Chapter 14

Thai Sac Brood Virus Disease Control in Vietnam

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In 1974, there were in North Vietnam 75,000 *Apis cerana* colonies kept in movable-frame hives with an average honey yield of 10–15 kg per hive per year. Colonies were well crowded with bees normally densely clustering on 5–6 frames but some reaching 9–10 frames (Anh and Dang, 1984). In April of the same year, a sac brood epidemic broke out. It first occurred in colonies imported from China and placed at Bach Thao apiary, Hanoi. Within a short time, it quickly spread to northern provinces causing losses of tens of thousands of colonies (Mulder, 1989; U.T.D., 1983; Vien, 1984). In some localities over 90 per cent of colonies were lost, e.g., before the epidemic there were 4300 colonies in the Thai Binh beekeeping company, but only 96 colonies survived (Ngan, pers. comm.). In 1977, it was estimated that only 7000 colonies were left in the country. By 1988, this number had increased to 15,000 frame-hive colonies but colony quality was worse than before the epidemic: a colony consisted of 3–4 frames only. In 1989, the presence of Thai Sac Brood Virus (TSBV) was determined in *A. cerana* colonies by Vincent Mulder, and Brenda Ball from Rothamsted Experiment Station in England.

Unlike in Thailand, Nepal or India where four to five years after the epidemic surviving colonies began to develop normally and the disease became less harmful (Kshirsagar and Phadke, 1984; Verma, 1990), TSBVD still lasts year after year in northern and southern Vietnam and causes large losses in some localities.

Treatment

Antibiotics

Since TSBVD occurred, many antibiotics have been tried in the hope of finding a successful treatment. These have included kanamicin, furazolidon, sulphathiazon natri, erythromycin, tetracyclin, biomycin (Anh, 1984), streptomycin (Vien, 1984), $KMnO_4$ 0.1%, rivanol 1 %, neotesol, chloramphenicol and penicillin. They were fed with 50% sugar syrup or sprayed into comb cells. However, effectiveness was very low. Some beekeepers put furazolidon into a small tin jar covered with mosquito netting and also sprayed it on to infected combs. This method is effective only for strong, populous, and lightly infected colonies. For the less crowded ones, it does not work. Residue of antibiotics remains in combs and honey.

Manual methods

Some beekeepers stimulate infected colonies to abscond artificially, then catch them again and force them to build new comb. Others remove

all brood comb and keep honeycomb. Some colonies recover but some do not and abscond. It is also time consuming.

Biotechnical methods

TSBVD can be controlled by biotechnical methods (Chinh, 1989) either by requeening an infected colony with a virgin queen or queen cell, or by caging the queen of an infected colony for 7–8 days. These two methods need to be combined with eliminating old combs in order to increase the density of bees on remaining combs. Feeding sugar syrup continuously for 3–4 days until honeycomb is sealed or moving colonies to new floral resources are also essential. These methods aim at creating a young-larvae-free period for 7–8 days, especially free from two-day-old larvae that are most sensitive to TSBV (Bailey, 1981). At this time, additional feedings are given to the colony, which is populous, so that cleaning behaviour is strengthened for picking up or eating all infected larvae. In this way, the causative agent can be reduced and even dry larval scales, if they remain, cannot spread the disease. Cells that are cleaned will be filled with nectar or sugar syrup by the bees. Seven to ten days later, the queen will start to lay eggs and the colony will recover. Results of a three-year experiment show that by carrying out these two biotechnical methods, more than 90 per cent of colonies recover (Tables 1 and 2).

Depending on climatic conditions, floral resources and the status of the apiary, the beekeeper has to decide whether to requeen or cage the laying queen. In favorable seasons when nectar and pollen sources are adequate, it is easy to rear a queen from a strong and disease-free colony. Replacing a laying queen of the infected colony with a queen cell is more efficient. When nectar and pollen are scarce and climatic conditions are not favorable, it is advisable to cage the queen because it will be difficult to rear a queen and the virgin queen will not have performed a mating flight successfully. However, when the caging method is used some colonies will become infected again so this is a temporary solution. When conditions improve, queens of re-infested colonies should be replaced.

Table 1. Effect of replacing laying queens with virgin queen or queen cells (Chinh, 1989)

Group	No. of colonies per group	No. of recovered colonies	Recovery rate (%)	Floral condition
November 1986				No nectar, sugar syrup feeding
Control	6	0	0.0	
Requeening	18	17	94.0	
April 1987				Honey-flow of longan flower
Control	6	3	50.0	
Requeening	22	20	90.9	
May 1988				Some nectar and pollen resources
Control	6	1	16.7	
Requeening	20	18	90.0	
Total				
Control	18	4	22.2	
Requeening	60	55	91.7	

Table 2. Effect of caging the queen for seven days (Chinh, 1989)

Group	No. of colonies per group	No. of recovered colonies	Recovery rate (%)	Floral condition
December 1988				Honey-flow
Control	6	3	50.0	
Queen Caging	15	14	93.3	
February 1989				Little flow, rainy weather and cold
Control	6	0	0.0	
Queen Caging	25	18	72.0	
Total				
Control	12	3	25.0	
Queen Caging	40	32	80.0	

Selection for Resistance to TSBVD

In 1983, the veterinary doctor Mai Anh co-operated with the Thai Binh Beekeeping

Table 3. Mean values of some parameters of closed population breeding programme for *Apis cerana* in Vietnam from 1990–1993. Values in parentheses show the range (Chinh and Lap, 1994)

	Mean (range)			
	1990	1991	1992	1993
Honey production (kg/colony)	10.2 (5.4–16.8)	11.23 (6.1–20.8)	13.73 (6.6– 21.75)	15.54 (7.4–24.9)
Number of capped brood/day	406 (218–713)	425 (154–1290)	382 (152–945)	403 (172–945)
TSBVD (% infected colony)	23.1 (0–85.7)	11.8 (0–26.7)	4.8 (0–16.7)	2.3 (0–13.3)
Europe Foul Brood (% infected colony)	45.4 (0–85.7)	41.9 (0–66.7)	18.0 (0–40.0)	17.2 (0–40.0)
Absconding rate (% colony)	4.2	3.8	3.5	3.3
Swarming rate (% colony)	10.5	10.4	10.2	3.1

Company to select the TSBVD-resistant colonies for queen-rearing in order to replace queens of infected colonies. It showed good effect in the first generation, but in the second and third generations disease resistance had decreased remarkably. A selection programme for high honey production with *A. cerana* was carried out from 1989 to 1993. The closed population breeding programme proposed by Page and Laidlaw (1982) was applied and preliminary results have been achieved. The rate of TSBVD infected colonies is low and has a tendency to reduce year after year from 23.1% to 2.3% (Table 3).

Conclusion

In general, in an apiary of 40 or more colonies, it is advisable to rear queens regularly (from strong and disease-free colonies) for replacing old queens and reducing egg-laying capacity of colonies infected with TSBVD. If requeening is routinely carried out, infection of TSBVD can be reduced remarkably. It has been concluded in regular beekeeping practice with *A. cerana* that all combs of a colony must be densely covered with bees. So when colonies are attacked by TSBVD and are weakened, it is always necessary to remove unoccupied combs. In cases where colonies are reduced to less than three combs, two colonies should be united into one. It is important to detect first signs of the disease (i.e., death of older larvae that turn into liquid sacs). At an early stage it is easy to treat colonies successfully and reduce losses of worker bees.

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