

Short Communication

A NEW DISEASE AFFECTING HONEY BEE COLONIES IN KANDY DISTRICT - A POTENTIAL THREAT TO BEE INDUSTRY

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INTRODUCTION

Several honey bee colonies in Digana, Menikhinna, Mailapitiya, Guhagoda and Katugastota areas were reported to abscond during 2012 and 2013 due to an unknown disease. The bee keepers complained that dead broods were found on the floor boards and outside the bee box together with inactive worker bees in some colonies. This situation caused 100 % economic loss and uncertainty of the future of bee keeping in the region. In a healthy bee colony, the brood combs are dense with convex capping. Whenever punctures appear on unfinished cells, they are with smooth edges and locate towards the centre of the cells. Therefore, the unhealthy colonies can be easily identified with the abnormalities of the cell arrangements. Honey bees are affected with number of diseases caused by bacteria, fungi, viruses, protozoans and acarines (Shimanuki *et al.*, 2000; Food and Environment Research Agency, 2013). Some honey bee diseases cause significant economic loss due to decrease in pollination and honey production (Munawar *et al.*, 2010; Shimanuki, 1980). The most commonly found diseases are American foul brood and European foul brood caused by bacteria, the fungal disease Chalk brood and Sac brood virus diseases. As by the mean of their names, these diseases affect the broods showing characteristic symptoms in them. Sac brood virus caused by *Morator aetotulas* is a common disease affecting both *Apis mellifera* and the Asian honey bee *A. cerana* (FAO, 2006). Thai sacbrood virus disease (TSBV) a new type of sac brood virus was first discovered in Thailand in 1981. It is also reported in Pakistan and Nepal, whereas in India 95 % colonies affected by this disease (Devanesan and Jacob, 2001). The objective of this study was to analyse the characteristic symptoms of the affected colonies and to diagnose the disease spreading in the Kandy district in order to find possible treatments and other control measures.

MATERIALS AND METHODS

Several bee colonies in Digana, Menikhinna and Katugastota areas were inspected for the brood comb characteristics, behavioural changes in bees and disease

symptoms. Pattern of cell arrangements in brood combs, appearance of holes in caps, position of larvae in the cells were monitored. Since the disease was reported more frequently and reportedly affecting colonies from different areas, samples of diseased and healthy brood and adults were collected for disease analysis from several colonies at Digana area at two occasions. Larvae and pupae were removed from their cells using forceps and directly placed in vials and petri dishes. Similarly, adult nursing bees were picked from the colonies. Sterilized petri dishes, vials, needles and forceps were used to collect the samples. Unhealthy larvae were observed closely. The dead and healthy brood and adult bees collected from Digana area were cultured separately at the Pathology division of HORDI for bacteria and fungi. The cultured plates were diagnosed at the Veterinary Research Institute, Gannoruwa. Similarly, another set of samples collected from Katugastota was sent to the Medical Research Institute, Colombo for the analysis of bacteria and fungi.

RESULTS AND DISCUSSION

The comb and brood characteristics of the inspected brood combs showed that they were unhealthy when only the broods were affected with an unknown disease. The brood cells showed a mottled appearance (Figure 1). The dead larvae in uncapped cells and pre-pupae in sealed cells were observed (Figure 2). The larvae were found to lie stretched out on their backs and head outward position in their cells (Figure 3). The diseased forms turned white to pale yellow with the spread of the disease. The diseased larvae were found in a sac like form filled with a creamy colour liquid. The dead larvae were odourless. In most affected colonies capped cells with diseased pre-pupae were punctured by worker bees (Figure 4). In some colonies the diseased larvae were ejected by the worker bees from their cells and were found on the floor board and outside of the colony (Figure 5). The workers were inactive as well and found on the floor boards in the some colonies (Figure 6). Many colonies were without the queen and multiple eggs laid by worker bees were found in a single cell (Figure 7). Further, with the decrease of the number of members in the colonies many were absconded. The diagnostic reports from Veterinary Research Institute and Medical Research Institute showed the presence of coli forming bacteria *Escherichia coli* both in diseased and healthy samples and *Penicillium* spp. in diseased samples. However, the reported bacteria and fungus do not have any history of showing such disease symptoms in bees.

