



Studying The Spread of Varroa on Honey Bee Workers and Incubators and Assessing The Health of Selected Strains

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ABSTRACT: Varroa parasite is the primary pest affecting honeybees and it is ranked first among diseases and pests that are most detrimental to bees globally and in the Arab world. Varroa parasite is dangerous because it reproduces quickly and spreads widely, killing off and destroying bee colonies. The aim of this study was to examine and assess the prevalence of Varroa on worker bees and honey bee colony incubators. Susceptibility tests were carried out to evaluate the prevalence of Varroa infection in colonies with covered brood, on adult workers, and on grooming and hygiene practices. The analysis of adult worker and brood samples from Varroa-infected honey bee strains revealed notable differences between the strains. The Italian hybrid had the highest average infection rate (19.20%), while the Egyptian hybrid had the lowest infection rates (11%). Lastly, the infection rates in Egyptian (Upper Egypt) and Carniola hybrids were medium (12.2 and 13.60%, respectively). Additionally, the evaluation of various chosen breeds' health behaviors was investigated. According to the data, Egypt (Upper Egypt) had the highest average percentage of dead brood that was removed and left exposed after twenty-four hours, 40.4, ranging between (40:42), i.e. healthy colonies. The local Carniola hybrid strain, 34.2, had the lowest value, ranging from It is considered unhealthy and falls into the average range of 30:39. Both the Egyptian (Alexandria) strain and the native Italian hybrid strain had scores of 34.4 and 39.8, respectively. For Al-Masry (Upper Egypt), the average percentage of removed and uncovered brood was 94, with a range of (98:95). The local Carniola 79 hybrid strain had the lowest average percentage, ranging from (69:90). After 48 hours, the Italian hybrid strain from the area and the Egyptian colony (Alexandria) recorded 92 and 80, respectively. The Carniola hybrid strain had the highest percentage recorded at 65.8, which ranged between (61-70), and the lowest value recorded in Egypt (Upper Egypt) was 59.6, which ranged between (58-61). These results were based on the average percentage of dead brood that was not removed or covered after 24 hours. The Egyptian (Alexandria) breed received a score of 60.2, while the local Italian hybrid breed received a score of 65.6. The local hybrid Carniola breed had the highest average percentage of dead brood that was not removed after 48 hours, according to the results. The local Italian hybrid strain and the Egyptian (Alexandria) strain recorded 20 and 8%, respectively, while the Egyptian (Upper Egypt) strain recorded the lowest value, 6, which ranged between 2 and 10.

Keywords: Varroa; Honey bees; Grooming behavior; Bee colonies; Sensory appreciation; Parasitic mites; Varroa destructor; Prepping behavior.

INTRODUCTION

Grooming procedures allow bugs to relax their bodies and sense organs (Zhukovskaya et al., 2013). As a result, this behavior is linked to the insect's ability to choose inputs from its environment. Parasitic mites can cause the afflicted bee to initiate grooming behavior in addition to producing chemosensory and mechanical stimuli. As a result, sensory

appreciation of the parasite as a grooming practice may also select to trigger immunological and behavioral responses (Roode and Lefevre 2012). Further Additional surrounds Good-natured grooming bees may rely on prompt detection of Varroa presence by chemosensory or tactile senses. This would activate defense mechanisms and cause them to react physically to do such

