J. Plant Prot. and Path., Mansoura Univ., Vol. 4 (10): 857 - 867, 2013

COMPARISON STUDIES BETWEEN THE HYBRID RACES OF CARNIOLEAN AND ITALIAN HONEYBEE TO RESISTANCE OF THE FOULBROODS

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ABSTRACT

This work was performed during the period from May 2011 to May 2012, the times of increase and decrease of the infection strength with American and European foulbrood diseases in certain hybrid honeybee colonies *Apis mellifera* (L**.)** (Hymenoptera**:** Apidae) were studied at Menoufia governorate, generally, it was appeared that American foulbrood (AFB) existing throughout the year by varied levels while European foulbrood (EFB) is viewed at short and defined periods, other hand, the hybrid Carniolean honeybee race was found more tolerance to infection with the foulbrood diseases than the hybrid Italian honeybee race in the Egyptian environment.

Keywords: Honeybee, *Apis mellifera* L., American foulbrood, European foulbrood, infection, Sheshae, Shatanof, hybrid Carniolean race, hybrid Italian race, fluctuation, Prospective.

INTRODUCTION

Honeybee colonies exposure to numerous pathogens uleide cause severe damage to beekeeping industry world wide.

The American foulbrood (AFB) is caused by only *Paenibacillus larvae* subsp. *larvae* (*P. l. l.*) bacterium by coordination of Morse (1980), Moosbeckhofer (1991), Shimanuki and Knox (1991), Alippi (1997), Hansen and Brodsgaard (1999) and Scuch, *et al*. (2001).

The European foulbrood (EFB) caused by another bacterium, *Melissococcus pluton* (*M. pluton*) bacterium according to Langdridge (1979), Morse (1980), Walton (1980), Bailey (1981), Farmnote (1984), Sanford (1987), Shimanuki and Knox (1991).

Honeybee colonies are susceptible to AFB disease or EFB disease, which caused momentous damage (Posyniak, *et al.*, 2003).

The two foulbrood diseases are widespread in the world (Hoyo *et al.*, 2001) and from year of 1996 to now according to observations of several beekeepers, the known symptoms of these diseases had been appearing in several Egyptian apiaries, for example Zakaria (2007) mentioned that in 2006 ten colonies from 75 honeybee colonies of Carniolean hybrid were located in an apiary at Giza region of Egypt were found infected with foulbrood disease, whereas he diagnosed the disease dependency on its symptoms as AFB. Also, dependency on the symptoms inspection and milk test procedure, Owayss (2007) reported that 30-50 % of 5 apiaries (two apiaries 150&100 colonies of *Apis mellifera carnica,* hybrid honeybee situated in Ibshawai

district, and three other apiaries 80, 90&100 colonies situated in Tameia district Fayoum governorate) were infected with AFB disease. While Khattaby *et al*., 2011 controlled or remedied 53 Carniolean honeybee colonies *(Apis mellifera* L.*)* distributed in two apiaries at Giza and Menoufia governorates whereas all those colonies were affected and exposed to the known symptoms of AFB disease, and intervened them some colonies included a few combs with EFB symptoms.

In this present investigation we tried the ascertain from sensitivity both of the hybrid races *Apis mellifera carnica* and *Apis mellifera ligustica* to the foulbrood diseases and from appearance times of these diseases with harshness in the apiary.

MATERIALS AND METHODS

Field experiment:-

The procedures of this field trial had been performed about of holly one year, from May 2011 to beginnings May 2012, in a private apiary own some beekeeper situated at Menoufia governorate.

The work started at 2 May 2011 whereas the apiary was consisted of 28 hybrid honeybee colonies in Sheshae district, divided to 16 Carniolean colonies and 12 Italy colonies, and all those had been sorted honey of the salty (*Citrus* sp.) season.

The colonies varied of the brood combs's numbers which swung between 4 to 8 combs.

Fig. (1) AFB Symptoms.

Fig. (2) A ropy threadlike material AFB only.

Fig. (3) EFB Symptoms.

