

## The Prevalence of *Nosemosis* in Honey Bee Colonies in Arasbaran Region (Northwestern Iran)

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**Abstract:** The aim of the present study was to determine the prevalence of *Nosema apis* (Nosemosis) in Arasbaran region-northwestern Iran (one of the important Beekeeping centre in Iran).the sampling was conducted on the beekeeping regions located in Arasbaran towns and villages in the three different seasons of spring, summer and fall in the year 2008. The rate of the infection was reached through counting the numbers of the nosema spores on the body of the bees. Out of 294 honey bee colonies, 72 cases were infected with nosema. The highest infection rate was observed to be in May (83.3%).The infection of the honey bee colonies was of its utmost level in the spring (59.5%), however the amount was considered to be low in the fall (0%) and in the summer (3.33%). The mountainous climate of the Northwestern Iran (such as Arasbaran) and the highest level of humidity in the spring bring about nosema spreads. In contrast with the Mediterranean regions, in Arasbaran, due to the lack of humidity in the summer and fall, in these seasons the incidence of nosema is observed in very lower rates. The highest level of infection in the spring could be related not only to the highest humidity but also the decrease in the population of the colony and colony's vulnerability as a result of high parasite widespread in the area including Varroasis.

**Key words:** Nosemosis % Honey bee colonies % Parasite % Spore % Iran

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### INTRODUCTION

Northwestern Iran is quite a capable place for beekeeping based on its geographical, climatic conditions and natural environment and the greatest amount of honey is produced in this region of the country. One of the apparent difficulties of beekeeping in this region is the existence of the parasites and diseases in the colonies.

*Nosema apis* are the causative agent of nosemosis in honeybees (*Apis mellifera*). This disease is widespread and found in every beekeeping country [1, 2].

Nosema disease is caused by the microsporidian *Nosema apis* which produces spores that are 4 to 6  $\mu\text{m}$  in length and 2 to 4  $\mu\text{m}$  in width. The disease is by far the most widespread of the adult honey bee diseases [2].

*N. apis* spores are ingested by the bee via contaminated water or food, by food exchange with other bees or in their duties of cleaning contaminated combs. The spores are passed quickly into the midgut by the proventriculus [2].

Nosema disease reduces worker longevity by 22-44% [3], which in turn reduces honey production and causes incomplete crop pollination [4]. If a queen becomes infected she is superseded [5].

The existence of nosema apis spores was firstly witnessed in the year 1882 in South Africa and in 1900 in 27 states of the United States [6].

The existence of the infection has been known for more than 20 years, but there is limited information on the prevalence of *N. apis* in many countries, including Iran [7, 8]. Today, nosema apis infection is visible among honey bees in North America, Europe and all around Asia [7, 9]

Therefore, according to the damages caused by nosema in colonies and the recent statistics about nosema infection, epidemiological studies in variant geographical regions of beekeeping sound essential.

Thus, the aim of the present study was to determine the prevalence of *Nosemosis* in Arasbaran region-northwestern Iran (one of the important Beekeeping centre in Iran).

**MATERIALS AND METHODS**

**Sampling:** In this study research, 294 honey bee colonies were studied according to their infection to Nosemosis. A sampling on the beekeeping regions located in Arasbaran towns (Ahar, Heris, Varzgan, Kaleibar and Horand) and their villages was conducted in the three different seasons of spring, summer and fall in the year 2008. Thirty 30 honey bees were taken randomly from each apiary.

The bee samples were put in plastic bags containing holes. The plastic bags, then, were transferred to laboratory of Ahar veterinary organization in a container full of ice. In the sampling conducted in late fall, the majority of samples were chosen from the adult and probably sick bees in front of the apiaries.