grooming tasks in order to effectively remove the mites from their body. The sensitivity of honey bees to functional grooming behavior may also be influenced by the age and reproductive reputation of mites. (Kirrane et al. 2012) studied how honey bees responded to *V. destructor* in laboratory cages and concluded that the mites' age and reproductive recognition had an effect on the bees' capacity to groom themselves successfully. The worm *Varroa destructor* (*Mesostigmata: Varroidae*) has emerged as the most effective parasite of *Apis mellifera* colonies because it initially expanded its host range to include this species (Oldroyd 1999). In the early piece of the only final century, two mitochondrial haplotypes of *Varroa destructor*, moved host from their close by *Apis ceranato* the Western bumble bee (Navajas et al., 2010). The two practices are significant methods for obstruction for the vermin's nearby host, *Apis cerana* and are carried out to fluctuating ranges by way of the usage of number traces of *A. mellifera* (Bozic and Valentincic 1995; Aumeier 2000; Correa-Marques et al., 2002; Mondragon et al., 2005; Stanimirovic et al., 2010; Balharethet et al., 2012). Together, the two practices focal point on the vermin at some stage in the two phases of its existence cycle; the phoretic prepare when the mite is linked to grown-up honey bees and the conceptive stage which occurs indoors the topped brood cells. Some bumble bee populaces oppose *V. destructor* vermin populace development. States of *A. mellifera* in Sweden (Locke and Fries 2011), France (Buchleret et al., 2010), and in woodlands of the north-eastern US (Seeley 2007) surely as Africanized honey bees in South America (Aumeier et al., 2000) are on the total geared up for making due besides compound treatment. Economically, two components of bumble bees have been constructed up that are able to do. opposing the bug. These are Russian bumble bees (RHB) from the Primorsky locale the place the host-move earlier happened (Rinderer et al., 2001; Harris and Rinderer 2004; Rinderer et al., 2013) and *Varroa* sensitive Hygienic (VSH) honey bees created at the USDA Honey Bee Breeding, Genetics and Physiology Laboratory in Baton Rouge, LA (Danka et al., 2013). RHB have been reared for low parasite populaces (Rinderer et al., 2010) while VSH honey bees have been at the start reproduced for the characteristic of concealment of vermin propagation (Harbo and Harris 1999b; Harbo and Harris 2005). (Kaiser et al. 2013) Extracts of automaton hatchlings and propolis as included materials are foreseen to help the getting ready habits of bumble bees towards *Varroa* vermin. It is additionally anticipated that prepping habits of honey bees and morphology of *Varroa* are every day for the length of the least dynamic time of the 12 months to honey bee

settlements (i.e. winter). Sugar syrup by means of myself or blended in with ramble hatchlings separate or propolis dispose of had been analyzed as conceivable *Varroa* manage materials to take a look at these conjectures. Besides, costs of organized bugs alongside body lengths and widths of *Varroa* had been regarded on week by means of week premise at some stage in winter (Ryabov, E. V. et al., 2022). The results indicated that propolis extricate had the alternative to extend the volume of fallen parasites underneath area stipulations however with deadly consequences on honey bee workers in the lookup middle than pay attention of automaton hatchlings or sugar syrup. Every one of the drugs had been not equipped to guide the prepping behavior of honey bees. Bumble bees are the precept focal point to numerous bugs and parasites such as *Varroa* vermin. These parasites can make intense harms the honey bees. Bumble bees can guard their provinces from *Varroa* vermin using specific practices including preparing habits (GB). Making harms *Varroa* bugs (for example GB) is a heritable persona in *A. mellifera* (Pritchard, 2016). Phoretic *Varroa* parasites; founders, gravid or little woman bugs are introduced to preparing through honey bees particularly girl bugs (Kirrane et al., 2012). The GB incorporates self-preparing and social prepping which compasses of custodians and beneficiary honey bees (Bozic and Valentincic, 1995). The GB can be animated making use of some sheltered substances along with idle sugar (Stevanovic et al., 2012). Other safe technique to manage *Varroa* comprises sprinkling honey bees with sugar syrup (Pileckas et al., 2012). Utilizing sugar syrup as a shower over honey bees has been seen as less unsafe to honey bees than sugar tidying (Abou-Shaara et al., 2016).

A lookup center have a look at has been created by (Aumeier, 2001) to survey the GB of bumble bees falsely pervaded with *Varroa* parasites. Variances have been found in *Varroa* populaces over months. Truth is told, the dependability level of the GB internal comparable honey bee provinces over the span of time in particular for the duration of wintry weather period has no longer been absolutely considered. It is realized that brood elevating motion is extremely low in the course of harvest time and wintry weather for example (Allen and Jeffree, 1956 and El-Sarrag, 1993). Likewise, the lifestyles span of iciness honey bees is excessive (Sakagami and Fukuda, 1986; Amdam and Omholt, 2002). Consequently, it is ordinary that grown-up honey bee populaces in the states are substantially consistent for the duration of winter. Along these lines, concentrating the GB of a similar gathering of honey bees is possible. There