By inspection the colonies, it was observed that two foulbrood diseases are found in some colonies without others, the inspection was mad within two steps, first by checkup of the diseased symptoms according to Shimanuki & Knox (1991) which belong to whether of the two diseases «Figs. 1, 2 and 3»

and second step was doing of the Holst test in order to distinction between AFB and EFB diseases according to Chantawannakul & Dancer (2001).

By the above-mentioned inspection, numbers of the affected colonies was recorded, whereas from the 16 hybrid Carniolean colonies, 2 colonies with AFB + 5 colonies with EFB were existed + 9 colonies are healthy, but from the 12 hybrid Italy colonies, it were found 3 colonies with AFB + 1 colony with EFB + 6 colonies contained on symptoms of the two foulbrood diseases + 2 colonies without foulbrood symptoms.

The experiment performances:-

6 diseased colonies were deducted from overall bee colonies of the apiary for this experiment without remedy and were transferred to another district in the same governorate which was Shatanof hamlet and faraways about 6 kilometers from the apiary's origin center. The six diseased colonies were 3 hybrid Carniolean (2 colonies with AFB + 1 colony with EFB) and another 3 hybrid Italy (all were affected by the two foulbrood diseases).

At beginning of the experiment, all these six diseased colonies consisted from only seven combs among broods, honey and pollen; therefore combs of each colony of these six colonies were marked by distinguished color belonging to each colony.

The 6 diseased colonies were not treated by any therapeutic materials, but were leaved or were allowed to go ahead with normal case, only it was satisfied with these six colonies by making of the ordinary beekeeping procedures as the follows;

1) Continual cleaning to the hives from the bee's wastes.
2) Warming or ventilation of the colonies excellently.
3) The interesting by the sugary and proteinaceous feeding for the needy colonies.
4) Each colony of these six colonies was supported every 21 days pursuant to its necessity by shaking suitable quantity of nurse honeybee (incubator adult honeybee) to it from the same race but healthy.

The colonies were inspected every 14 days (6/5/2011 - 4/5/2012) for the diseased symptoms of whether AFB or EFB as well as mentioned previously, whereas the checkup had been finished to double faces of all the seven combs per each colony.

The readings of total number and mean of the diseased brood cells (capped and uncapped cells) were registered per every colony (tables No. 1, 2 and 3).

RESULTS AND DISCUSSION

Presence & fluctuation of the tow foulbrood diseases

From values which showed in Table (1), and present the total number of the diseased brood cells with AFB or EFB disease in each replicate it became clear that:

AFB disease is existent round the year approximately and its symptoms to come to light at any period of the year but by varying rates if it wasn't controlled whereas;

a. The symptoms begin to appearance during and after season of the citrus blooming (March, April and May months).
b. Then, the symptoms begin to decrease until the June month beginnings.
c. The symptoms to take up again and with a harder condition is presented by increment of the affected cells number after the clover blooming season and through the summer's months (June, July and August respectively), it is worth mentioning that Zakaria (2007), stated that he found the AFB infections in an apiary at Giza region during summer season clearly.
d. Then appearance of the symptoms shrinks from September up to December months.
e. Then the colonies enter to January and February months combined with conflicting or ashamed rises in the symptoms.

Appearance's highest of AFB symptoms cleared in August month, since, the values of the total number of the brood cells which exhibited the AFB symptoms in each three replicates were 94, 85 and 61 cells respectively in the hybrid Carniolean race, while in the hybrid Italian race, these values were 279, 393 and 221 cells to the same respect. By contrary, Lotfi and Shahryar (2011) stated about AFB by examination of bee larva and honey samples collected from 650 apiaries in Iran during two years, that 5.8% total infection rate was recorded, AFB infection was started in May with highest incidence rate (17.3% of apiaries) and finished in July with 1%.

It is observed that AFB disease less of appearance in the winter than the summer's months, and that is cleared from the low levels of the affected brood cells number at this time of the year.

