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EFFICACY OF PHOSMET AGAINST WOOLLY APPLE APHID *ERIOSOMA LANIGERUM* (HAUSMANN)

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ABSTRACT

The efficacy of phosmet was evaluated against the aerial form of the woolly apple aphid *Eriosoma lanigerum* (Hausmann) during October- November 2017 and 2019 in apple orchards at Manali district Kullu of Himachal Pradesh. All the doses of phosmet were effective in suppression of the aphid up to 21 days of the spray. Chlorpyriphos (0.05%) was found statistically superior (0.06 aphid colonies/ twig) followed by phosmet @ 0.075%, 0.05% and 0.025% (0.36, 0.40 and 0.54 aphid colonies/ twig, respectively) during 2017. Similar trend was observed during 2019 but chlorpyriphos was found statistically at par with phosmet @ 0.05% and 0.075%. All the concentrations proved safe to the apple plants as there were no phytotoxic symptoms.

Key words: Apple, *Eriosoma lanigerum*, phosmet, chlorpyriphos, Dursban, efficacy, dose, aphid colonies/ twig, phytotoxicity, Himachal Pradesh

Apple is the most important cash crop of Himachal Pradesh accounting for about 90% of the total horticultural produce, and it is infested by a number of insect pests. Among them, woolly apple aphid *Eriosoma lanigerum* (Hausmann) is a serious pest infesting both aerial as well subterranean plant parts, and affecting the plant vigor and yield. In some apple growing areas of Himachal Pradesh, especially Kullu valley and middle valley areas of Kinnaur district, the aerial populations are managed successfully by its endoparasitoid *Aphelinus mali* (Haldemann) introduced in the mid- thirties (Rawat and Pawar, 1987). However, in other apple growing areas like Shimla, Mandi, lower and upper valley areas of Kullu, Kinnaur and Spiti valley, this insect pest appears in epidemic form and needs regular insecticidal applications. A large number of options are recommended (Thakur and Dogra, 1980; Thakur and Gupta, 1988). Later, some neonicotinoids, with different mode of action had been found effective against sucking pests (Angelini and Lazzarini, 1997; Lacombe, 1999; Nakano et al., 1999). Some insecticides have been banned or could not be recommended according to the current Control Insecticides Board (CIB), India guidelines. With malathion and chlorpyriphos, registered against aphids on apple is proposed to be banned, there is a need to evaluate new ones. The present study evaluates the efficacy of phosmet, a new molecule against *E. lanigerum*.

MATERIALS AND METHODS

Field experiments were carried out in apple orchard at farmer's field at village Brua in Manali area during 2017 and 2019. The trials were laid in randomized block design on 10-15 years old trees of variety 'Royal Delicious'. Three concentrations of phosmet (@ 0.025, 0.05 and 0.075% along with standard chlorpyriphos (@ 0.05 %) were evaluated as foliar application at post-harvest stage i.e. October- November. Two more concentrations viz., 0.1 and 0.15% were observed only for phytotoxic symptoms. There were five treatments including an untreated control, each treatment replicated four times with single tree as a replication. Spray was done with a high-volume sprayer in October @ 10 l of spray fluid/ tree. The pretreatment counts on the number of woolly apple aphid colonies on ten randomly selected twigs were observed in each treatment one day before the spray, while post- treatment counts were made after 3, 7, 14 and 21 days of the spray. These data were analyzed statistically after subjecting to $\sqrt{n+1}$ transformation. The plants were also observed for phytotoxic symptoms, if any.

RESULTS AND DISCUSSION

Data on the number of woolly apple aphid colonies/ twig during 2017 and 2019 presented in Table 1 reveal that all the treatments are effective against the aphid.

Table 1. Efficacy of phosmet 50WP against woolly apple aphid (2017, 2019)