are distinctive sorts of Varroa bugs on the other hand *Varroa destructor* is the one making harms *A. mellifera*. This precise species is ordinary in distinct pieces of the world such as Egypt (Awad *et al.*, 2011; AbouShaara and Tabikha, 2016). This species can be separated than different Varroa species through estimating physique length and width to confirm share of body size. There are roughly 15 haplotypes of *V. destructor* (Zhou *et al.*, 2004). It is viable to distinguish four morpho sorts of Varroa parasites utilising morphometric portrayal (Aude *et al.*, 2016). Up until this point, it is not totally recognized whether the body morphology can be modified (for example improved or diminished) interior a comparable populace of Varroa after some time. An examination in Ukraine has indicated sorts between morphological characteristics of summer time and winter Varroa parasites (Akimov *et al.*, 2004) All things considered the vacillations in morphological attributes, basically body length and width, need greater examinations especially at some stage in winter. During this season rummaging motion of bumble bees is extremely low (Gisder S, Genersch E 2022)

The varroa sianhai Dee lfinado and Baker is a characteristic parasite of the smaller person bumble bee, *Apis florea* (Koeniger *et al.*, 1983; Mossadegh and Komili, 1986 and Mossadegh, 1991). This honey bee parasite species has plagued *Apis mellifera*, *Apis dorsata*, and *Apis cerana* indica colonies, as proven by rare assortments of this vermin in flotsam and jetsam from base sheets of *A. mellifera* settlements in India and Thailand and in flotsam and jetsam from *A. dorsata* provinces in Thailand (Kavinseksan, 2003).. Also, *E. sinhai* was placed between the sternites of *A. cerana* indica rambles in hives in Eastern India (Panda *et al.*, 1989). Prepping or cleaning conduct of bumble bees (*Apis spp.*) is one of numerous shielding constructions of bumble bees that has been related with retreat from parasitic vermin (Guzman-Novoa *et al.*, 1999; Arechavaleta-Velasco and Guzman-Novoa, 2001; Koeniger *et al.*, 2002; Kavinseksan, 2003, 2012, 2013; Kavinseksan *et al.*, 2016). This habit affects the reduce of vermin populaces indoors honey bee settlements. Prepping habits with the aid of *A. dorsata* and *A. cerana* closer to *Tropila elapsmercedesae* and Varroa vermin has been accounted for by a few scientists (Koeniger 1980; and Rath, 1999; Kavinseksan, 2003). *A. dorsata* has cultured prepping conduct, which expels bugs from their our bodies and moreover executes them, demonstrated with the useful resource of the portions of harmed Varroa vermin (37.5%), *Tropila elapsmercedesae* (76%), and *T. mercedesae* (73 – 93%) in flotsam and jetsam

from *A. dorsata* provinces (Delfinado Baker *et al.*, 1992; Koeniger *et al.*, 2002; Kavinseksan, 2003). *A. mellifera* personnel do show off prepping conduct, then once more to a lesser degree than *A. cerana* and *A. dorsata* (Boecking and Spivak, 1999; Kavinseksan, 2003, 2012, Buchler *et al.*, 2010; Khongphinitbunjong *et al.*, 2012). The stage of Varroa parasites harmed with the aid of the practice of getting ready habits used to be round 30–98% The Primorsky in *A. cerana* (Fries *et al.*, 1996) and 12.3% in *A. mellifera* (Fries *et al.*, 1996; Kavinseksan, 2013). bumble bee (*A. mellifera*) has quality prepping habits than the Thai monetarily family honey bee (*A. mellifera* in Thailand) to expel parasites from their bodies and moreover slaughter *Tropilaelaps* and Varroa bugs (Kavinseksan, 2003, 2012, and 2013). The ordinary stage of vermin that had harshly harmed the two legs and physique in the flotsam and jetsam from the Primorsky provinces (20.6% for *Tropilaelaps* bugs and 51.1% for Varroa mites) was greater than that of the Thai business states (17.1% for *Tropilaelaps* bugs and 41.1% for Varroa bugs) (Kavinseksan, 2012, 2013).

MATERIALS AND METHODS

Preparation of experimental honey bee colonies

The current study was carried out at the experimental apiary of El-Sabaheia Research Station (27.2831°N and 30.7632°E) and at the City of Scientific Research and Technological Applications in the Burj Al Arab region (30.9028 north, 29.5539 east), Alexandria, Egypt during the two seasons of 2017 and 2018 using twenty colonies in each year. The experiments were conducted on four different hybrid local strain queens including Italian hybrid, Carniola hybrid and Egyptian hybrid from two different locations (Upper Egypt and Alexandria).