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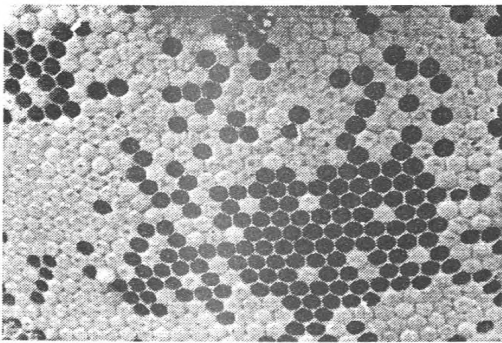


Figure 1. Mottled brood comb with sunken caps

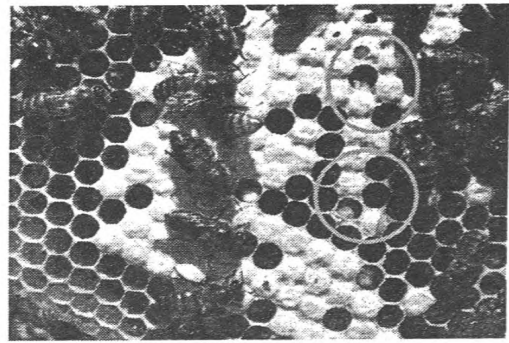


Figure 2. Diseased larvae



Figure 3. Diseased larva in stretched out position

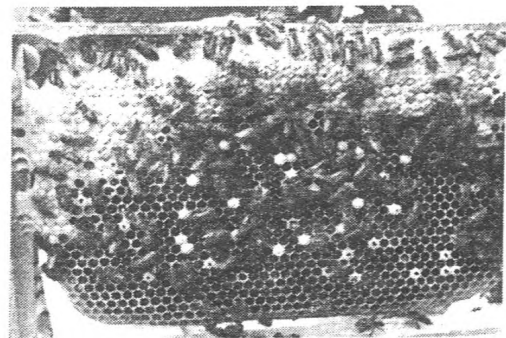


Figure 4 Scattered brood cells with punctured cell caps

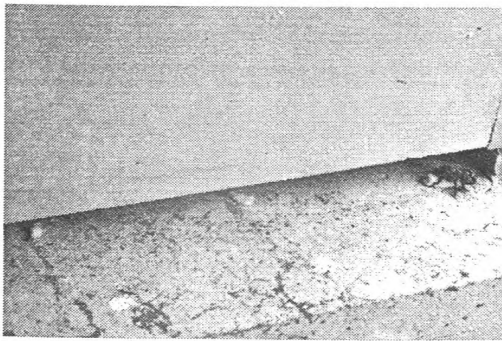


Figure 5. Diseased larvae ejected by worker bees

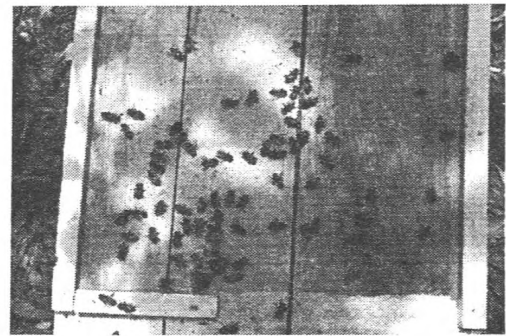


Figure 6. Inactive worker bees

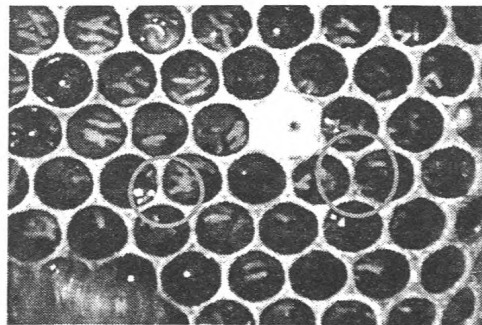


Figure 7. Cells with multiple eggs laid by worker bees

It was noted that the bee keepers have treated the diseased colonies with antibiotics with no observed results. Further, the disease symptoms observed are more identical with the symptoms of Thai sac brood virus disease (TSBV) (Shimanuki *et al.*, 2000; Devanesan *et al.*, 2001; FAO, 2006; Rana *et al.*, 2011). TSBV is known to occur with colonies under the stress of food scarcity, rainy weather, unhygienic bee boxes, affected colonies with other diseases etc. It is known to transmit via brood-food gland secretions of nurse bees (FAO, 2006). TSBV is reported with 4 year cycle of appearance with natural recovering of successive colonies in India (Verma *et al.*, 1990). Chemotherapeutic treatments are not effective for the control and there is no specific treatment found (FAO, 2006; Food & Environment Research Agency, 2013). Spreading of the disease can be prevented by minimizing the stress conditions. A weak colony can be strengthened by adequate food supply and addition of worker population. Further, regular inspection of bee boxes and improving hygienic spacious environment is important. For potential recovery, it is suggested to remove infected brood combs, colony isolation and replacement with a healthy queen. The apiary owners in developed countries apply artificial swarming method to quarantine infected colonies in extreme infestations.

CONCLUSIONS

The disease symptoms of the unknown disease spread throughout the bee colonies in Kandy district of Sri Lanka during 2012-2013 is suspected to be as Thai sac brood virus disease. Efficient management of the colonies by regular inspection, facilitating hygienic environment, adequate food supply in rainy periods and maintaining colonies with sufficient number of worker bees would prevent the spread of the disease. Natural recovery is also expected in strong colonies. In severe infected conditions, colony isolation and re-queening the colony are required to minimize the damage. However, application of molecular techniques is required for confirmation of the causal agent.

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