Treatments	2017					2019				
	No. of woolly apple aphid colonies/ twig									
	Pre count	3 DAT	7 DAT	14 DAT	21 DAT	Pre count	3 DAT	7 DAT	14 DAT	21 DAT
Phosmet @ 0.025%	12.06 (3.61)	3.10 (2.01)^{b}	2.74 (1.93)^{c}	2.10 (1.76)^{c}	0.54 (1.24)^{b}	6.32 (2.70)	3.22 (2.05)^{b}	1.58 (1.59)^{b}	1.54 (1.59)^{b}	1.18 (1.46)^{b}
Phosmet @ 0.05%	10.42 (3.37)	1.96 (1.72)^{a}	1.32 (1.52)^{b}	1.04 (1.43)^{b}	0.40 (1.18)^{b}	7.06 (2.83)	2.88 (1.96)^{b}	0.98 (1.40)^{b}	1.10 (1.43)^{ab}	0.42 (1.19)^{ab}
Phosmet @ 0.075%	11.02 (3.46)	2.36 (1.82)^{ab}	1.22 (1.49)^{b}	1.14 (1.46)^{b}	0.36 (1.17)^{b}	7.38 (2.88)	2.74 (1.93)^{b}	1.20 (1.48)^{b}	1.18 (1.47)^{ab}	0.82 (1.34)^{ab}
Dursban @ 0.05%	10.68 (3.41)	2.22 (1.78)^{ab}	0.30 (1.14)^{a}	0.08 (1.04)^{a}	0.06 (1.03)^{a}	7.28 (2.87)	1.10 (1.45)^{a}	0.10 (1.05)^{a}	0.30 (1.14)^{a}	0.10 (1.05)^{a}
Control (water spray only)	10.56 (3.40)	10.74 (3.43)^{c}	12.04 (3.61)^{d}	12.82 (3.71)^{d}	11.04 (3.47)^{c}	5.40 (2.52)	5.70 (2.57)^{c}	6.28 (2.68)^{c}	6.72 (2.73)^{c}	7.20 (2.82)^{c}
CD (p = 0.05)	NS	0.27	0.20	0.16	0.06	NS	0.25	0.30	0.40	0.37

Figures in parentheses √ (n+1) transformed values; Each replication consisted of 10 twigs; Means followed by common letters do not differ significantly; DAT = Days after treatment

During 2017, after three days after spray (DAS) aphid colonies/ twig ranged from 1.96 to 3.10 in the treated plants compared to 10.74 in the untreated control. Phosmet @ 0.05% recorded significantly less aphid colonies/ twig (1.96) followed by chlorpyriphos @ 0.05 % (2.22), phosmet @ 0.075 % (2.36) which were at par with each other. Similarly, during 2019, aphid colonies/ twig ranged from 1.10 to 3.22 in treated plants. Chlorpyriphos showed significantly less aphid colonies (1.10) as compared to phosmet @ 0.075, 0.05 and 0.025%. Similar trends were observed after 7 DAS, during 2017 and 2019, with chlorpyriphos (0.05%) exhibiting significantly higher toxicity to aphid as compared to phosmet; however, phosmet (0.05 and 0.075%) was statistically at par. During 2017, aphid colonies/ twig in chlorpyriphos treated plant was 0.30 whereas it was 1.22 and 1.32 in phosmet (0.075 and 0.05%) treated plants, respectively. In 2019, chlorpyriphos resulted in 0.10 aphid colonies while it was 1.20 and 0.98 in phosmet @ 0.075 and 0.05%, respectively; only least control was obtained with phosmet @ 0.025% (1.46 aphid colonies/twig). On 14 DAS, all treatments continued their efficacy, and chlorpyriphos proved highly effective followed by phosmet @ 0.05%. During 2017, similar trends were observed even after 21 DAS; however, chlorpyriphos was found to be statistically at par with phosmet @ 0.05 and 0.075% after 14 and 21 DAS during 2019.

Chlorpyriphos 0.05 % was found to be the most effective insecticide (0.06 average number of colonies/ twig during 2017) and it was followed by phosmet @ 0.075% and 0.05%. All the treatments were found safe with no phytotoxic symptoms. Pree (1979) found that phosmet provided good control of Oriental fruit moth and was least toxic to the parasite, *Macrocentrus ancylivorus* (Rohwer) amongst azinophosmethyl and permethrin. Bradley et al. (1997) placed phosmet in 'no or little toxicity' (<10 %) category while evaluating effect 31 pesticides on *Aphelinus mali*, a parasitoid of woolly apple aphid. The results of the present study corroborate earlier results on chlorpyriphos as highly effective (Thakur and Gupta, 1998; Khajuria et al., 2010). Singh and Bhardwaj (2018) reported higher toxicity of chlorpyriphos and thiamethoxam against aerial form of woolly apple aphid. Keeping in view the over /and longtime use of chlorpyriphos, its toxicity to the parasitoids/ predators and in case of restrictions on its further use in agriculture in the coming time, phosmet @ 0.05% may provide an alternate and comparatively safer molecule for the suppression of woolly apple aphid.

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