For each hybrid, five colonies were used and acted as five replicates as follow:

1. Group (C): five colonies were headed by carniolian hybrid queen's race from Cairo governorate, agriculture research center.
2. Group (I): five colonies were headed by Italian hybrid queens race from Cairo governorate agriculture research center.
3. Group (E): five colonies were headed by Egyptian hybrid queens race from upper Egypt, Assiout governorate.
4. Group (E*): five colonies were headed by Egyptian hybrid queens race from Alexandria governorate, sabhiia research station

Experiment procedure

a- Evaluation of varroa percentages on adult workers and broods of honey bee colonies:

An approximate number of 400 to 500 worker bees per colony were sampled by brushing them off from the open combs through a large funnel of paper into a wide mouthed jar contained 10% detergent solution or 75% ethyl alcohol ((Shimanuki and Knox, 1991).

The jar was vigorously shaken for several minutes and the dislodged mites were collected by passing the bees and solution through a wire screen to remove the bees and then sieving the solution through a piece of cotton cloth. The cloth was examined and mites were counted. The collected bees on the wire screen were also spread on a white surface to be examined for any attached Varroa to bee.

To estimate the Varroa level of infestation by using current widely used diagnostic methods the naturally fallen mites during 24 hours, the mites inside the sealed worker brood and the mites attached to adult workers.

- Inspection of the sealed worker brood:

Samples of 100 cells from two sealed worker brood combs were examined at random. The worker brood cells were uncapped with a fine forceps and Varroa mite was easily recognized against the white surface of the pupa and then counted (Martin, S. J. (1994). The percentage of infestation was calculated by dividing the number of the presented mites by the number of examined cells (Sostenes *et al.*, 2020.).

b- Analysis of grooming behavior:

Many mites die naturally when workers clean themselves and other workers. Mites were fallen and stuck on the paper which greased by Vaseline. After 24 hour the vase lined paper were collected and counted.

c-Analysis of hygienic behavior (pin killed brood method):

About 100 random sealed brood determinate from each colony, this brood were killed by using sharp pin. Percentage of cleaning cells were recorded after 48 hours. The hygienic colonies and non-hygienic colonies were determinate

RESULTS AND DISCUSSIONS

Assessment of the percentages of varroa in adult workers and honey bee colonies' broods:

The purpose of the guessing experiments was to determine the percentage of varroa infestation in

the honey bee colony's covered brood, adult workers, and grooming and hygiene practices. The regular analysis of worker samples, both adult and brood, from honey bee races infested with varroa mites revealed significant differences between the races. The data presented in Table (1) and Figure (1) illustrates the percentage of varroa infestation in covered brood. The Italian hybrid had the highest mean infestation percentage (19.20%), followed by the Egyptian hybrid (11%) with the lowest infestation percentage. Carniola and Egyptian (Upper Egypt) had the lowest infestation percentages (12.2 & 13.60), respectively. These findings are consistent with research conducted in 2013 by Taha and Al-Kahtani, who examined the connections between population size and worker brood rearing, colony population density, and stored pollen and honey production. They discovered that the robust colonies had significantly higher populations, worker sealed brood, stored pollen grain areas, and honey production than the susceptible ones. During clover, the stronger colonies produced more honey (286.80 and 291.67%) and more common beans (289.24%) than the weaker colonies. There is a strong and excellent correlation between the colony population, brood location, and honey yield (Jevtic *et al.* 2009).

Owayss *et al.* (2013) discovered that the greatest brood production was noted in the summer, followed by the spring, winter, and autumn, with a discernible difference between the summer and every other season for the first year. In contrast, summer, fall, and winter differed significantly in the second year. demonstrated that there was a strong and significant correlation during the experimental period between the area of unsealed brood and the quantity of pollen collected. Queen-less colonies without any brood were only able to gather small amounts of pollen. Conversely, colonies with comparable areas of unsealed brood collected varying amounts of pollen at different times and places. Masry and Abdelaal (2016) found that under arid land conditions, there was a highly significant correlation between the population of the colonies and races under investigation, the stored honey region, and the stored pollen vicinity. Furthermore, there has been a positive correlation found between temperature diploma, preserved pollen, and stored honey. At some point during spring and winter, Egyptian and Italian honeybee colonies produced more employee brood.

