Applied Biological Research 15 (1): 53-56; 2013 **Short Communication**

OCCURRENCE OF NOSEMOSIS (*Nosema apis*) AFFECTING HONEY BEE (*Apis mellifera* L.) COLONIES IN KASHMIR

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ABSTRACT

The present study was aimed to determine the occurrence of *Nosema apis* (Nosemosis) on *Apis mellifera* L. in Kashmir. The samples of *A. mellifera* were collected from 6 districts of Kashmir in 3 seasons viz., spring (March - May), summer (June - August) and autumn (September - November) in the year 2011. The rate of nosemosis infection was assessed by counting the numbers of *Nosema* spores on the body of bees. Out of 270 honey bee colonies, 49 were infected with *Nosema*. The highest infection rate was observed in spring (41.1%) and lowest in summer (13.3%), however infection was low in autumn (0%). The mountainous climate of Kashmir and humidity in spring and summer favoured *Nosema* spreads, whereas *Nosema* incidence was very low in autumn perhaps due to the lack of humidity.

Key words: *Apis mellifera*, Kashmir, *Nosema apis*, parasite, spore

INTRODUCTION

Kashmir is suitable place for beekeeping owing to its topography, temperate climate and conducive environment for bees. However, one of the constraints in beekeeping in Kashmir is the prevalence of parasite and disease infection in bee colonies. Worldwide, Nosemosis is one of the most serious adult honey bee diseases (Fries, 2010) and is caused by intracellular microsporidian parasite of genus *Nosema* which produce spores of 4 - 6 x 2 - 4 µm size. *Nosema apis* spores are ingested by bee via contaminated water or food, by food exchange with other bees or in their duties of cleaning contaminated combs. For decades, Nosema disease was exclusively attributed to a single species of *Nosema*, *N. apis*, which was first detected in European honey bee *Apis mellifera*. In 1996, a new species *Nosema ceranae* was discovered in Asian honey bee *A. cerana* (Fries *et al*., 1996). In 2005, a natural infection of *N. cerana* was reported in *A. mellifera* colonies from Taiwan (Huang *et al*., 2005). Thereafter the infection of *N. ceranae* to *A. mellifera* was reported from Europe (Higes *et al*., 2006; Paxton *et al*., 2007), United States (Chen *et al*., 2007), China (Liu *et al*., 2008), Vietnam, etc. (Klee *et al*., 2007). *N. ceranae* since its emergence has been a potentially virulent pathogen of *A. mellifera* causing colony collapse of honey bees (Higes *et al*., 2008; Paxton, 2010). *N. ceranae* has recently expanded its host range to South American native bumblebees (Plischuk *et al*., 2009) causing a new epidemiological concern for this pathogen. Nosema disease reduces worker longevity by 22-44% which, in turn, reduces honey production and indirectly influences crop pollination (Fries *et al*., 2003). If a queen becomes infected, she is superseded. The existence of infection is known for more than 20 years; however there is limited information on the prevalence of *N. apis* in many countries (Aydin *et al*., 2006; Bahreini, 2007). *N. apis* infection has been noticed among honey bees in North America, Europe and Asia. Keeping in view the damages caused by *Nosema* in colonies and rising nosema infection, the epidemiological studies in variant geographical regions of beekeeping is essential. The

present study was aimed to determine the occurrence of Nosemosis on *A. mellifera* in Kashmir, an important beekeeping place in Western Himalayan region.

MATERIALS AND METHODS

In present study, 270 honey bee colonies were examined for their infection to Nosemosis. The honey bee (*A. mellifera*) samples were collected from 18 locations from 6 districts of Kashmir. viz; Anantnag (Darigund, Achabal and Kokarnag), Pulwama (Tral, Lurgam and Goose), Srinagar (Shalimar, Dara and Nishat), Budgam (Khanshab, Magam and Tangmarg), Bandipora (Arin, Chontimula and Ajas) and Baramulla (Watergam, Sopore and Dalina). The samples were collected from the apiaries of private beekeepers in 3 different seasons viz., spring (March - May) summer (June - August) and autumn (September - November) in the year 2011. Fifteen honey bees were randomly selected from each location (5 bees in each season). The samples were collected with the help of aspirator and put in perforated plastic bags. The worker bees which are crawling in front of hives were taken as sampling unit. The samples were transferred to the laboratory for microsporidian examination. For diagnosis and examination of Nosemosis, the bees infected with *N. apis* were first identified by *Nosema* field test (NFT) by dissecting out the midgut of adult bees and examining them for general appearance. The sting apparatus and last segment of infected bee were pulled out until the hindgut, midgut and honey stomach emerged. The whole digestive system were placed over white papers and midgut examined. For laboratory test, the honey bee abdomens were first separated from their bodies, crushed in a mortar and pestle and 5 ml distilled water added. Drops (2 to 3) of homogenized solution were put on the slides and examined under a binocular microscope (40×) for the presence or absence of *N. apis* spores.