While symptoms of EFB disease, it had been observed at definite periods from the year without others whereas;

a. The disease presents at months of the spring (February, March and April), and at times of the weather's fluctuations (May, first half of June, September and start of October).
b. The EFB disease high in values of the brood cells number which exhibited to the symptoms, then these numbers rapidly decrease and suddenly disappear, due to power of the honeybee colony as a result of improvement in the weather circumstances, (Heath; 2012, answered on question "if EFB is present in a colony in Spring why does it appear to disappear in summer?" by that if larvae are well fed, and can manage to take in enough food to feed both themselves and the EFB *Melissococcus plutonius* bacteria, they can manage to survive with EFB bacteria in their gut. As the brood nest reaches its peak in size in mid June the nurse bees will be stretched to feed all their charges, so EFB may claim more victims. Once the brood nest reduces in size later in summer, an efficient colony will be better able to feed its larvae well and the disease will 'appear to disappear'. A good nectar flow is crucial for this.).

Table (1): Total number of brood cells infected with foulbrood diseases per each colony every 14 days

Honeybee strain			Hybrid Carniolean						Hybrid Italian					
Replicate			1		2		3		1		2		3	
Kind of foulbrood			AFB	EFB	AFB	EFB	AFB	EFB	AFB	EFB	AFB	EFB	AFB	EFB
Date of checkup	2011	6 May	66	0	68	0	0	16	134	419	306	205	89	109
		20 May	46	0	54	0	0	7	94	273	287	176	63	79
		3 Jun	22	0	13	0	12	0	86	211	235	123	34	56
		17 Jun	31	0	19	0	36	0	161	34	241	61	57	27
		1 Jul	38	0	26	0	38	0	186	0	254	0	78	0
		15 Jul	40	0	32	0	45	0	191	0	267	0	94	0
		29 Jul	52	0	44	0	47	0	214	0	279	0	125	0
		12 Aug	70	0	64	0	59	0	247	0	291	0	203	0
		26 Aug	94	0	85	0	61	0	279	0	393	15	221	0
		9 Sep	64	11	80	9	53	0	201	68	314	31	165	47
		23 Sep	37	7	42	4	30	2	172	62	216	23	88	35
		7 Oct	23	0	38	0	19	0	106	22	121	14	43	19
		21 Oct	7	0	16	0	4	0	84	0	82	0	35	0
		4 Nov	0	0	2	0	0	0	81	0	68	0	31	0
		18 Nov	0	0	0	0	0	0	58	0	32	0	29	0
		2 Dec	0	0	0	0	0	0	26	0	21	0	21	0
		16 Dec	0	0	0	0	0	0	20	0	18	0	17	0
		30 Dec	10	0	0	0	0	0	14	0	NB	NB	24	0
	2012	13 Jan	9	0	11	0	10	0	6	0	NB	NB	19	0
		27 Jan	5	0	8	0	6	0	5	0	NB	NB	13	0
		10 Feb	8	0	13	5	11	0	NB	NB	NB	NB	16	39
		24 Feb	11	0	15	12	17	3	NB	NB	NB	NB	21	44
		9 Mar	2	17	0	16	0	13	NB	NB	NB	NB	5	48
		23 Mar	0	19	0	0	0	6	NB	NB	NB	NB	0	51
		6 Apr	0	8	0	0	0	0	NB	NB	NB	NB	0	57
		20 Apr	3	0	1	0	0	0	NB	NB	NB	NB	10	62
		4 May	17	0	7	0	4	0	NB	NB	NB	NB	28	31

NB; It means Non Brood or there weren't brood of honeybee by reason of loss or weakness of the queens.

Susceptibility of the tow hybrid honeybee races to the foulbrood diseases :

From values which present means of the brood cells number affected with AFB (table No. 2), or affected with EFB (table No. 3) expressive of the foulbrood diseases intensity over the year, it was showed that hybrid Italian race is more susceptibility or passivity by any foulbrood disease than hybrid Carniolean race, whereas that comes to light from the following;

The means of brood cells number affected by whether of the tow foulbrood diseases / one comb face at most of the infection periods during the year were higher in the hybrid Italian race than in the hybrid Carniolean race (More showing on Figures No. 1 and 2).

