

SURVEY OF AMERICAN AND EUROPEAN FOULBROOD DISEASE ON HONEY BEE COLONIES IN DAKAHLIA GOVERNORATE.

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ABSTRACT

It is essential that beekeepers are able to recognize the diseases and distinguish them from foul brood. Survey was carried out in four districts of Dakahlia governorate (Mansura, Metghamer, Al-Met salsil and Bilqas) from Sept 2009 to Aug2011. Two bacterial diseases of the honey bee larvae were widespread in all districts which were American and European foulbrood diseases (AFB and EFB). AFB disease is one of the most destructive diseases of the honey bee in all apiaries during autumn and winter however; it is spread sometimes during spring. EFB disease is a bacterial disease that effects honey bee larvae before the capped stage, it spread in all districts during spring and summer.

INTRODUCTION

Honey bee colonies exposure to numerous parasites and pathogens which causes sever damages to the bee keeping industry world wide. The term 'foul brood' covers two diseases of the honey bee larvae, one known as (AFB), and the other EFB. The names bear no relation to the geographical distribution of the diseases: One of the most important diseases that attacks honey bee (*Apis* spp.) in the larval stage is AFB. The American foulbrood is caused by serious bacterial disease *Panobacillus larvae subsp. larvae* Schuch, *et al.* 2001). Honey bee colonies are susceptible to AFB disease or EFB disease, which caused momentous damage (*Posyniak, et al.* 2002). AFB disease causes significant economic losses to the beekeepers, because it is the most harmful pathology of honeybee brood (*Genersch et al.* 2006). Diagnosis of AFB disease is based on hives visual inspection (*De Graaf et al.* 2001). This procedure presents clear limitations because it depends on the judgment of an expert and relies on the observation of clinical symptoms that are not always easily recognized (*Lindström* 2006). The disease spreads when spores are carried on 2 drifting bees, hive parts, beekeepers' clothes, and contaminated pollen or honey. Spores of *P. larvae* are capable to germinating after 35 years in scales (*Matheson and Reid, 1992; Lindström, 2008*). EFB disease is a bacterial disease that affects honey bee larvae before the capped stage. The causative bacteria, *Melissococcus plutonius* is ingested by honey bee larvae after which the bacterium competes for food inside the larvae. which leaves bacteria on the combs that can be infective for years, even though this bacteria does not produce spores (*Baily 1981 and 1983*). American foul brood is considered the most destructive brood disease. However, European foul brood is currently the most widespread, and where it occurs it often

spreads rapidly and is difficult to eradicate unless prompt measures are taken.

Recently, in Egypt, there were some indications about the occurrence of AFB in some regions without formal authentication, but with some exceptions e.g. Zakaria (2007), in Giza, Egypt, Owayss (2007), in Fayoum gov, Mostafa *et al* (2008) in Alexandria gov, and Abd Al-Fattah *et al* (2010) in some Egyptian-Delta governorate but a survey of the Egyptian apiaries for the incidence of European foulbrood disease is ongoing as well. The present work aimed to survey brood bacterial disease on honey bee colonies in Dakahlia governorate .

MATERIALS AND METHODS

Field diagnosis and sampling

Many honey bee apiaries were in Dakahlia governorate in four districts; Mansura , Metghamer ,Met salsil and Bilqas ,. Apiaries contain 150 & 100 colonies of *Apis mellifera*, (hybrid Carniolan), were inspected for foulbrood disease .American foulbrood was diagnosed in the field by the following criteria devoted by **Shimanuki and Knox (2000) (Table 1)**.

Table (1): Symptoms of American foulbrood disease in infected honeybee colonies.

Symptoms	Appearance of brood comb	Age of dead brood	Color of dead brood	Dead brood consistency	Odor of dead brood
American Foul brood	Sealed brood. Discolored, sunken, or punctured capping	Usually older sealed larvae or young pupae. Lying lengthwise in cells.	Dull white, becoming light brown, coffee brown to dark brown, or almost black.	Soft, becoming sticky to ropy.	Slightly to pronounced putrid odor

