

A Survey of *Nosema apis* of Honey Bees (*Apis mellifera* L.) Producing the Famous Anzer Honey in Turkey

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The aim of this study is to find out the ratio of *Nosema* infected honey bees which are producing the famous Anzer honey that is used for the cure of the illnesses such as farangitis, tonsillitis, ulceration, and scratches due to the experiences of the people living in Turkey. Honey bee samples were collected from two different regions of Anzer plain in July. Honey bee abdomens were homogenized and 1 ml distilled water was added for each honey bee. Later, 0.1 ml out of this solution was examined by Neubauer slides and the number of *Nosema apis* spores were counted. The results showed that *Nosema apis* significantly infected the honey bees although it was summer season. However, the summer season at the Anzer plain, when compared with the Mediterranean climate, is considered to be spring.

Introduction

The microsporidian Protozoa, *Nosema apis* Z. is a spore-forming intracellular parasite of honey bee (*Apis mellifera* L.) which causes considerable economic losses in the beekeeping industry. The spores are infested with food and germinate after they have reached the ventricular lumen (Bailey, 1955). If the temperature is optimal for the parasite (30–35 °C) the whole ventriculus becomes infected within two weeks post-infection, irrespective of initial spore dose (Fries, 1988; Fries *et al.* 1992). *N. apis* injects its sporoplasm into the host cell and completes its developmental cycle intracellularly (Larson, 1986; Fries *et al.*, 1992). The completion of the developmental cycle of *N. apis* from ingestion of spores to production of new spores has been reported to be completed in 2 days (Kollner, 1980) or 3–5 days (Bailey, 1981) if the temperature is optimal (Fries, 1989). The spores escape from hosts in a variety of discharges, the most con-

spicious of these are faeces, urine, vomit secretions of specialized glands (Kramer, 1976; Liu, 1990).

N. apis has a world-wide distribution (Bradbear, 1989). In temperate climates however, infections by *N. apis* must be considered a serious disease. Large reductions in the production capacity have been reported from honey bee colonies in temperate climates (Furgala and Mussen, 1978; Nixon, 1982; Fries *et al.* 1984). The disease evolves without producing any visible signs meaning that in many cases no treatments is given (Fries, 1993).

There are very few studies on *N. apis* in Turkey (Keskin *et al.* 1996). The aim of this study is to investigate the *Nosema* diseases in Anzer plain.

Material and Methods

During July, 1228 adult honey bee samples were collected and brought to the laboratories from hives of Anzer of Rize in Turkey. Adult worker bees were taken from the hive entrance. The bees, whose age was unknown were conserved in 70% ethyl alcohol.

The abdomens of 50 bees were dissected and placed in petri dishes homogenising with a small piston in 50 ml distilled water. 0.1 ml of this solution was placed in a haemocytometer to give liquid depth of 0.1 mm under small grid areas of 0.0625 mm². The number of spores in 16 grid squares was counted.

Various descriptive statistical analyses were made (Sokal and Rohlf, 1981) and used SPSS programme.

Results and Discussion

Table I sets out the results of the sampling. *N. apis* is widely distributed, being diagnosed% 100 apiaries. These infected bees contained a mean of $7.6 \times 10^6 \pm 1.7$ spores per bee (mean \pm SE).

As can be seen in Table I, we found that *N. apis* is most prevalent even in summer season. Statistical analyses were made of 18 bee colonies; the mean was found to be 3.5×10^6 and the standard deviation was 1.6×10^6 . On the other hand in high mountainous regions as Anzer where plentiful pollen and nectar exist throughout the year, the temperature is low during the summer. When com-



pared with Mediterranean subtropical climate, the season of summer in Anzer is similar to the spring in Mediterranean region. Although these infection results are very high for this season, climatic conditions are important and are the reason that many studies carried out in the same region gave different results (Bailey and Ball, 1991). The disease also affects the honey samples, and this restricts the export of the famous Anzer honey as *N. apis* decreases the quality of the honey even though it does not cause any parasitic disease to vertebrates.

By this study the hives in Anzer was taken to the control of Hacettepe University. They will be examined and cured every year with respect to *N. apis* and other diseases.

Table I. Results of survey of *Nosema apis* spores in adult worker honey bees from Anzer in Turkey carried out in July using 18 colonies.

Location	The number of honeybees	Average number of spores per infected bee
Anzer 1	58	1.7×10^6
Anzer 1	67	4.8×10^6
Anzer 1	52	2.8×10^6
Anzer 1	68	2.7×10^6
Anzer 1	73	3.2×10^6
Anzer 1	68	4.4×10^6
Anzer 1	83	2.6×10^6
Anzer 1	66	3.6×10^6
Anzer 1	71	1.6×10^6
Anzer 1	55	2.6×10^6
Anzer 1	65	1.6×10^6
Anzer 1	72	7.2×10^6
Anzer 2	92	1.4×10^6
Anzer 2	77	4.9×10^6
Anzer 2	63	4.6×10^6
Anzer 2	56	5.3×10^6
Anzer 2	83	2.7×10^6
Anzer 2	59	5.3×10^6

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