

Beekeeping in the Kingdom of Saudi Arabia

Past and Present Practices

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The Kingdom of Saudi Arabia is a very large and interesting country about which many people would like to know more. Certainly not a lot has been written about beekeeping here - a situation that *Bee World* hopes to remedy with two articles which look in detail at the current apicultural scene in this vast land and what future developments can be expected.

Introduction

The Kingdom of Saudi Arabia covers 2,250,000 km², most of which is lowland plain. However, there are also extensive mountain chains and associated valleys. The Sarawat Mountains (Fig. 1), which range in altitude between 800 and 3,000 metres above sea level, stretch for more than 1,000 km, and are the dominant ones. These mountains have diverse climates and receive adequate rainfall in summer, winter and early spring to support the growth and flowering of a great diversity of plant species that are rich in nectar and pollen for bees. As a result, these mountain chains and their associated valleys are the best potential beekeeping regions of the country.

Many works of literature support the theory that the origin and diversification of the honey bee (*Apis mellifera* L.) was in the Near East (Ruttner, 1988; Franck *et al.*, 2001), an area that includes present-day Saudi Arabia. These studies indicate that the people of this region may have started to exploit honey from wild nests of *A. mellifera* earlier than in other places. Although written documents that indicate precisely when and where beekeeping started in Saudi Arabia are lacking, the practice can be traced back at least 4,500 years, when the region was much wetter and covered with dense vegetation. It can be easily inferred that during these periods, Beekeeping was widely practised in the areas such as ancient Egypt by about 2500 BC (Crane and Graham, 1985; Crane, 1983). Moreover, the presence of earthen paintings in Iraq that date back to 2000 BC (Crane, 1983)



Fig. 1. Map showing south western mountainous regions of Saudi Arabia.

and rock paintings in Eastern Yemen (Giovanni, 2001) also indicate that the beekeeping began long before the Islamic period (Crane, 1990).

The written beekeeping history of Saudi Arabia can be traced back to the beginning of the first century, with references to the "*Arabia Felix*" as a land with plenty of honey (Jabra, 1951). Moreover, some written documents by Bilons (79 AD) referred to the region as one in which honey and beeswax were dominant agricultural products (Tarcissi, 1968).

By the 7th century, the Holy Qur'an included many statements about bees, beekeeping practices and various uses of honey as an important remedy to

treat several disorders in humans (Qur'an 16: 68-69) (Giovanni, 2001). This evidence documents a history of honey bee exploitation in the country that extends back at least 1,400 years.

Honey Bee Diversity

Apis mellifera is native to Saudi Arabia. *Apis florea* F. was introduced to the country in 1985; however, *A. mellifera* remains the dominant species. *Apis mellifera jemenitica* is the only race of *A. mellifera* naturally found in the country and traditional beekeeping is mostly practised using this race. *Apis m. jemenitica* is well adapted to the semi-arid to semi-desert conditions in its distribution. The bees are reported to cope well with long dry periods, brief

flowering intervals, temperatures up to 40°C, and annual rainfall of just 50-100 ml (Ruttner, 1988).

Many reports have suggested *A. mellifera* originated in Near East Asia, which includes Saudi Arabia. Based on this hypothesis, *A. m. jemenitica* could be ancestral to the other races of *Apis mellifera*. *Apis m. jemenitica* is found both in Asia and Africa and its geographical distribution extends for more than 4,500 km from the Arabian Peninsula via the Horn of Africa to West Africa. In the Arabian Peninsula, *A. m. jemenitica* is found in Saudi Arabia, Yemen and Oman (Ruttner, 1988; Hepburn and Radloff, 1998).

Morphometric Characteristics of *A. m. jemenitica*

Apis m. jemenitica is readily identified by its yellow abdomen with grey to brown bands. Morphometrically, it is the smallest race of *Apis mellifera* (Ruttner, 1988). Different populations of *A. m. jemenitica* are reported to exist within its distribution. The Saudi Arabian population race is reported to have the smallest body size (Ruttner, 1988). It is almost the same size as *A. cerana* (Oldroyd and Wongsiri, 2006). Because of its small size, Saudi Arabian populations of *A. m. jemenitica* build on average 25% more worker cells per unit area under natural conditions than European honey bees build on embossed wax foundation sheets (Al-Ghamdi, 2005). Moreover, a recent comparative study by Al-Ghamdi (2006) of morphological and histological characters of Saudi Arabian *A. m. jemenitica* demonstrated that the mean values of morphometric characters such as width of wax gland mirror on sternite 3 (1.95 mm) were smaller than the values (2.05 ± 0.06 mm) reported for *A. m. jemenitica* of Ethiopia (Amssalu *et al.*, 2004).