It is important to not confuse European with American foulbrood. These are two very different diseases that require different management and treatment routines. Both are however bacterial brood diseases. Use the table below as an overview to tell the difference between European and American foulbrood disease. Diagnosis of infection with European and American foulbrood disease should begin with visual inspections of the above symptoms. The American foulbrood disease was diagnosed according to symptoms described by Alippi, 1991, Survey was determined followed this scale by: 0=Healthy colonies, 1= Can be slightly ropy with threads less than 1.5cm, but usually not ropy., 2= Odor: sour or none, 3= brown to black, rubbery.4= Stage of Brood: before capped and 5= Appearance: twisted, dull to yellow to dark brown, tracheal tubes often visible:

$$\% \text{Infected colonies in each apiary} = \frac{\text{Infected trials}}{\text{Total of trials colony}} \times 100$$

Brood combs showing severe symptoms of American and European foulbrood disease were carefully collected from the infected apiaries along different seasons (Table 2).

Diagnosis of infection with European foulbrood should begin with visual inspections of the above symptoms. A "spotty brood pattern" (Fig. 2) in a honey bee colony can often be the first sign of a wide variety of problems, including EFB. A spotty brood pattern can occur when some larvae die in their cells from a disease, while others survive and become capped resulting in a spotty or shotgun appearance of the capped stage of brood. Many other conditions and situations can cause a spotty brood pattern. In hives infected with EFB, dying and dead larvae can become yellow and then brown. A sour, fishy odor may be present or not. Tracheal tubes can become more apparent as the larvae flattens or 'deflates'(Fig.2). The larvae can also twist as they die and can die curled upwards (fig.1). The remains can be slightly ropery with threads less than 1.5cm long (Shimanuki 1997). Once dried, a rubbery scale remains.

Table (2): Date of collecting the infected brood combs from different apiaries in Dakahlia governorates.

Date		Location
Month	Year	
Sep -Nov	2009	all district
Dec - Feb	2009/2010	all district
Mar -May	2010	all district
Jun -Aug	2010	all district
Sep -Nov	2010	all district
Dec - Feb	2010/2011	all district
Mar -May	2011	all district
Jun -Aug	2011	all district

Diagnosis of infection with European foulbrood should begin with visual inspections of the above symptoms. Beekeeper's inexperienced with EFB disease would likely benefit from confirmation of diagnosis before taking action, in case the infection is another bacteria, virus, chilled brood, or some other situation. Confirmation could occur through their state sponsored apiary inspection program, if available, or by the use of an inexpensive and easy to use diagnostic test kit

RESULTS AND DISCUSSION

Until the last few years, foulbrood is not a common honeybee larvae disease in Egypt. Few non-documented field observations denoted the incidence of such contagious disease in several Delta governorates with a tendency to ascribe the symptoms to the AFB causative bacterium. Most recently, Four apiaries in different sites of Dakahlia governorate were inspected for the incidence of foul brood disease during the period extended from Sept 2009 to Aug 2011 (Table 2) fig 1. The appearance of brood combs as well as age, colour, odour and consistency of dead larvae were recorded in the field (Table 2). A great number of the inspected colonies displayed various signs of AFB and EFB infections.

However, the discriminative features of the disease were clear in the inspected governorates with variable rates as shown in (Table 3).



Fig. 1: Table from Shimanuki and Knox (2000) and Delaplane (1998), Ropey length from American foulbrood photo by Williams, USDA..



Fig. 2: Pictured is a spotty brood pattern with larvae discolored. Taken from a hive with European and American foulbrood disease .

Field diagnosis of the diseased brood combs in Dakahlia apiaries pointed out to a stern infestation with foulbrood harming in some apiaries up to 5-10% of the colonies. Comparable frequencies of foulbrood infections were observed as well in the apiaries of Met salsil district. On the other hand, the lowest range of infected colonies was recorded in Mansura where it ranged between 1 and 5% of the total inspected colonies. In all infected district, the field-diagnosed symptoms of the diseased brood combs were mostly related to the American rather than European type of foulbrood. This was rather obvious with the inspected brood combs in Met salsil apiaries in the autumn of 2009,2010 and in winter 2010 for Dakahlia apiaries as well as in the early summer of 2009 for Mansura ones Abd Al-Fattah in (2010) (table 3). Although the field-diagnosis of AFB symptoms was uncertain in some colonies , AFB disease symptoms were easily evidenced in the others for Metghamer, Bilqas and Mansura apiaries (Fig.1). The foulbrood-associated microorganisms were examined in the AFB infected brood-combs. All samples harboured different types of bacteria in addition to fungi and to a lesser extent yeasts.

