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Situation of Beekeeping in North Africa- a review

Kuzey Afrika'da Arıcılığın Durumu- derleme

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Abstract

North Africa is a Mediterranean climatic zone characterized by mild winters and hot and dry summers. The flora of this region is similar to that of south Spain and Italy. *Apis mellifera intermissa* is indigenous subspecies found in Tunisia, Algeria, and Morocco. In Egypt, the indigenous subspecies is Apis mellifera lamarckii. The two subspecies are characterized by great adaptability to climatic conditions and by a marked cleaning behavior. Among hive products, honey is the most common in these countries cultures. However, the number of hives and the honey production remains low compared to the rest of the world and beekeeping is facing many problems such as diseases in particular varroa mites, insecticides, ecosystem degradation and climate change. All these factors can weaken the local bee and affect negatively the production of honey and colony development.

Keywords: Honeybee, North Africa, diseases, situation, production

Özet

Kuzey Afrika, ılıman kışlar ve sıcak ve kurak yazlarla karakterize bir Akdeniz iklim bölgesidir. Bu bölgenin florası, güney İspanya ve İtalya'nınkine benzemektedir. *Apis mellifera intermissa*, Tunus, Cezayir ve Fas'ta bulunan yerli alt türdür. Mısır'da yerli alt tür Apis mellifera lamarckii'dir. İki alt tür, iklim koşullarına mükemmel uyum ve belirgin bir temizleme davranışı ile karakterize edilmektedir. Kovan ürünleri arasında bal, bu ülke kültürlerinde en yaygın olanıdır. Bununla birlikte, kovan sayısı ve bal üretimi dünyanın geri kalanına göre düşük kalmaktadır ve arıcılık, arıcılık, hastalıklar, özellikle de akar böcekleri, böcek öldürücüler, ekosistem bozulması ve iklim değişikliği gibi birçok sorunla karşı karşıyadır. Tüm bu faktörler yerel arıyı zayıflatabilir ve bal üretimini ve koloni gelişimini olumsuz etkileyebilir.

Anahtar kelimeler: Bal arısı, Kuzey Afrika, Hastalıklar, Durum, Üretim

Abbreviations: AFB, American foulbrood; EFB, European foulbrood

1. INTRODUCTION

North Africa, on the map, looks a good piece of Africa; it is firmly united to this continent massive but is separated from the rest of Africa by the immense Sahara Desert. Bordered by the Mediterranean Sea to the north and east, it looks like a lot to the other countries that border this sea such as Italy, Spain, and South France. The North of Africa is a Mediterranean land by its climate,

its relief, its resources, its populations and his civilization (Debesse, 1939). But, according to FAO (2001), the forest cover in North Africa is small compared to the rest of the world (Figure 1). North Africa is characterized, in general, by mild winters, very hot and dry summers, with heavy rains during the cold season. The average annual precipitation is between 400 mm and 800 mm per year overall and is distributed very unevenly over the year, goes up to 1500 mm in mountains in Tunisia and up to 2000 mm in the mountains of Morocco.

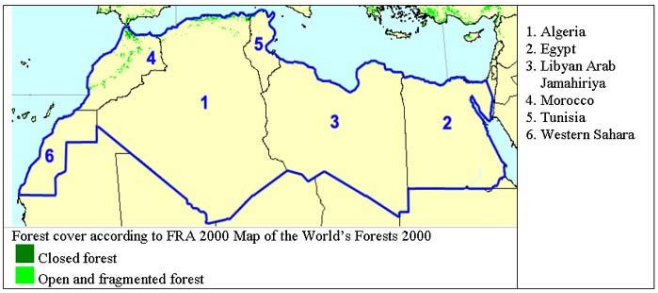


Figure 1. Forest cover map (FAO, 2000)

Honeybees have been part of the culture and human heritage for millennia, they are therefore essential for the maintaining of plant biodiversity. Not many records or artifacts from ancient times that might explain the history of beekeeping in North Africa. However, in Egypt, a painting showing a beekeeper in Egypt, in 664-625 BC (Crane, 1999). Also, honey containers have been found on rock walls in Libya as well as many other countries (Keshlaf, 2017). There are two types of beekeeping found in North Africa countries: the modern ones using the Langstroth hives with mobile frames and traditional ones using hives from rocks, mud and palm trunk. The last type is variable among countries. In the western region of Libya, beekeepers are using Dadant hives (Keshlaf, 2017).