Behavioural characteristics of the bees

Unlike the populations of *A. m. jemenitica* of Africa, populations in Saudi Arabia are reported to be very gentle and calm (Alqarni, 1995). Alqarni further reported the absence of stinging even after provocation. As a result, Saudi Arabian honey bee hives can be manipulated even during the daytime with minimal protection. The same report indicated the absence of an annual migration in these bees. Moreover, the bees have

been reported to have robust grooming and hygienic behaviour, short post-capping durations, and periodical declines in the brood population (Khanbashi, 2002; Al-Ghamdi and Hoopingarner, 2002). These behavioural and other biological characteristics confer a certain degree of resistance to *Varroa* mite infestation as reported in many references to *A. cerana* and their resistance to *Varroa* mites (Oldroyd and Wongsiri, 2006). Although many beekeepers have complained that *A. m. jemenitica* is less adaptable to box hives, Al-Ghamdi (2005) demonstrated that these bees can be easily establish in box hives.

Apis florea

Apis florea is the smallest honey bee species, both in its body size and its single open-nest comb. The main range is in the tropical regions of India and South East Asia, Thailand, Vietnam, Burma (Myanmar) and southern China (Wongsiri *et al.*, 1997). It is also found in several Middle Eastern countries including Iran, Iraq and Oman (Peterson, 2011). The bees are highly adapted to hot climatic conditions and their small bodies and colony population size may favour its adaptation to an arid climate and limited forage resources. Currently, *A. florea* distribution is expanding from east to west and is found in many parts of the Arabian Peninsula and in the eastern and central parts of Saudi Arabia. Local beekeepers in Oman have been reported to keep *A. florea* and collect honey but it is not recommended that both species are kept in the same place. They act as carriers of mites into weak *A. mellifera* colonies. At present reports do not cause too much concern as some *Varroa* mites have only been found in weak *A. florea* colonies. Researchers have not found *Euvarroa sinhai* and *E. wongsirii* in *A. florea* in Saudi Arabia and Oman (Peterson, 2011). This theory of Mac Arthur and Wilson (2001) and our hypothesis showed that *A. florea* is the introduced species but left the native parasitic mites at its native home. On this evidence the *A. florea* population will distribute and establish quite successfully in the new habitats of the Arabian Peninsula and Middle Eastern countries.

Current Practices in Saudi Arabia

Beekeeping is practised in most areas of Saudi Arabia, but it is largely concentrated

in the south western mountainous regions (Al-Baha to Jizan, Makkah, Asir, and Al-Medinah). More than 70% of the bee colonies in the Kingdom were estimated to be found in these regions (Fig. 1) (Al-Ghamdi, 2007).

Beekeeping is a long-standing practice in rural Saudi Arabia. It is one of the most important economic activities for these communities. Approximately 5,000 beekeepers maintain more than one million honey bee colonies and produce approximately 9,000 metric tonnes of honey annually (Al-Ghamdi, 2007). More than 70% of the bees are still kept in traditional cylindrical hives made from various locally available materials.

Types of traditional hives used in Saudi Arabia

In Saudi Arabia, different types of traditional hives, including log hives, clay pot hives, and mud hives, are widely used. The log hive is very dominant and usually made from date palm tree trunks (Fig. 2a) and other processed timber. Today, the log hive is precisely designed and assembled in cylindrical form using machine-made timbers (Fig. 2b). To construct one machine-made log hive, about 12 pieces of timber with dimensions of 10 cm × 100 cm are required. The outer shape of the hive can be either round or rectangular. The hives have openings at both ends with leads.

Many commercial beekeepers still use such traditional hives. Beekeepers prefer traditional hives because of their better insulating properties and because the volume of such hives better matches the colony size of local honey bees than that of box hives. Moreover, beekeepers and consumers believe that honeys from traditional hives are higher in quality because of higher viscosity. Moreover, traditional hive beekeeping practices do not require extra accessory equipment, and the price is inexpensive compared to box hives.