Foulbrood symptoms were easily recognized in the field as AFB traits relying on visual inspection of the foulbrood-infected combs regarding dead larvae appearance, colour and odor. Such preliminary field diagnosis of foulbrood disease infestation was approved by Bailey and Ball (1991).

This was rather obvious with the inspected brood combs of EFB in all districts apiaries in the spring of 2009,2010,2011 and its appeared in summer in some apiaries as well as in the early summer of 2011 for Mansura and Metghamer shows in (table 4). where it ranged between 5 and 25% of the total inspected colonies. Explains the occurrence of EFB as having the propensity, "...to remain in apparent, then to appear, sometimes in a very severe form, and then frequently to disappear spontaneously, especially after midsummer..." Baily (1983). Thompson and Brown (2001) indicate that yearly recurrence of the disease in infected apiaries is particularly problematic in the UK.

Table (3): The range percentages of AFB disease infected colonies in different apiaries of Dakahlia governorate

	2009				2010				2011				Infected colonies % in each apiar
	Field diagnosis				Field diagnosis				Field diagnosis				
	Mansura	Metghamer	Met salsil	Bilqas	Mansura	Metghamer	Met salsil	Bilqas	Mansura	Metghamer	Met salsil	Bilqas	
Autum	+	+	+	+	+	+	+	+	+	+	+	+	5-10
Winter	+	+	+	+	+	+	+	+	+	+	+	+	1-5
Spring	-	+	-	+	-	-	+	+	+	-	-	-	0-1
Summer	-	-	-	-	-	-	-	-	-	-	-	-	0

A relatively high number of yeasts was isolated from malt agar plates inoculated with samples from Dakahlia and Giza, Indistinct disease traits in some apiaries lead to a non-decisive diagnosis with an affinity to be related to the European type of foulbrood. In such cases, the milk curdling test and microscopic examination of Gram-stained smears of the dead larvae were applied for differentiation between the suspected European and American types of foulbrood infection. Nevertheless, the incidence of many other bacterial species, in particular the spore-forming bacilli and cocci-form bacteria in the dead larvae might lead to non-decisive result. (Hornitzky and Clark, 1991).

Table (4): The range percentages of EFB disease infected colonies in different apiaries of Dakahlia governorate.

Season	2009				2010				2011				Infected colonies % in each apiar
	Field diagnosis				Field diagnosis				Field diagnosis				
	Mansura	Metghamer	Met salsil	Bilqas	Mansura	Metghamer	Met salsil	Bilqas	Mansura	Metghamer	Met salsil	Bilqas	
Autum	-	+	-	+	+	-	-	+	-	-	-	-	1-5
Winter	-	-	-	-	-	-	-	-	-	-	-	-	0
Spring	+	+	+	+	+	+	+	+	+	+	+	-	20-25
Summer	-	+	-	+	-	-	-	-	+	+	+	+	5-13

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حصص لمرض تعفن الحضنة الأمريكي والأوروبي اللذان يصيبان طوائف نحل العسل في محافظة الدقهلية

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في السنوات الأخيرة أشار بعض مربّي النحل في عدد من المحافظات المصرية إلي ظهور أعراض مرضية علي الحضنة تشبه التعفن سواء عن الحضنة الأمريكي أو الأوروبي وقد تم الحصر في محافظة الدقهلية في أربع مراكز مختلفة وهي المنصورة ، ميت غمر ، ميت سلسيل و بلقاس في الفترة من سبتمبر 2009 حتى أغسطس 2011 . أظهرت النتائج وجود أعراض التعفن الأمريكي والأوروبي في كل المناطق ولكن وجد اختلافات في فترات الظهور بين الحضنة الأمريكي والأوروبي حيث ظهر التعفن الأمريكي في فترات الخريف والشتاء في مركز ميت سلسيل في عامي 2009-2010 وبلغت نسبة الإصابة حوالي 5-10% بينما وصلت أقل فترات الإصابة في جميع المراكز خلال فصل الربيع في عامي 2009-2010 وبلغت نسبة الإصابة حوالي 5-25% بالتعفن الأوروبي. وظهرت أعراض الإصابة بالتعفن الأوروبي في جميع المراكز خلال فصل الربيع في جميع المراكز ويختفي في فصلي الصيف والشتاء

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