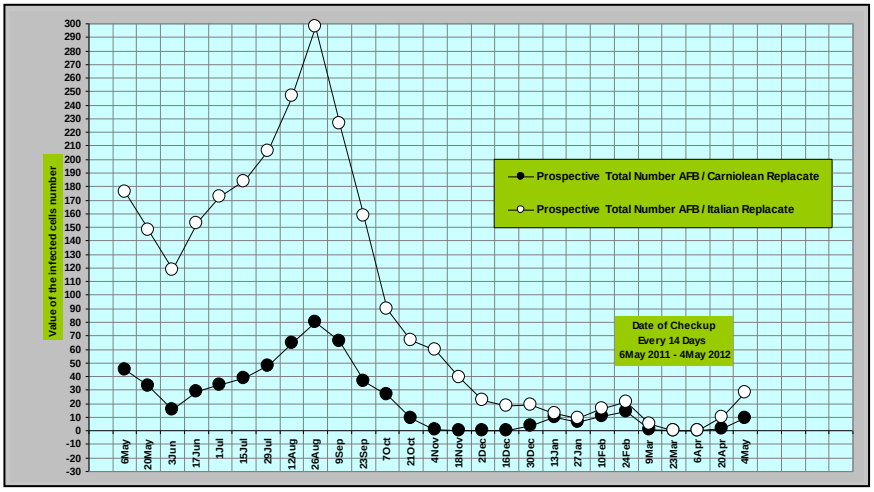

Fig. 1: The differences between hybrid races of Carniolean and Italian honeybee infected by AFB disease.

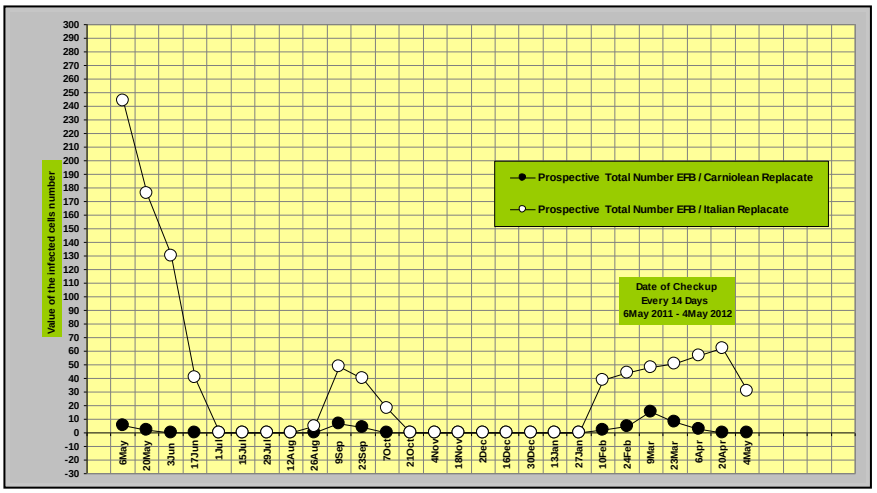

Fig. 2: The differences between hybrid races of Carniolean and Italian honeybee infected by EFB disease.

Appearance continuity to the infection's symptoms by the foulbrood especially EFB for a longer period in the hybrid Italian race than in the hybrid Carniolean race.

Non tolerance of two replicates in the hybrid Italian honeybee race for infection with any foulbrood kind for a long time, and consequently that lead to death or loss of these replicates completely contrary of three replicates in the hybrid Carniolean honeybee race in which the brood generation continued all through the year.

Prediction with seriousness times or critical levels of the infection

Table (2) shows that highest prospective number for total of the brood cells infected by AFB occurs at 26 August, and that appears on Figure (1) clearly, whereas in hybrid Carniolean race, the prospective number was 80 brood cells and this number is considered less than total number of the infected brood cells (the critical level) in which it must be interference by the remedy or the treatment (this critical level or sever degree is 100 brood cells as it was shown by Aly; 2012), while the prospective number was in hybrid Italian race 297,67 brood cells and this number here already exceeded the critical number with grades, whereas it originally at the period (May – September) in all dates had exceeded the critical number, but at the period (October – April), the prospective number was less than 100 brood cells.