In Saudi Arabia and in many Middle East countries many colonies in traditional hives are kept stacked (Figs. 3 and 4) which is efficient in space and sheltering materials. It also requires less time to inspect and harvest honey. However, such stacking may cause robbing, drifting



Fig. 2a. A hollowed trunk log commonly used in Saudi Arabia .

bees and could be susceptible to the rapid dissemination of bee diseases.

Modern box hive beekeeping

Along with traditional beekeeping practices, box hive beekeeping with Langstroth-type hives is also widely practised in Saudi Arabia (Fig. 4). However, in most cases, the colony size does not reach to the first super level and the bees do not even fully occupy the base of such hives, due to the brief flowering periods and long conditions of dearth in the area. As a result, beekeepers are currently strongly recommended to use modified box hives with fewer frames.

Honey bee management practices in Saudi Arabia

In traditional hives, colony management is very limited because the nature of the hive does not allow many management activities. However, beekeepers do try to adjust the volume of the hive to the seasonal variation in colony population size by inserting or removing foam or other rounded material that fits the diameter of log hives. The volume of the hive is adjusted by moving the plug of filling material along the cylinder depending on the size of a colony in different seasons. Colonies in box hives rarely expand to the super level, so adding or removing supers is infrequently practised.

Control of reproductive swarms is not practised with traditional hives. However, beekeepers do try to catch swarms by placing tree branches in front of the apiary so that a new swarm will temporarily rest on the branches and can be re-hived, or by preparing and placing bait hives. Other common management practices include feeding colonies sugar syrup, providing water, and moving colonies to



Fig. 2 b. An assembled log hive from machine-made timber.

better forage areas. Since the area is very hot in summer many beekeepers cover the hives with some insulating materials.

Hive placement

In most cases, bees are kept in apiaries in backyards or away from homes. For traditional hives, about 30 bee colonies are kept stacked together. The stacks are either permanently fixed (Fig. 4) or placed on mobile stands allowing the colonies to be moved from place to place (Fig. 3). Box hives are kept in permanent apiaries on metal hive stands in several rows (Figs. 5a,b,c). In general, large numbers of colonies are kept in one apiary site, leading to serious overcrowding and resource competition among colonies. Beekeeping is generally



Fig. 3. Apiary with colonies in traditional hives kept stacked together and covered with tent-cloth.



Fig. 4. Colonies in traditional hives kept stacked together in permanent apiary.

practised as a family business or as large-scale commercial ventures. Some commercial beekeepers manage up to 2,000 bee colonies.



Figs. 5a, b, c. Box hives in permanent apiaries.

Migratory beekeeping practices

In many areas of the Kingdom, migratory beekeeping is very common. Seasonal shortages of bee forage and seasonal and geographic differences in bee forage availability drive many beekeepers to move their colonies from one area to another in search of better nectar and pollen resources. Sometimes, 100 or more honey bee colonies are kept on trailers that are towed behind vehicles, allowing migration from place to place (Figs. 6a and b). Beekeepers migrate their bee colonies to follow the flowering of major bee forage plants. Some beekeepers reported migrating their bees between 3 and 6 times per annum.

Migration sometimes leads to dense concentrations of bee colonies (up to 500 colonies per site; (Fig. 7) in some areas. These colonies may be owned by a single or multiple beekeepers and are



Figs. 6a and b Honey bee colonies kept in trailers and towed behind vehicles for migration.



Fig. 7. Migratory beekeeping site in Saudi Arabia, where up to 500 bee colonies may be kept in one place (up to 30 traditional hives are kept in each stack or block).

placed without consideration for colony density or the actual carrying capacity of the area. Sometimes, beekeepers congregate in areas where a few special plant species grow that yield the most desired and expensive types of honey such as *Ziziphus spina Christi*.

Honey Production

The average annual honey production of a traditional hive is 3-5 kg/annum, while that of a box hive is 5-10 kg/annum. In areas with beekeeping potential there are two or more harvests resulting from multiple flowering periods. In the country, about 9,000 metric tons of honey are produced annually (Al-Ghamdi, 2007). The types of honeys produced in Saudi Arabia are well known according to their seasons and their botanical origins. These types include *Ziziphus* (sider), *Acacia*, *thian*, *summer* and *majra* honeys. The majority of beekeepers extract honey by the traditional straining method, while some beekeepers, with modern hives extract their honey using honey extractors.

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