Table (1): The percentages of varroa on broods of selected honey bee colonies.* Strain of Egyptian (Alexandria).

Replicates	Strains							
	Hybrid Carniola local		Hybrid Italian local		Egyptian (upper Egypt)		Egyptian (Alexandria)	
	Colony.No	Percentages (%)	Colony.No	Percentages (%)	Colony.No	Percentages (%)	Colony.No	Percentages (%)
R ₁	C ₁	8	I ₁	31	E ₁	5	E ₁ *	13
R ₂	C ₂	18	I ₂	22	E ₂	4	E ₂ *	9
R ₃	C ₃	13	I ₃	17	E ₃	15	E ₃ *	22
R ₄	C ₄	6	I ₄	12	E ₄	24	E ₄ *	3
R ₅	C ₅	16	I ₅	14	E ₅	20	E ₅ *	8
Mean	12.20 ^b		19.20 ^a		13.60 ^b		11.00 ^b	

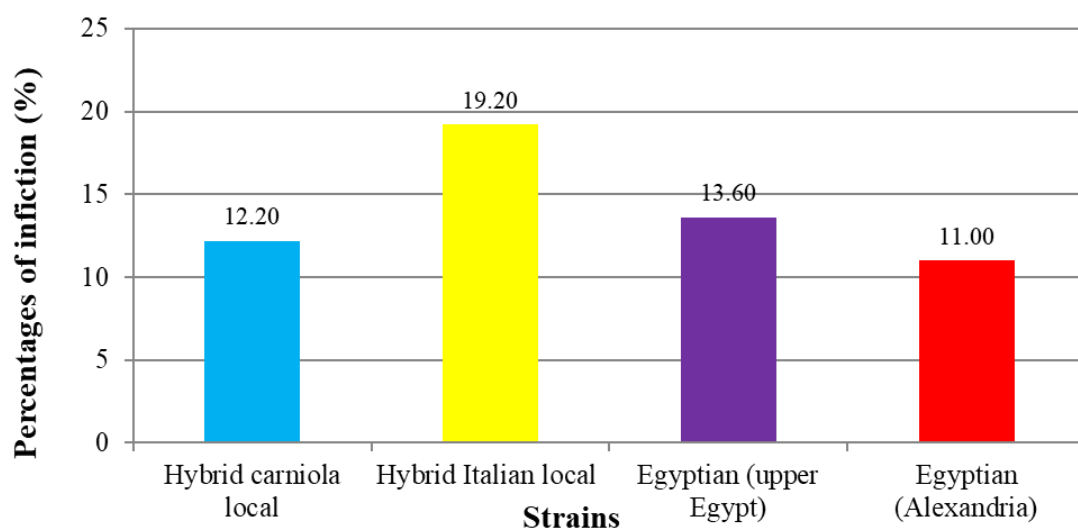
**Fig (1): The mean percentage of varroa on broods**

table (2) and figure (2), which presents the mean percentage of varroa on adult workers of four different honey bee colonies—local hybrid Carniola, Italian hybrid local, Egyptian (Upper Egypt), and Egyptian (Alexandria)—is shown with the data. According to the data, the strain of hybrid Carniola local achieved the highest percentage with a value of 3.55, ranging from 0.93:7.60, while the strain of Egyptian hybrid Alexandria achieved the lowest percentage, with a value of 0.70, ranging from 0.00:1.77). The hybrid Italian local strain recorded a moderate value of 2.67, ranging from 1.01:4.00, while the Egyptian Upper Egypt strain recorded 0.79, ranging from (0.00:1.27). The key finding is that different races of honey bees under similar environmental conditions differ in terms of Varroa infestation levels, hygienic behavior, and other population traits. Furthermore, in a subset of these genetically varied colonies, mite-biting behavior, a sort of grooming, has a worse correlation with Varroa infestation levels than hygienic conduct. *A. m. syriaca*, the commercially less applicable southern bee, exhibits the lowest

