

ACARINE DISEASE OF HONEY BEES AND ITS CONTROL IN PAKISTAN

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Abstract: Acarine disease of young honey bees appeared in Pakistan for the first time in epidemic form, inflicting 85% loss of honeybee colonies during 1982-83. Application of the dequeening method for the control of tracheal mite disease gave encouraging results particularly in the queen-right and dequeened colonies. The queen-right colonies were recovered sooner than the dequeened colonies. A supplementary fumigation of Folbex strip is helpful. The supply of a booster clean package bees to the queen-right colonies helped in building up the colony strength quickly.

Introduction

Acarine disease (tracheal mite disease) is one of the most destructive diseases of young bees. It is caused by microscopic mite, *Acarapis woodi* (Rennie) (Scutacaridae: Acarina). In severe cases, the colony population would dwindle, ultimately death results (Dadant 1975). Jeffree (1959) reported that acarine disease would be the most serious problem in some areas of North America. Morse (1978) viewed *Acarapis* mite as a serious pest of honeybees. Adam (1968) reported that almost all the honeybee colonies at the British Isles perished in 1904 by the great epidemic called the Isle of Wight disease and later it swept away 90% of the colonies during 1913. Those that survived were of Ligurian or Caronolan origin. By the end of 1919 the causal organism (*Acarapis woodi*) of this malady was discovered. Adam (1985) imported a huge number of honeybee colonies in skeps from Holland under the British Restocking Scheme in 1919 for resistance breeding programme. He confirmed in 1925 that the bright coloured strains are susceptible to acarine.

Dadant (1975) reported that may be difference in susceptibility to acarine disease is within a given population of bees. Woyke (1984) reported 90% loss of the *Apis mellifera* colonies in Afghanistan. According to his findings acarine mites cannot survive in colonies that undergo a long broodless period. Ruttner and Koeniger (1980) recommend biological control for the parasitic mites in Europe.

The tracheal mites occur in several South American and Eurasian countries including USSR and recently introduced into many states of America as reported by Eckert and Shah (1974).

This disease has never been recorded in the North West Frontier Province of Pakistan prior to 1980. According to the report of the Entomologist, ARI, Tarnab (Khan 1982), this

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tracheal mite was introduced during 1981 by the Afghan Refugees who brought with them honeybee colonies for the first time. The situation was greatly aggravated by their migration of honeybee colonies from one area to another in search of the best bee flora which caused its quick dispersal throughout the province and 85% of the honeybee colonies were perished in 1985.

On invitation of the Government of Pakistan, Dr. Wilhelm Drescher (Professor of Bonn University, West Germany) inspected all the diseased apiaries of the government and private beekeepers including Afghan Refugees and suggested the Folbex fumigant strips for its control. Then the Government for the first time imported the Folbex-strips in bulk through the Pakistan CIBA and GIEGY Ltd., and supplied to the beekeepers at subsidized rate. Illingworth (1982) applied the Frow treatment consisting of 2 parts of nitrobenzene, 1 part of safrol oil and 2 parts of petrol (gasolene) to control the parasitic mites. Since this treatment destroys hive-odour to stupefy the bees to some extent and it frequently promotes robbing which must be guarded against because robbing plays an important role in disease transmission. Atwal and Sharma (1970) recommended the use of methyl salicylate (oil of winter green), methanol, and chlorobenzilate for the control of the parasitic mites. Frala (1950) applied hydrochloric acid in the Frow treatment during the broodless period because the acid tends to injure brood. Grobov (1976) reports at least eight materials are being used in Europe against mites but no one of these is described as being outstanding. Morse (1978) reported that several miticides (acaricides), including chlorobenzilate (folbex), phenothiazene, methanol, methyl salicylate, nitrobenzene, naphthalene, tobacco and sulphur, all being used as differential fumigants but no one of these techniques has been adopted universally.

Morgenthaler (1931) demonstrated that emerging bees, combs of honey or brood are not infested and that 12 days old bees are immune from the attack by this parasitic mite. Svoboda (1947) suggested establishing of new colonies with emerging brood in temperature control cabinets and maintaining the colonies under artificial conditions until the bees have passed the susceptible age of 12 days. Morse (1978) reported that the maintenance of populus colonies is helpful.