**Examine and Diagnosis of Nosemosis:** Twenty-thirty honey bee abdomens were separated from their bodies and crushed in a mortar. Next, 5ml distilled water was added. 2 or 3 drops of the homogenized solution was put on the slides and, using a microscope with a magnification scale of 10×40 the existence or non-existence of Nosema apis spore was examined. The next step is to calculate the intensity of the infection through the study of at least 5 of them and determining the average.

**RESULTS AND DISCUSSION**

The results of the study in the three different seasons in the year 2008 are presented in Table1.

The infection of the honey bee colonies was of its utmost level in the spring (59.5%), however the amount was considered to be low in the summer and no infection was observed during the fall.

In a research conducted by Aydin *et al.* [7], 23.8% of the 168 investigated colonies were infected with Nosema apis and the infected apiaries were adjacent.

In the researches conducted in Europe from 2005 to 2007, it was reported that among the colonies under study in the spring, 14.1% in Spain, 7.2% in Germany, 2.8% in Switzerland and 0% in France are infected by *N.apis* [10].

Unfortunately, the majority of the studies conducted on the case of epidemiology of nosemosis have presented the amount or the average of the infection in the whole period and they have not provided the exact information about the peak time (which month?) for the infection. Researches in three different parts of Chile revealed that nosema infection in the spring is much more than the amount obtained in other seasons, especially in the summer [11].

Table1: Prevalence of *Nosemosis* in different months (spring, summer, autumn) in honey bee colonies of Arasbaran region

Month	Number investigated	Number infected			Infection percent (%)
		<i>chronic</i>	<i>medium</i>	<i>acute</i>	
April	42	0	19	17	45.2
May	42	2	35	23	83.3
June	30	8	15	2	50
July	30	1	3	0	10
August	30	-	0	-	0
September	30	-	0	-	0
October	30	-	0	-	0
November	30	-	0	-	0
December	30	-	0	-	0

Total infection rate: Spring: 59.5%, Summer: 3.33%, Autumn: 0%

Martín-Hernández *et al.* [10] reported that the most amount of the infection is in the spring and the least is in the summer, who also reported some cases of nosemosis infection in the fall, however in the present study the least amount of the infection was in the fall [Table1].

In the sampling conducted in Finland in September, 28% of the colonies were infected with nosema [12], in spite of the fact that in the colonies under the study in different parts of Arasbaran, no case of infection with nosema was observed in September [Table1].

The researches conducted on nosema indicate that the infection reaches its highest rate in the humid seasons of the year [13, 8, 10]. In the Mediterranean regions that the humidity is high in the summer, the Nosemosis infection is also high [14].

The Northwestern Iran such as Arasbaran region has a mountainous climate and the temperate humidity in the spring brings about the conditions for the abundant occurrence of Nosemosis in apiaries.

The study conducted on the bee keeping areas in Kars, Northwestern Turkey neighboring country of Iran, in 8 different Northeastern cities, the infection rate was reported as the highest in the spring (23.91%) and the lowest in the summer and fall [13] which is in correspondence with the statistical results of Nosemosis in Arasbaran (neighboring region of Northwestern Turkey).

It is likely that the lack of humidity in mountainous regions such as Arasbaran in the summer and the highest population of the colonies' bees in the summer and fall are the main causes for the resistance of the bees to Nosemosis and the low level of infection (0%-3.3%).

Considering the highest level of the infection in the spring, the highest parasitic infection of the bees in Arasbaran with other parasites such as Varroasis, which are the most frequently witnessed ones among bees in this region [7, 15], can lead to the decrease of the population of the colony and consequently, these vulnerable colonies would demonstrate high rate of Nosemosis in the spring (with the suitable humidity and temperature for the spreads of Nosemosis).

Generally, the spreads of Nosemosis in the colonies of Arasbaran were observed to be high merely in the spring and in the other periods of the year are very low and insignificant.

It is recommended that the epidemiological studies on nosema infection be conducted continuously according to the climatic and the geographical conditions of the regions and the statistics concerning infection in honey bee colonies be presented based on seasons and months.

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