Table (2): Infected intensity by AFB disease between hybrid races of Carniolean and Italian honeybee

Honeybee strain			Hybrid Carniolean					Hybrid Italian				
Replicate			1	2	3	1, 2, 3		1	2	3	1, 2, 3	
Estimate			Mean of one face	Mean of one face	Mean of one face	General Mean of one face	Prospective Total number /replicate	Mean of one face	Mean of one face	Mean of one face	General Mean of one face	Prospective Total number /replicate
Date of checkup	2011	6 May	4.71	4.86	0	3.19	44.67	9.57	21.86	6.36	12.60	176.33
		20 May	3.29	3.86	0	2.38	33.33	6.71	20.50	4.50	10.57	148.00
		3 Jun	1.57	0.93	0.86	1.12	15.67	6.14	16.79	2.43	8.45	118.33
		17 Jun	2.21	1.36	2.57	2.05	28.67	11.50	17.21	4.07	10.93	153.00
		1 Jul	2.71	1.86	2.71	2.43	34.00	13.29	18.14	5.57	12.33	172.67
		15 Jul	2.86	2.29	3.21	2.79	39.00	13.64	19.07	6.71	13.14	184.00
		29 Jul	3.71	3.14	3.36	3.40	47.67	15.29	19.93	8.93	14.71	206.00
		12 Aug	5.00	4.57	4.21	4.60	64.33	17.64	20.79	14.50	17.64	247.00
		26 Aug	6.71	6.07	4.36	5.71	80.00	19.93	28.07	15.79	21.26	297.67
		9 Sep	4.57	5.71	3.79	4.69	65.67	14.36	22.43	11.79	16.19	226.67
		23 Sep	2.64	3.00	2.14	2.60	36.33	12.29	15.43	6.29	11.33	158.67
		7 Oct	1.64	2.71	1.36	1.90	26.67	7.57	8.64	3.07	6.43	90.00
		21 Oct	0.5	1.14	0.29	0.64	9.00	6.00	5.86	2.50	4.79	67.00
		4 Nov	0	0.14	0	0.05	0.67	5.79	4.86	2.21	4.29	60.00
		18 Nov	0	0	0	0	0.00	4.14	2.29	2.07	2.83	39.67
		2 Dec	0	0	0	0	0.00	1.86	1.50	1.50	1.62	22.67
		16 Dec	0	0	0	0	0.00	1.43	1.29	1.21	1.31	18.33
		30 Dec	0.79	0	0	0.26	3.67	1.00	NB	1.71	1.36	19.00
	2012	13 Jan	0.64	0.79	0.71	0.71	10	0.43	NB	1.36	0.89	12.50
		27 Jan	0.36	0.57	0.43	0.45	6.33	0.36	NB	0.93	0.64	9.00
		10 Feb	0.57	0.93	0.79	0.76	10.67	NB	NB	1.14	1.14	16.00
		24 Feb	0.71	1.07	1.21	1.00	14.00	NB	NB	1.50	1.50	21.00
		9 Mar	0.14	0	0	0.05	0.67	NB	NB	0.36	0.36	5.00
		23 Mar	0	0	0	0	0	NB	NB	0	0	0
		6 Apr	0	0	0	0	0	NB	NB	0	0	0
		20 Apr	0.21	0.07	0	0.10	1.33	NB	NB	0.71	0.71	10.00
		4 May	1.21	0.50	0.29	0.67	9.33	NB	NB	2.00	2.00	28.00

NB; It means Non Brood or there weren't brood of honeybee by reason of loss or weakness of the queens.

But EFB disease, table (3) and Figure (2), the highest prospective number for total of the brood cells infected by this disease in the hybrid Italian race was at May month equals 244,33 brood cells, and persisted higher than the critical number up to beginnings of June month, then it decreased after that even it decreased off the sever degree at the same May month but in the second year of the experiment because of weakness and inability for compensation of the brood which were missed by EFB disease in hybrid Italian race, while on the contrary, the disease was lower than the critical number in hybrid Carniolean race always.