2. SUBSPECIES IN NORTH AFRICA

The main subspecies found in north Africa are *Apis mellifera intermissa* also called "tellian" or "punic" bee (Rinderer, 2013) spreading along Morocco, Algeria (Barour, Tahar, Radloff, & Hepburn, 2005) and Tunisia (Lebdi-Grissa, M'Sadda, Cornuet, & Fresnaye, 1991) and *Apis mellifera lamarckii* described, in 1906, as originating from the Nile Valley and Sudan (Sheppard, Shoukry, & Kamel, 2001). In Libya, Shaibi, Fuchs, and Moritz (2009) reported that honeybees found at the coast and desert in Libya are different from *A. m. intermissa* of Tunisia and Algeria and from *Apis mellifera lamarckii*. The subspecies was closely related *to A. m. sahariensis. Apis mellifera intermissa* is small and black (Figure 2).

Figure 2. *Apis mellifera intermissa*

It is nervous and showing an aggressive defense behavior and abundant use of propolis. It showing also an extreme swarming tendency (Bendjedid & Achou, 2014). This bee seems to be the only race that can resist the climatic contrasts of North Africa. European races mostly from Italy and

France were imported to North Africa on large scale but these introductions were complete failures (Crane, 1999). *A. m. sahariensis* is smaller and yellowish-reddish and has a restrained swarming tendency. The workers built a restricted number of queen cells, and eliminate immediately the virgin queens during the swarming process. *A.m. sahariensis* has a weak defense reaction and don't use much propolis (Ruttner, Tassencourt, & Louveaux, 1978). Finally, Lamarck's bee is described as a poor honey producer. It has been replaced by imported subspecies, mostly *A. m. carnica* (Sheppard et al., 2001).

3. STATISTICS ON BEEHIVES AND HONEY PRODUCTION

According to data collected from the Food and Agriculture Organization (FAO), the number of beehives in North Africa rose since 2000 for Tunisia and Algeria peaking in 2018 at 700.000 and 400.000 beehives respectively. Libya presented the lowest number of hives with 36.000 and 37.500 hives in 2000 and 2018, repectively (Figure 3).

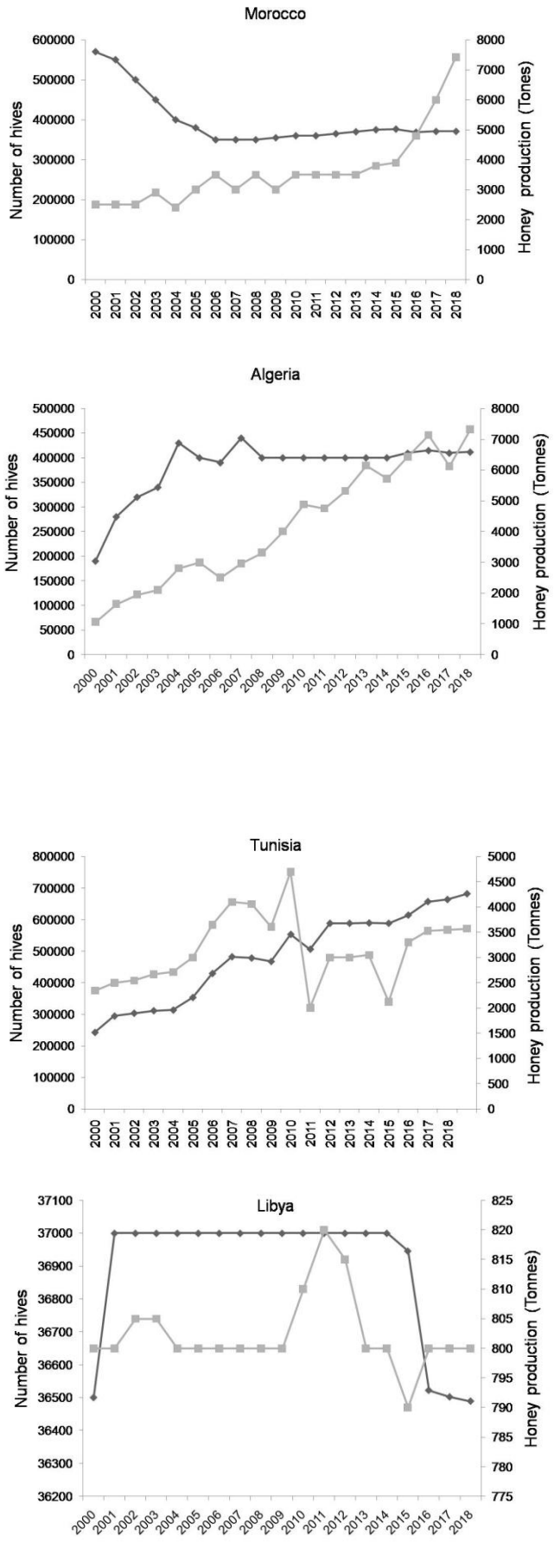
The number of hives in Egypt decreased from 1,4 million hives in 2000 to 800.000 in 2018. Morocco also presented a decline in hives numbers. It was 600.000 in 2000 and reached almost 400.000 in 2018. However, its national honey production reached its maximum in 2018 with 7.500 tonnes which is the higher value compared to the rest of the countries followed by Algeria with a production of 7.000 tonnes. Although Egypt had the highest number of hives, the honey production was less than 4.000 tonnes in 2018. In Tunisia, the honey production increased with the increase in the number of hives but after 2010, the production decreased while the number of hives continued to increase. The lowest honey production recorded in Libya with only 790 tonnes in 2018 (Figure 3).

