Chapter 15

Study on Thai Sac Brood Virus Disease of *Apis cerana* in Nepal

K.K. Shrestha and Nabin C.T.D. Shrestha***
* Beekeeping Project, ICIMOD, Nepal
**Bee Development Section, Department of Agriculture, Godawari, Nepal

Incident of TSBV Disease

Beekeeping with *Apis cerana* is decreasing among beekeepers in Nepal because of the frequent incident of brood diseases, mainly Thai Sac Brood Virus Disease (TSBVD). It is the most prevalent *A. cerana* brood disease in Nepal, and between 1980 and 1984 killed more than 90 per cent of colonies. During 1980, it was observed spreading in eastern border areas; and during 1983, its spread along the western border created a crisis in Nepalese beekeeping causing almost total loss of colonies. This was the first historical evidence of this disease on such a scale. It is possible that it was introduced from India as it was first observed in northern parts there during 1976. The disease started to subside by 1984 and bees began to regain normal populations in the eastern border. At present, TSBVD still occurs in almost all parts of the country causing epidemics during some seasons and as a result *A. cerana* colonies are declining at a rate that threatens the survival of the species. In districts such as Chitwan, Bhojpur, Makawanpur, Jumla, Jajarkot, Tanahun, Dolakha, Sindhupalchowk, Kaverepalanchowk, Rolpa and Kathmandu its presence has been confirmed. The disease tends to be seen in early spring and early autumn when brood-rearing is at a peak, and also whenever colonies are weak.

Status of Disease at Different Locations

Mid-Western Region: Jumla District (high-hill region)

In Jumla, TSBV infection rate was mostly high in the following areas surveyed during 1996 and 1997. In Chaukidhunga, during field surveys in 1996, 50 per cent infection was observed in four colonies of the ICIMOD apiary. Colonies of local beekeepers were free of disease and strong. In the same location when resurveyed in 1997, hives were found almost empty. Only three weak colonies were present against 66 the year before. It was obvious that transmission of TSBVD was from nearby infested apiaries through robbing, infested forage bees and improper handling by beekeepers. In Patmara, TSBV infection was 100 per cent in the ICIMOD apiary during 1996. Although infection was high, colonies were not too weak. However in 1997, no colonies remained in the ICIMOD apiary. Beekeepers' colonies were also highly infected with TSBV and had low honey and pollen storage. In Chandan Nath during 1996, ICIMOD apiaries located at the Karnali Trade School (KTS) and at Dadakot

were seriously affected by TSBVD with about 50 per cent brood-comb infection. During 1997 the KTS apiary lost all but two colonies and caught three new swarms. At the Dadakot apiary, all bees absconded leaving diseased brood behind and no hives were occupied. In Gidikhola, low (33 %) brood-comb infection was seen in the ICIMOD apiary during 1996. In 1997, only one of six colonies remained.

Western Region: Tanahun District (mid-hill region)
In Dhorfirdi, colonies were in good condition in newly established apiaries owing to good management practices by well-trained farmers supported by the government's Beekeeping Section. However, at the Akie Vocational Training and Community Development Project, colonies with newly introduced swarms looked after by women farmers showed low TSBV infection in 1996 but all had absconded in 1997 as a result of bad colony management.

Eastern Region: Bhojpur District (mid-hill region)
In Bhaisipankha, all colonies in log hives surveyed in 1996 showed 20 per cent infection. In 1997, they had been transferred to modern hives with newly swarmed colonies and were performing well with no disease. In Taksar, TSBV infection was lower in 1997 than in 1996 mainly because strong colonies were able to suppress the disease. The beekeepers of Bhojpur were skilled. Although TSBVD was seen in some colonies, colony losses were few. Mostly it was neglected colonies that were highly infected. In Pokhim, TSBV infection was mostly in log hives and modern hives because of poor management; colonies in wall hives were performing well without any brood disease.

Central Region: Dolakha District (high-hill region)
Beekeepers were well trained in handling beehives. Mostly modern and some wall hives were found. Only 15.7 per cent TSBV infections were recorded in 1996 and 4.7 per cent in 1997.

Sindhupalchowk District (high-hill region)
Beekeeping is not widespread here because of scarcity of bee flora. Only Chautara was surveyed. Farmers were found keeping bees in modern hives with very few TSBV infected colonies.

Kavrepalanchowk District (mid-hill region)
As there is sufficient bee flora and an abundance of cherry trees in the forest, colonies can be found in most locations. In some locations, wall hives were preferred to modern hives, and had no TSBV infection. In other locations with newly established apiaries, TSBVD causes continual loss of colonies.