Table (3): Infected intensity by EFB disease between hybrid races of Carniolean and Italian honeybee

Honeybee strain			Hybrid Carniolean					Hybrid Italian				
Replicate			1	2	3	1, 2, 3		1	2	3	1, 2, 3	
Estimate			Mean of one face	Mean of one face	Mean of one face	General Mean of one face	Prospective Total number /replicate	Mean of one face	Mean of one face	Mean of one face	General Mean of one face	Prospective Total number /replicate
Date of checkup	2011	6 May	0	0	1.14	0.38	5.33	29.93	14.64	7.79	17.45	244.33
		20 May	0	0	0.5	0.17	2.33	19.50	12.58	5.64	12.57	176.00
		3 Jun	0	0	0	0	0	15.07	8.79	4.00	9.29	130.00
		17 Jun	0	0	0	0	0	2.43	4.36	1.93	2.91	40.67
		1 Jul	0	0	0	0	0	0	0	0	0	0
		15 Jul	0	0	0	0	0	0	0	0	0	0
		29 Jul	0	0	0	0	0	0	0	0	0	0
		12 Aug	0	0	0	0	0	0	0	0	0	0
		26 Aug	0	0	0	0	0	0	1.07	0	0.36	5
		9 Sep	0.79	0.64	0	0.48	6.67	4.86	2.21	3.36	3.48	48.67
		23 Sep	0.50	0.29	0.14	0.31	4.33	4.43	1.64	2.50	2.86	40.00
		7 Oct	0	0	0	0	0	1.57	1.00	1.36	1.31	18.33
		21 Oct	0	0	0	0	0	0	0	0	0	0
		4 Nov	0	0	0	0	0	0	0	0	0	0
		18 Nov	0	0	0	0	0	0	0	0	0	0
		2 Dec	0	0	0	0	0	0	0	0	0	0
		16 Dec	0	0	0	0	0	0	0	0	0	0
		30 Dec	0	0	0	0	0	0	NB	0	0	0
	2012	13 Jan	0	0	0	0	0	0	NB	0	0	0
		27 Jan	0	0	0	0	0	0	NB	0	0	0
		10 Feb	0	0.36	0	0.12	1.67	NB	NB	2.79	2.79	39.00
		24 Feb	0	0.86	0.21	0.36	5.00	NB	NB	3.14	3.14	44.00
		9 Mar	1.21	1.14	0.93	1.10	15.33	NB	NB	3.43	3.43	48.00
		23 Mar	1.36	0	0.43	0.60	8.33	NB	NB	3.64	3.64	51.00
		6 Apr	0.57	0	0	0.19	2.67	NB	NB	4.07	4.07	57.00
		20 Apr	0	0	0	0	0	NB	NB	4.43	4.43	62.00
		4 May	0	0	0	0	0	NB	NB	2.21	2.21	31.00

NB; It means Non Brood or there weren't brood of honeybee by reason of loss or weakness of the queens.

CONCLUSION AND RECOMMENDATION

Based on the experiment results which were previously mentioned, it was concluded the following;

Expansion in breeding of the honeybee Carniolean race inside the Egyptian apiaries more than the honeybee Italian race is the best by reason of the honeybee Carniolean race is lower infection and is more tolerance than the later race opposite AFB and EFB by noticeable shape.

The best is non much reliance on that mentioned in certain research papers (such as Aly; 2012) of waiting until reaching to the sever degree of the infection for the intervention with the control, rather must be earliness by the treatment in condition of appearance of any few symptoms of the infected brood cells especially in the Italian race.

Intervention with the suitable medicine at pausing interval of the main nectar in most Egypt which is from mid of June until mid of February of the next year is the best, whereas the remedy additions at this interval cause protection opposite appearance of the infection in citrus blooming season (March – April), then we recommend also with returning the remedy after extracting the citrus honey at mid of April to May beginnings due to prevent appearance of the infection with its very high numbers in the clover season and in July, August and September months especially in the Italian race.