infestation tiers and the widest ranges of hygienic behavior, which supports the theory that (sub) tropical bees have stronger defenses against parasites (Bozkus, M. (2023). Kruskal-Wallis test conducted in one direction: $v_2 = 3.76$, d.f. = 1, $P < 0.05$. The biting performance locations were split among the tested races: two colonies of *A. m. syriaca* and one each of *A. m. carnica*, *A. m. caucasica*, and *A. m. anatoliaca*. In *A. m. syriaca* and *A. m. carnica* colonies (both races: 300 bees tested, from three colonies), shaking and swiping was previously observed at a frequency of 16.7% in *A. m. anatoliaca* bees (200 bees tested, from two colonies), and 30% in *A. m. caucasica* bees (200 bees tested, from two colonies). These percentages of shaking and swiping the 10 colonies to remove mites had not been found to be correlated with the levels of Varroa infestation, when For ten colonies for which all measurements were completed, partial correlations between ranges of defense and residual infestation (controlling for colony population) have been computed. The finding that hygienic behavior and mite finding version in Varroa defenses among

herbal populations in Turkey is consistent with the observation of honey bee populations surviving except chemical treatments, or uninfested with mites in Europe and some other place (Lamas Z.S. 2022) The poor correlation between protecting mite biting and Varroa infestation was once highly significant. The fact that this version is presented under common-garden conditions facilitates genetic variations in ectoparasite defense mechanisms. According to some reports, *Apis mellifera scutellata* Lepel tier, the tropicalized Africanized honey bee, combats mites more effectively than European bees. This difference can be attributed to hygienic practices and distinct behaviors like grooming, increased swarming, and absconding .Extreme grooming (shaking and swiping) used to be correlated with lower mite infestation tiers in colonies; however, biting was not immediately examined in a recent study on grooming in Africanized, European, and Russian bees and two selected traces [low (SL) and excessive (SH) varroa populace lines of Russian bees] (Guzman-Novoa et al., 2012). Shaking and swiping, when considered separately from biting behavior, were no longer found to be correlated with infestation level in this study. The use of mites in the assay arena is a key methodological distinction between the two investigations. Guzman-Novoa et al 2012. included the mite on a bee's dorsal thorax. Previous studies have shown that this method biases the check in favor of shaking and swiping and prevents the evaluation of biting. This study

shows that the test is biased towards biting behavior when the mite is placed on the area ground, and it also makes it easier for the bees to shake and remove the mite. Often times, as a result, mites could no longer enter the bee's thorax dorsum (Evans KC, Underwood RM, López-Urbe MM. 2022). The observation that the frequency of shaking and swiping behavior increases in colonies with higher infestation costs could indicate the source of this behavior's induction. Additional research is necessary to fully understand the relationship between biting and shaking/swiping behaviors, as this should help us achieve new selection goals to increase Varroa-resistant bees for beekeepers. It has been demonstrated that genetic diversity in honey bee colonies increases colony health and raises the bar for hygienic conduct efficiency Seeley, 2007. It has been noted that populations of honey bees in Turkey differ genetically from European bees, but not as much from African bees. However, prior research for defensiveness and related traits) suggested that a correlated set of qualities leading to behavioral syndromes should have prevented commercial bees from accessing any preferred mite resistance mechanism. Thus, it is possible to combine desirable traits for resilient and productive bees, as evidenced by the colonies from these four honey bee races' apparent independence in honey storage, Varroa defenses, and colony population characteristics.

Table (2): The percentages of varroa on adult workers of selected honey bee colonies.

Strains	Replicates	Percentages	Mean
Hybrid Carniola local	C ₁	1.41	3.55 ^a
	C ₂	1.58	
	C ₃	6.21	
	C ₄	7.60	
	C ₅	0.93	
Hybrid Italian local	I ₁	2.48	2.67 ^a
	I ₂	4.60	
	I ₃	1.20	
	I ₄	1.01	
	I ₅	4.06	
Egyptian (upper Egypt)	E ₁	1.27	0.79 ^b
	E ₂	1.41	
	E ₃	0.00	
	E ₄	0.58	
	E ₅	0.67	
Egyptian (Alexandria)	E ₁ *	1.77	0.70 ^b
	E ₂ *	0.00	
	E ₃ *	0.64	
	E ₄ *	0.63	
	E ₅ *	0.47	

* Strain of Egyptian (Alexandria).