Makawanpur District (mid-hill region)
Bee colonies are confined to pockets because of insufficient and scattered flora. Locations that were infected with TSBVD in 1996, were free of disease in 1997 owing to frequent absconding and swarming of colonies for better flora pasture. In nature, colonies become virus-free when there is a one-week gap in brood-rearing.

Chitwan District (Terai)
Beekeepers focus on commercial beekeeping with *A. mellifera* bees. Some beekeepers also keep *A. cerana* colonies. TSBV infection was seen in most modern hives. So absconding is common. Only one wall hive in Ratnanagar showed good colony development with no disease.

Kathmandu District (mid-hill region)
Nearly all private beekeepers have changed to *A. mellifera* beekeeping although small farmers keep one or two *A. cerana* colonies by catching natural swarms. In the Royal apiary, there was little TSBV infection during spring 1996. However in autumn 1997, all colonies were in a broodless condition owing to scarcity of bee flora.

Lalitpur District (mid-hill region)
Both ICIMOD and government apiaries at Godavari were infected with TSBV in both weak and strong colonies: 20 per cent in 1996 and 30 per cent in 1997. TSBVD has become established in these old apiaries.

Bhaktapur District (mid-hill region).
No TSBV infections were seen at the KNSN *A. cerana* apiary at Patletar in 1996 and 1997. This is a newly established apiary with no nearby beekeeping areas.

Colony Losses in Surveyed Areas

Among the areas surveyed, TSBV infection rate was highest in Jumla. Within one year only (1996–1997), colony losses of ICIMOD apiaries at Patmara, Chaukidhunga and Dadakot were 100 per cent, at KTS 80 per cent and at Gidikhola 83.3 per cent. Owing to a lack of movable-frame hives, the condition of bees cannot be seen easily and seasonal management approaches are not applied. As a result, TSBVD is multiplying and spreading into healthy colonies. Unknowingly, farmers are spreading the virus through improper handling and the catching of diseased swarms. In Bhojpur District, colony losses were 33.3 per cent in Bhaishipankha, 14.2 per cent in Takshar, 26.3 per cent in Bhojpur and 18.7 per cent in Pokhim. In the Central Development Region, colony losses were 21.4 per cent in Dolakha, 30 per cent in Sindhupalchowk and 11 per cent in Kavrepalanchowk. Besides TSBVD, other factors such as European Foul Brood, lack of proper management, insecticidal spray and scarcity of bee flora are the main reasons for declining populations of *A. cerana* colonies.

Field Observations

- Unskilled beekeepers were the main source for virus transmission, as they were not taking hygienic measures while handling colonies.
- Colonies that are weak because of a lack of seasonal management, traditional methods of honey-harvesting and primary infection by other diseases such as European Foul Brood, are more prone to virus attack and multiplication.
- Once TSBVD establishes in an apiary, it is difficult to remove it. Highly infected colonies are the main source for spreading the disease to healthy colonies. Such colonies should be destroyed or provided with better management at an early infection stage.
- Among hives, traditional wall hives seem to be most suitable for good colony development and lower TSBVD incidence.

Problems and Suggestions

As in many mountain countries, Nepal has placed emphasis on high-value crops: citrus throughout the mid-hills; apple in the inner Himalayan zone; and, vegetable-seed production in the hills and mountains including cash-crop farming. Beekeeping is a traditional household activity that, with little support of modern techniques, can improve the productivity of crops, fruits and vegetables through cross-pollination. Furthermore, it also helps in the preservation of the natural ecosystem through cross-pollination of forest plants. Hence, TSBVD management is essential. Most *A. cerana* beekeepers were found to be not thorough about modern management practices. As a result colony losses are high.

To solve the problem of TSBVD the following should be considered.

- Farmers should be convinced of the advantages of modern frames for proper seasonal management.
- Queens should be reared from disease-resistant colonies and supplied to beekeepers.
- Improvement of bees through selection and breeding should be carried out to prevent extinction of the species.
- As there is little expertise of bee diseases in many developing countries including Nepal, technology-sharing and transfer of knowledge through workshops, seminars and meetings of national and international groups should be organized.
- Suitable improved hives for better colony development that are less prone to TSBVD should be developed for the harsh and

changeable cold climate of northern parts close to the Himalayas. Desirable bee flora should be available; plantation should be encouraged.

- Exotic *A. mellifera* bees should be introduced only in tropical areas and should be strictly restricted from temperate regions for preventing disease transfer and risk of endangering indigenous bees.
- Before involving farmers in beekeeping, effective training, especially practical training, is necessary along with regular supervision and monitoring to establish good apiaries free of disease.