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"دراسات مقارنة بين سلالتي هجين نحل العسل الكرنيولي والإيطالي في مقاومة تعفنات الحضنة"

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تم قياس قدرة عدد من طوائف نحل العسل الهجين المصابة بمرضي التعفن الأمريكي والأوروبي على مقاومة هذين المرضين وإستمراريتها بدون إضافة أية علاجات حيث تم عمل مقارنة بين سلالتي هجين الكرنيولي والإيطالي من حيث حساسيتهما لهذين المرضين، أجريت التجربة في منطقة شطانوف بمحافظة

المنوفية لمدة عام (مايو2011 - مايو2012) على ثلاثة طوائف (مكررات) من كل سلالة، فثبت من نتائج البحث ما يلي؛

من خلال متوسطات عدد العيون المظهرة لأعراض التعفن على مستوى كل طائفة من طوائف التجربة وجد الآتي بوجه عام؛

1) أن مرض تعفن الحضنة الأمريكي متواجد على مدار العام ولكن بدرجات متفاوتة وتظهر أعراضه على حضنة نحل أي من السلالتين عند عدم مكافحته حيث تبدأ الأعراض فى الظهور أثناء وبعد موسم الموالح ثم تعود في التناقص حتى بدايات شهر يونيو ثم تعاود الظهور مرةً أخرى وبصورة أشد وبتزايد فى عدد العيون المصابة وذلك بعد موسم البرسيم خلال أشهر الصيف يونيو، يوليو، أغسطس ثم يتناقص ظهور الأعراض من سبتمبر حتى يناير لتعاود الأعراض فى الظهور مرةً أخرى ولكن بدرجة خفيفة فى يناير وفبراير.
2) أقصى ظهور لأعراض التعفن الأمريكي تكون في شهر أغسطس وهذا يتضح من قيم العدد الإجمالي لعيون الحضنة المظهرة للأعراض في كل من مكررات السلالتين في هذا التوقيت.
3) يلاحظ أن التعفن الأمريكي أقل ظهوراً فى الشتاء عنه فى أشهر الصيف ويتضح هذا من تدني قيم عدد العيون المصابة فى هذا الوقت من السنة.
4) أما مرض تعفن الحضنة الأوروبي فيلاحظ ظهور أعراضه في أوقات معينة من السنة دون الأخرى حيث يتواجد فى بدايات الربيع وأوقات التقلبات الجوية يبدأ مرتفعاً فى قيم عدد العيون المظهرة للأعراض ثم يتناقص سريعاً ويختفي فجأةً بسبب قوة الطائفة نتيجةً لتحسن الظروف الجوية.
5) تبين أن السلالة الإيطالي الهجين أكثر حساسيةً أو تأثراً بأي من مرضي التعفن عن السلالة الكرنيولي الهجين ويظهر هذا فى الآتي --->

أ. إجمالي عدد العيون المصابة بأي من مرضي التعفن ومتوسطاتها فى أكثر أوقات الإصابة خلال السنة أعلى فى حالة النحل الإيطالي عنها فى النحل الكرنيولي.
ب. إستمرار ظهور أعراض الإصابة فى السلالة الإيطالي الهجين لفترة أطول بالتعفن خاصةً الأوروبي عنه فى السلالة الكرنيولي الهجين وذلك فى النصف الأول من السنة.
جـ- عدم تحمل بعض طوائف سلالة النحل الإيطالي الهجين للإصابة بالتعفن بنوعيه كثيراً مما أدى إلى موتها أو فقدها تماماً وذلك بفقد أو موت الملكات لأن الملكات هي مصدر الحضنة فإذا لم توجد الحضنة لا توجد الإصابة.

وبناءً على ماتقدم فإن الدراسة توصي بالآتي؛

1) التوسع في تربية وإكثار سلالة النحل الكرنيولي في المناحل المصرية نظراً لتحملها أو مقاومتها لمرضي التعفن بنوعيه أكثر من سلالة النحل الإيطالي.
2) التبكير بالتدخل بالعلاج المناسب لأي من مرضي التعفن عند ظهور أية أعداد قليلة من عيون الحضنة المصابة وعدم الإنتظار حتى تصل للدرجة الحرجة.
3) دائماً يكون العلاج وقائياً في الفترة من منتصف يونيو أو بعد فرز عسل نوارة البرسيم وحتى منتصف فبراير من العام التالي فهذا يقي الطوائف من ظهور التعفن خلال موسم الموالح (مارس – أبريل)، ثم معاودة وضع العلاج للطوائف بعد فرز عسل الموالح أي من منتصف أبريل إلى بدايات شهر مايو فهذا يمنع ظهور أعراض التعفن بأعدادها الكبيرة في موسم البرسيم وإلى نهاية العام.

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