SCREENING OF ACARICIDAL FUMIGANTS FOR THE CONTROL OF TRACHEAL MITE DISEASE OF HONEY BEES IN PAKISTAN

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Abstract

Three acaricidal fumigants namely Folbex, Perizin and Frow mixture were evaluated, under local condition, for their efficacy against the tracheal mite disease of honey bees in aparies in N.W.F.P. The fumigants significantly reduced the number of sick bees and showed gradual increase in assumption of normal routine foraging than in the control where the colony population quickly dwindled resulting in complete collapse. Folbex strip fumigation proved comparatively economical and more effective. Perizin was better than Frow mixtures.

Introduction

Tracheal mite is one of the most destructive endoparasite of young adult honey bees, generally known as acarine disease. Its causal organism, *Tarsonemus woodi* Rennie described by Rennie et al (1921) later changed to *Acarapis woodi* [Rennie) by Hirst (1921) and included in family Scutacaridae: *A. woodi* is very small in size and is able to enter through the prothoracic spiracles to invade the tracheal system of young bees less than 12 days of age. (Eckert and Shaw 1974).

Jeffree (1959) reported acarine disease as the most serious problem in some states of America. Adam (1968) reported that almost all the honey bee colonies in British Isles perished in1904 due to the great malady called the "Isle of Wight disease" and later it swept away 90% of the colonies during 1913. Morgenthaler (1951) and Morse (1978) reported that tracheal mite is a serious major pest of honey bees. Woyke (1984) reported 90% mortality of the *Apis mellifera* colonies in Afghanistan.

Acarapis woodi was reported as parasite of honey bees in Pakistan in 1981 (Khan 1982) but its presence in the neighbouring countries India, Afghanistan and USSR is well documented. Singh (1957) reported its presence on *Apis cerana* in India might have been introduced into Pakistan by different means. Consequent upon Russian intervention of Afghnistan in1979 the Afghan refugees along with their other belongings and livestock, brought their honey bee colonies of *Apis mellifera* to Pakistan in 1980. Scattered settlement of these refugees and their frequent migration to different places introduced this mite in Pakistan and caused out break of acarine disease in Pakistan in 1982-83, bringing about 85% and 70% mortality in *Apis cerana* and *Apis mellifera,* respectively.

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N.W.F.Province being the base for most refugee population suffered the most as all apiaries were hard hit and *Apis cerana* colonies completely perished on account of this disease.

Illingworth (1928) applied Frow treatment of nitrobenzene mixture to control the acarine disease but its application promoting robbing, Frala (1950) applied hydrochloric acid in the Frow treatment during the broodless period. Atwal *et al* (1970) recommended the use of methyl salicylate, methnol and chlorobenzilate separately for the control of the parasitic mites. Methyl salicylate (oil of wintergreen) has been found fairly effective in the control of these mites by Eckert and Shaw (1974). Grobov (1976) has use of Naphthalene, Sulpher, Chloroben zilate, Methnol, Methyl salicylate, Nitrobenzene, Phenothiazene and Safrol in European countries against mites but none proved effective.Morse (1978) reported several miticides including chlorobenzilate (Folbex), phenothiazene, naphthalene, tobacco and sulphur as potential fumigants for the control of the tracheal mite disease but none of these has been adopted universally. Khan *et al* (1986) found the use of Folbex fumigant strip in combination with the dequeening treatment very useful for control of tracheal mite.

Materials and Methods

The trials were conducted in the Apiary at the Agricultural University, Peshawar during the year 1984-85. Following Acaricidal fumigants were tested:

1. Folbex – one strip per week.
2. Perizin – 25 ml per week.
3. Frow mixture – 5 ml per week.

For Folbex treatment a shallow super was placed in each hive without frames.The treatment was applied after closing the entrance at dusk when the bees had stopped foraging and were all back in the hive. The colonies were kept warm to avoid clustering of bees. The Folbex strip was fixed to the underside of the top inner cover in the middle with the help of drawing pin, leaving the strip hanging downwards in the empty super. The lower end of the strip was ignited to glow and give off fumes. The top cover was replaced tightly, to avoid leakage. An hour after the treatment the entrance was opened but the empty super was removed at daybreak. Subsequent treatments were repeated the same way.

Frow was prepared by mixing nitrobenzene, safrol oil and petrol in the ratio of 2:1:2 and 5 ml mixture was poured on the flannel pad which was fixed on the underside of the top inner cover.

Ten ml of Perizin was mixed in 500 ml of distilled water and 25 ml of the mixture was sprinkled with the help of atomizer on the hive frames starting from one end to the other.

In the control treatment one teaspoon of lukewarm distilled water was sprinkled over the frames.

The observations were recorded on the number of paralysed honey bee workers in each colony at the start of the experiment and at intervals of 2 weeks. To ascertain the results microscopic examination of prothoracic tracheae of the workers was also carried out after 42 days of the treatment. The tracheae infected with mite were clearly seen congested while the healthy ones were with shining appearance.

Results and Discussion

The data based on the observations recorded 2, 4 and 6 weeks after treatment are presented below:

Table 1

Comparative % Reduction in Acarine Disease in Honey Bees

Treatment	After 2 weeks	After 4 weeks	After 6 weeks	% Mite in Micro-scopic Test
Folbex strip	50	100	Colonies Normal	Nil
Perizin	42	75	No paralysis	10
Frow mixture	36	64	- do -	16
Control	*75	*100	Colonies perished	100

* % increase in disease in control.

It is quite evident from the above data that acarine disease was reduced considerably after 2 weeks in all the treated colonies as against 75% increase in disease in the control. After 4 weeks the position was more clear when 100%, 75% and 64% disease was wiped out from the colonies treated with Folbex, Perizin and Frow mixture, respectively, where as 100% increase in disease was noticed in check. Colonies treated with Folbex became normal after 6 weeks and disease was also completely controlled in Perizin and Frow treated colonies although 10% and 16% bees harboured stages of the mite which disappeared in a few days without causing any paralysis. The colonies in control completely perished due to the disease.

In order to ascertain the comparative efficacy of the acaricids the data were statistically analysed for significance.

Folbex proved more effective than Frow mixture and Perizin albeit the difference with Perizin was not significant. Perizin and Frow mixture were clearly more effective than control but among each other the difference is in significant.

Table 2

% Reduction in Disease in Honey Bees in Different Acaricidal Treatments After 2 Weeks.

Replication	Folbex	Perizin	Frow Mix	Replication Total
1	44	39	32	115
2	56	44	41	141
3	40	38	34	112
4	60	47	37	144
Treatment Total	200	168	144	512
Mean	50	42	36	–

ANOVA

CV	DF	SS	MS	'F' Value
Replication	3	283.33	94.445	6.391N
Treatment	2	394.67	197.335	13.3538**
Total	11	766.67	69.697	4.716
Error	6	88.664	14.777	–

L.S.D. = 8.45

Means in ascending order	Frow Mix	Perizin	Folbex
	36	42	50

Under lines show nonsignificance at 5%

Conclusion

Folbex strip treatment controlled acarine disease in honey bees upto 50% in 2 weeks and completely wiped out in 4 weeks to make the colonies function normally in 6 weeks. Perizin and Frow mixture treatments took 6 weeks to completely control the disease whereas colonies in control treatment perished altogether in 4-6 weeks.

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