Methods and Materials

Ten egg laying queens of two years age were removed, each in a queen cage, from the infested colonies. Each queen was put into a new hive along with the only frames of ripe worker pupae, free of brood parasitic mites. Each caged queen and the hive was tagged with the same number of her respective previous hive from which she was removed. Three drawn frames were also put into the queen-right hive for oviposition. Immediately these queen-right hives were placed at the site of the old (original) dequeened hives respectively for five hours to receive the respective sister foragers. The entrance of each dequeened hive was turned to the opposite direction to stop the entry of incoming bees. After five hours the queen-right hives were shifted 2 miles away to the mite free area. Both the queen-right and dequeened hives were regularly fed with sugar solution for 15 days even during the honey flow. Half of the each lot i.e. 5 queen-right and 5 dequeened hives were fumigated with Folbex strips at the rate of one

strip per colony per week. The rest of 5 queen-right and 5 dequeened colonies were left untreated for comparison. The entrances of the treated colonies were kept closed for an hour and kept warm particularly during cold months to avoid clustering. The entrances were regularly opened after one hour without fail.

Results and Discussion

This disease caused heavy ravages in 1982-83 and the great epidemic almost swept away all the colonies particularly of *Apis cerana* in Peshawar Region and spread like wildfire throughout the country including the natural habitats of honeybees like Swat, where the honeybees are still kept in earthen pitchers and hollowed tree trunks (logs); and consequently the farmers and the honey beekeepers were deprived of honeybees, pollination and honey income.

In view of the economic losses caused by the acarine disease in Pakistan particularly in the Frontier Province which witnessed a complete setback of the cottage industry in 1983, the authors initiated a series of control experiments during 1983 through 1985, of which the dequeening method gave the encouraging results.

Table I Recovery duration of the bee colonies from
Tracheal Mite Disease

Treatment	50%	100%
	Recovery in (days)	Recovery in (days)
1. Queen-right Folbex treated	3	12
2. Queen-right Untreated	5	15
3. Dequeened Folbex treated	10	18
4. Dequeened untreated	15	25

The data in table 1 indicate that fifty percent reduction in mortality (paralysis of honeybees) was recorded 10 and 15 days after the division in the treated and untreated dequeened colonies respectively, whereas the same reduction percentage was recorded on 3rd and 5th day of the division in the treated and untreated queen-right colonies, respectively. The treated and untreated dequeened colonies were completely recovered after 18 days and 25, respectively, whereas complete recovery was noted on the 12th and 15th days of the division in the treated and untreated queen-right colonies, respectively.

**Table 2 Comparative Recovery Duration of bee colonies
from Tracheal Mite Disease**

Colony position	Folbex Treated	Untreated	Difference
	Days	Days	Days
Queen-right	12	15	3
Dequeued	18	25	7

Table 2 indicates that both the queen-right and dequeened treated colonies were recovered 3 and 7 days earlier than the untreated ones. The least difference was found in queen-right colonies due to the low disease virulence because of the absence of young bees at the time of division which are the potential source of infestation. The one week old bees are more susceptible to the disease providing an ideal situation for the development and multiplication of disease, resulting in the premature death of honeybees. Similarly the reduction in number of youngest bees in the dequeened colonies is reciprocally proportional to the virulence of disease.

The dequeened colonies raised good queens whose fecundity, particularly mated in April, was better than the mother queens. Moreover the daughter queens and the son drones of the dequeened colonies showed no symptoms of the tracheal mite disease.

In regions like Peshawar, where severe winter and summer seasons exist, it is preferable to devise a mechanical type of control method than the chemical ones which involve direct use of toxic fumigants in combination with one and more chemical compounds. In the Frontier Province the tracheal mite disease usually takes a heavy toll of the honeybees in winter such as it did during 1981-82, 1982-83 and 1983-84. As a matter of fact, the honeybees form clusters in the coldest months of the winter season and particularly in hilly areas which made the chemical fumigation ineffective or very costly by putting colonies in the heated (warmed) enclosures at night and bringing them out at dawn. The clustering of honeybees prevents the free circulation of fumes and on the other hand it helps insuring the disease transmission among the sister bees. Thus this mechanical dequeening of method will go a long way in controlling the malady and to minimise the side effects and hazards caused by the usage of chemical compounds. During natural breeding season of the honeybees, it is preferred to cage the honeybees queen and place it in the new hive alongwith her daughter foragers and booster package bees from mite free areas. If the booster packages are not available then all the sealed worker pupae, free of brood mites, are to be placed in the incubator till emergence for putting them into the mother queen hive, but in no case the young honeybees of less than two week age and larvae should be allowed to mix with the queen-right hives.

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