In 2016, Al-Ghamdi, Alsharhi, and Abou-Shaara (2016) establish a survey of beekeeping status in Arabic countries and reported honey production per colony in different countries (Table 1).

Table 1. Honey production (Kg) per colony in north african coutries (Al-Ghamdi et al., 2016)

Country	Honey production (kg) per colony
Algeria	8.75 ±6.49
Morocco	14.08 648
Tunisia	9.00 498
Egypt	9.50 3.18
Libya	12.56 5.64

Morocco was ranked firstly followed by Libya. Egypt, Tunisia, and Algeria presented less than 10 kg/hive



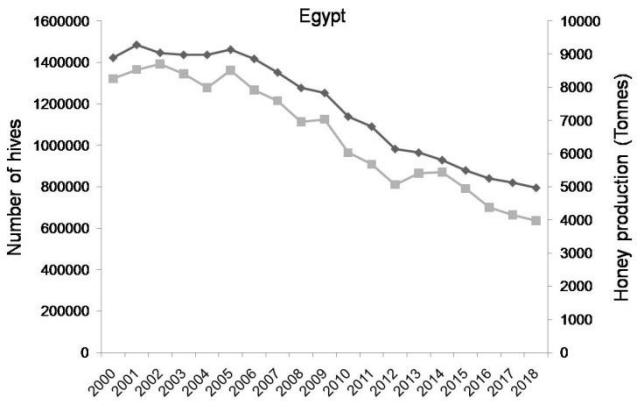


Figure 3. Number of beehives and honey production (tonnes) in North African coutries (Morocco, Algeria, Tunisia, Libya and Egypt) from 2000 to 2018. (Data source: www.fao.org/faostat).

4. MAIN TYPE OF HONEY IN NORTH AFRICA

The vegetation of North Africa resembles that of other Mediterranean countries. They represent very diverse areas of vegetation. The bee colonies, therefore, find very different living conditions in the coastal regions, on the cultivated plains, in the mountains or on the edge of the desert. The flora from which they derive their subsistence is very heterogeneous which requires a systematic study based both on botanical studies carried out in the field and on honey samples to obtain a complete picture of the honey resources of the different environments.

Louveaux and Abed (1984) study the pollinic spectrum in North African honey. The honey currently known differs from the rest of the Mediterranean basin. The pollen of Eucalyptus in the honey of North Africa is omnipresent. Honey with nearly 100 % eucalyptus pollen is not rare. Honey commonly called "orange honey", where the orange pollen is dominant, are common in Algeria as well as in Tunisia and Morocco. The

main honeys in Libya coming from Acacia, Pinus, Cupressus, Thymus, Rosmarinus, Citrus, Eucalyptus, and many wild plants which also they can be found in Tunisia, Algeria and Morocco (Keshlaf, 2017).

In Egypt, the main honey yields are from citrus, Egyptian clover, luffa, cotton and, banana. Pollen also is collected from many plants like faba bean, flax date palm, luffa and maize (Taha, Taha, & Al-Kahtani, 2019).

5. HONEYBEE DISEASES AND PESTS IN NORTH AFRICA

Most of the known pests and diseases of honeybees are present in North Africa colonies (Table 2). The honey bee ectoparasitic, *Varroa destructor*, was first reported in Tunisia in 1974 (Ben Hamida, 1997) then in Libya in 1976 (Crane, 1979). In Egypt it was firstly recorded in 1983 (Abou-Shaara & Tabikha, 2016). It was introduced from Bulgaria through infested bee packages. According to Kefuss (1995). Fortunately, *A. m. intermissa* is known to have higher hygienic behavior. Her grooming and removal activities prove her mechanisms of resistance against the mite *V.destructor*.