RESULTS AND DISCUSSION

Of the 270 honeybee colonies, 49 were infected with *Nosema* (Table 1). A healthy midgut appears normally brownish yellow with ringed appearance. A midgut infected with nosema, on the other hand, appears white, swollen and without rings or constrictions (Fig. 1). The highest infection rate was observed in spring (41.1%) but nil in autumn. The mountainous climate of Kashmir and apparent humidity during spring and summer seem to favour *Nosema* spreads. The low incidence of *Nosema* in autumn may be attributed to the lack of humidity. The high infection in spring season could be related to the prevalence of high humidity, decrease in colony population and colony vulnerability in the area including *Varroa destructor* (Le Conte *et al.*, 2010). Aydin *et al*. (2006) observed that 23.8% of 168 investigated colonies infected with *N. apis* and the infected apiaries were adjacent. However, in Europe from 2005 to 2007, amongst the colonies studied in spring 14.1% in Spain, 7.2% in Germany, 2.8% in Switzerland and none in France were infected by *N. apis* (Martin-Hernandez *et al.*, 2007). Contrary to our observation most of the epidemiological studies on nosemosis have reported infection in whole period but without providing information about the peak time for infection. Hinojosa and Gonzalez (2004) revealed that *Nosema* infection in spring was more than the infections seen in other

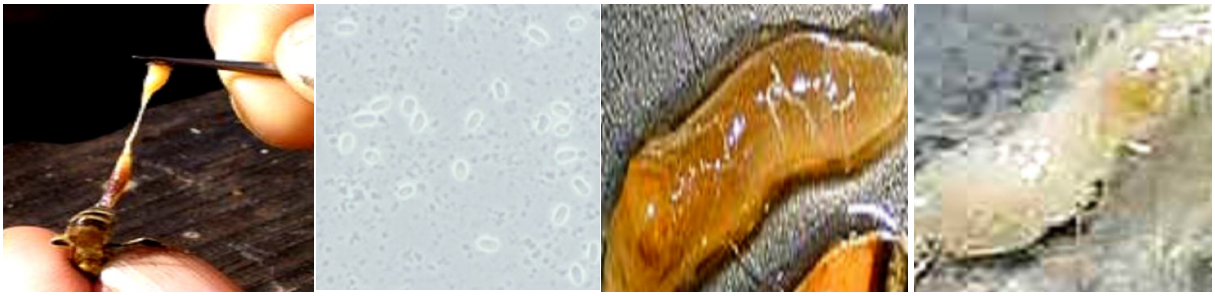

Fig. 1: (from left to right) a) Midgut of adult bee infected with *Nosema,* b) *Nosema* spores, c) Healthy midgut [brownish yellow in colour], d) *Nosema* infected midgut [white in colour]

seasons. Martin-Hernandez *et al*. (2007) have reported that the infection rate of nosemosis increases in spring and is least in summer and autumn. In Finland 28% colonies were found infected with *Nosema* in September (Varis *et al*. 2004). However, in the present study the least infection was observed in bees in autumn, whereas no infection with *Nosema* was observed in September from any month of autumn season in Kashmir (Table 1).

Table 1: Occurrence of *Nosema apis* in different months (spring, summer, autumn) in honey bee (*Apis mellifera* L.) colonies from Kashmir region

Month	Colonies infected (No.)	Infection (%)
March	4	13.3
April	10	33.3
May	23	76.6
June	7	23.3
July	5	16.6
August	0	0
September	0	0
October	0	0
November	0	0

Total infection rate: spring: 41.1%, summer: 13.3%, autumn: 0%, N = 30

Nosema infection generally reaches its highest rate in humid seasons of the year (Topcu and Arslan, 2004; Bahreini, 2007; Martin-Hernandez *et al*., 2007). In Mediterranean regions, the humidity is high in summer; therefore Nosemosis infection is also high during this period (Ozkirim and Keskin, 2001). The Northwestern Iran such as Arasbaran region has a mountainous climate and temperate humidity in spring, which creates conducive conditions for the abundant occurrence of Nosemosis in apiaries and the infection rate has been reported to be high in spring (23.9%) and the lowest in summer and fall (Topcu, and Arslan, 2004). In present investigation, the lack of humidity and highest population of bee colonies in spring of mountainous areas of Kashmir region is the main causes for resistance to Nosemosis. Considering the highest level of infection in spring, the highest parasitic infection of bees in Kashmir with other parasites such as *Varroa destructor*, which are the most frequently, witnessed ones among bees in this region, can lead to the decrease in population of the colonies. Consequently, these vulnerable colonies would demonstrate high rate of Nosemosis in spring (with suitable humidity and temperature for the spreads of Nosemosis). Generally, the dissemination of Nosemosis in bee colonies of Kashmir was high in spring and low in other periods of the year. It is recommended that the epidemiological studies on *Nosema* infection be conducted continuously according to the climatic and the geographical conditions of Kashmir and the statistical concern regarding the infection in honey bee colonies be presented based on the season.

Conclusion: Generally, the spreads of Nosemosis in honey bee colonies of Kashmir region were high in spring but very low in other seasons. Lack of humidity in autumn apparently did not favour *Nosema* spread in autumn. The high infection in spring season could be related to high humidity which caused decrease in colony population.

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