LSD 0.05 = 2.57

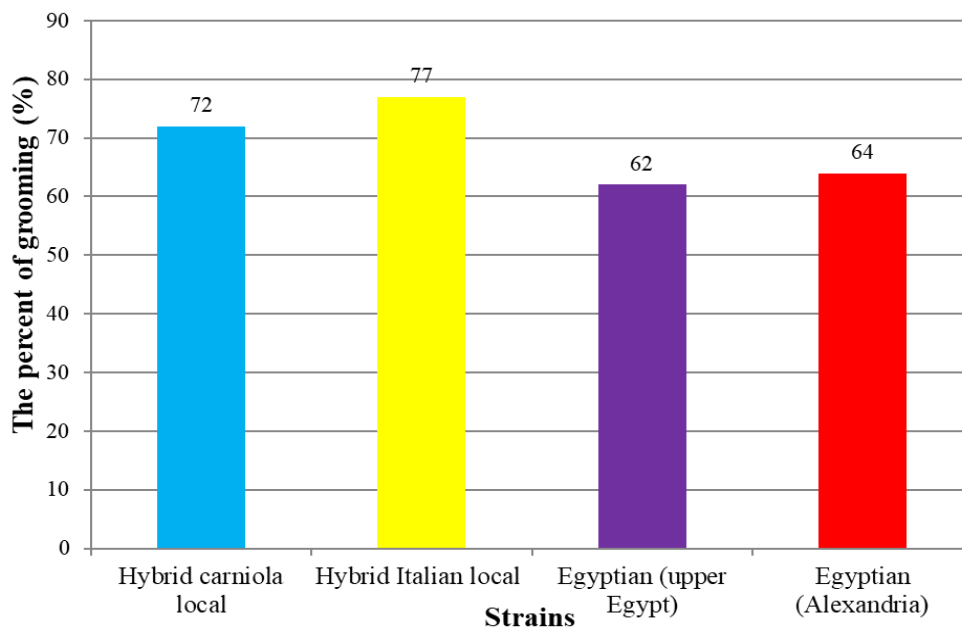


Fig (3): numbers of the fallen varroa on sticky sheets.

1. Evaluation of Hygienic behavior for different selected strains:

The data in table (4) and figure (4) show that the highest mean of percent of dead brood removed and uncapped after twenty-four hours was for the Egyptian (upper Egypt) 40.33 which ranged from (40:42), its mean that is hygienic colonies. The lowest value was recorded for the hybrid Carniola local strain 34.14 which ranged from (30:39), its mean that is Non hygienic colonies. The hybrid Italian local strain and the Egyptian (Alexandria) recorded 34.49 and 39.65, respectively. The results in table (4) and figure (4) cleared the highest values of percent of dead brood removed and uncapped was for the Egyptian 94 (Upper Egypt) which ranged from (98:95).

The lowest mean percent was recorded for the hybrid Carniola local strain 79 which ranged from (69:90). The Egyptian (Alexandria) colony and hybrid Italian local strain recorded 92 and 80 after 48 hours, respectively, table (4) figure (4).

The result in table (4) and figure (4) cleared the mean percent of dead brood not removed and uncapped after 24 hours. The highest percent was recorded for the hybrid Carniola strain 65.8 which ranged from (61-70). The lowest value was recorded for the Egyptian (Upper Egypt) 59.6 which ranged from (58-61). The hybrid Italian local strain and the Egyptian (Alexandria) recorded 65.6 and 60.2 respectively. The results of mean percent of dead brood not removed after 48 hours illustrated in table (4) and figure (4).

The values showed that the highest value was recorded for the hybrid Carniola local strain. 21 which ranged from (10-31) while the lowest value was recorded for the Egyptian (Upper Egypt), 6 which ranged from (2-10). The hybrid local Italian strain and the Egyptian (Alexandria) were recorded 20 and 8, respectively table (4) and histogram (5).

Hygienic behaviour of honey bees offers more than one benefits for beekeepers with no obvious negative traits that accompany the trait. Breeding stock can be selected for hygienic behaviour, and installed strategies of queen rearing can be used to produce massive numbers of hygienic queens from a few breeder queens. Any race of bees can be bred for hygienic behaviour.

Most colonies headed with the aid of queens from business breeders have very low hygienic behaviour, and solely a small share of managed colonies nowadays categorical the behaviour. It will be crucial to have many queen breeders that will select for the behaviour among their personal strains of bees to keep genetic variability inside and among bee lines and to extend the behaviour in the customary populace of honey bees. Commercially accessible lines of productive, hygienic bees would considerably advantage the beekeeping enterprise by way of ameliorating the results of AFB, chalkbrood and varroa; decreasing beekeeper dependence on chemical controls, and decreasing the contamination of bee merchandise with pesticides and antibiotics. Selection for hygienic behaviour should be a routine thing of bee breeding.