The bee louse, *Braula coeca*, ectoparasite attacking the honeybees colonies was reported in Tunisia in 1978 (Smith & Caron, 1985) then in Libya in 1980 (Alfallah & Mirwan, 2018). In 1981, The parasite was reported in Egypt, then in Algeria and Morocco (El-Niweiri, El-Sarrag, & Neumann, 2008a). To control varroa mite, beekeepers in North Africa use miticides, especially Apistan «fluvalinate». The use of these miticides resulted in a decrease of the population of the bee louse (Alfallah & Mirwan, 2018). Besides ectoparasites, North African beekeepers have to deal with the greater wax moth *Galleria mellonella*, which damage the stored combs and infest weakened colonies during summer. Brood diseases such as American foulbrood (AFB) and European foulbrood (EFB) are widely distributed in many African countries. However, no significant losses have been reported in this region. It might due to the stronger hygienic behavior of african honeybees (Fries & Raina, 2003). *Nosema ceranae* is widely distributed (Martín-Hernández et al., 2018). It has been detected in *Apis mellifera intermissa* in North African countries such as Libya and Egypt in 1977. In Algeria, it has been reported that 65% and 85% of hives contained *nosema sp*. spores (Chahbar, Tefiel, Adidou-Chahbar, Doumandji-Mitiche, & Gaouar, 2016).

In North Africa, the small hive beetle (SHB) was reported only in Egypt in 2000 (Mostafa & Williams, 2002). But in many local colonies, the SHB is absent (Hassan & Neumann, 2008) or sometimes its population remain low (El-Niweiri, El-Sarrag, & Neumann, 2008b).

Table 2. Presence (+) or absence (-) of somes honeybee diseases and parasites in northen African countries

Country	Brood diseases			Adult diseases		Parasitic mites			References
	AFB	EFB	chalkbrood	nosema	amoeba	tracheal	varroa	tropilaelaps	
Algeria	+	+	+	+	+	-	+		(Adjlane, Belkadi, Mecheri, Ridane, & Haddad, 2016)
Egypt	+	+	+						(Ali, Olfat, & Al-Fattah, 2010; Masry, Kabeil, & Hafez, 2014)
Libya	-	+		+			+		(Alfallah & Mirwan, 2018)
Morroco	+	+		+			+		(Ellis & Munn, 2005)
Tunisia	+	+		+		+	+	+	(Abdi et al., 2018; Ellis & Munn, 2005; Hamdi et al., 2013)

AFB= Amercian foulrood; EFB= European foulbrood

6. MAIN PROBLEMS FACING BEEKEEPING IN NORTH AFRICA

Difficulties that are facing the beekeepers in North Africa are variously listed as bee diseases, land degradation through deforestation and agricultural intensification, the indiscriminate use of pesticides, low quality of honey and hive products, and market access challenges among others.

The poor hive management skills among the beekeepers and weak capacity for monitoring beehives for pests and diseases and management are major challenges that affect the quality and wholesomeness of honey and other hive products. Moreover, the high production costs of treatments and basic equipments are the problems facing beekeepers in Tunisia and Egypt (Al-Ghamdi et al., 2016). The non-availability of honey plants because of the decrease in forest areas due to the fire and deforestation is one of the beekeeping problems in Tunisia. Hence, beekeepers are forced to transport their hives in the regions of the country which increases the spread of diseases among colonies. In Libya as well in Morocco, beekeepers are facing a higher temperature in the

summer leading to short flowering period plants (Sparks et al., 2010).

In many countries, mostly in Europe, there are surveillance systems to record and investigate cases of bee intoxications by pesticides. Such systems are not in place in North Africa, nor are there programs that measure residues of agrochemicals in beehives and correlate them with health parameters. Due to these facts, it is difficult to judge to what extent pesticides are relevant stressors to bee health in North Africa, although beekeepers claim the death of their colonies because of pesticides. Unfortunately, there no official data but only some scientific *in vitro* research relatively few in some countries (Nabti, Achou, & Soltani, 2014).

The honey market is still not efficient or well organized since most beekeepers sell their honey locally. Therefore there is a need for the beekeepers to join together into cooperatives. The formation of these cooperatives would trigger the involvement of other actors in the value chain.

7. CONCLUSION

North Africa is a sub-region that has enormous potential for development, particularly in agriculture and is the home to a variety of honeybees found across all agro-ecological zones. However, beekeepers have to face many problems such as the decrease in colony productivity, the marketing of honey and the unfavorable environmental conditions. Thus, scientific research and training programs are needed to solve these problems linked to colony management, producing various beekeeping products and methods of controlling bee diseases and pests.

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