T1 (2.00 colony⁻¹) followed by T2 (2.66 colony⁻¹) while it was recorded 44.33 colony⁻¹ control. The data recorded after 15 days showed that the population density of WAA was 0.33 colony⁻¹ in T1 and 0.66 colony⁻¹ in T2 compare to control where it was recorded 63.00 colony⁻¹. The overall mean shows

that the population density of WAA was 1.11 colony⁻¹ in T1 and 1.55 colony⁻¹ in T2, while, it was recorded 52.44 in control. The percent reduction over control was recorded 97.88 and 97.04 in T1 and T2 respectively.

The result are in agreement with the finding of Shaw and Wallis [6] who noticed that neem extract had highest reduction in WAA population. Botanical insecticides are as effective as synthetic in controlling the woolly apple aphids in apple, [7]. The effectiveness of neem oil and neem seed extract was also studied by Immaraju and found as effective as synthetic insecticide [8]. The synthetic insecticide control the woolly apple aphid population.

Table3: Mean population of *Eriosoma lanigerum* colony⁻¹ of apple linear shoot at Minjee

Treatment	Dosage	Pre-treatment	Post-treatment				Percent over reduction
			1 day	7 days	15 days	Overall mean	
Chlorpyriphose(T ₁)	1ml/l	43.33	2.00	1.00	0.33	1.11	97.88
Neem oil(T ₂)	5ml/l	42.33	2.66	1.33	0.66	1.55	97.04
Check(T ₀)		43.00	44.33	50.00	63.00	52.44	-----
CD		NS	2.26ss	4.21	2.52	14.03	-----

Conclusion

The present study concluded, that neem oil (botanical insecticide) is as effective as the chloropyriphose (synthetic insecticide) in reduction the population of WAA, *Eriosoma lanigerum*. Neem oil reduced the risk to human being, environment and provided safety to biocontrol agent /predators, which can be utilized in integrated pest management (IPM). Therefore, the use of botanical pesticide should be encouraged. The use of chloropyriphose is also very effective against the WAA, *Eriosoma lanigerum*, but its intensive use should be discourage due environmental and ecological concern.

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