Table (4): The percent of hygiene on selected honey bee colonies using pin killed method.

Strains	Replicates	Percent of dead brood removed and uncapped				Percent of dead brood not removed			
		After 24	Mean after 24	After 48	Mean after 48	After 24	Mean after 24	After 48	Mean after 48
Hybrid carniola local	C1	34	34.14	80	79.40	66	65.86	20	20.60
	C2	39		90		61		10	
	C3	36		83		64		17	
	C4	32		75		68		25	
	C5	30		69		70		31	
Hybrid Italian local	I1	37	34.49	85	80.20	63	65.51	15	19.80
	I2	37		86		63		14	
	I3	34		80		66		20	
	I4	32		75		68		25	
	I5	32		75		68		25	
Egyptian (upper Egypt)	E1	39	40.33	90	93.80	61	59.67	10	6.20
	E2	41		95		59		5	
	E3	42		98		58		2	
	E4	40		92		60		8	
	E5	40		94		60		6	
Egyptian (Alexandria)	E*1	39	39.65	90	92.20	61	60.35	10	7.80
	E*2	41		95		59		5	
	E*3	40		94		60		6	
	E*4	40		92		60		8	
	E*5	39		90		61		10	

LSD 0.05 = 2.80467538768

DF 24

Periods 2524.7875 .0000 ***

MSE 9.233333

Main Plot Error 9.5875 LSA 2.72

Strains 32.844765 .0000 *** LSB 2.80

Strains * periods 5.0036101 .0078 ** LSAB 3.96

Error 24 9.233333 T 2.06

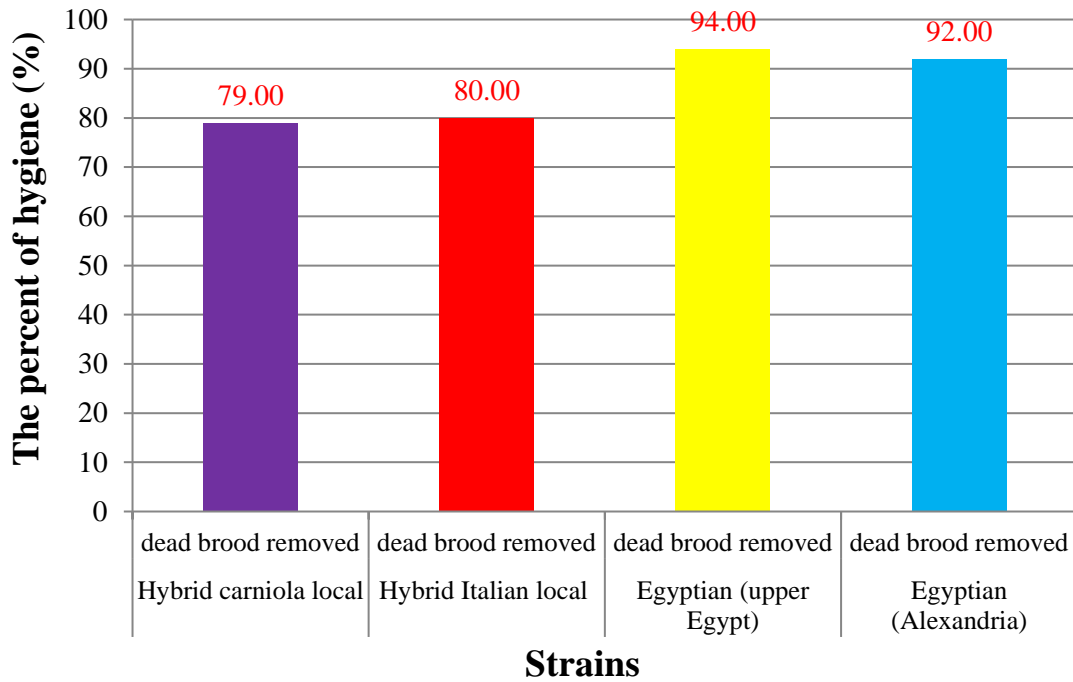


Fig (4): percentage of dead brood removed After 48 hours.

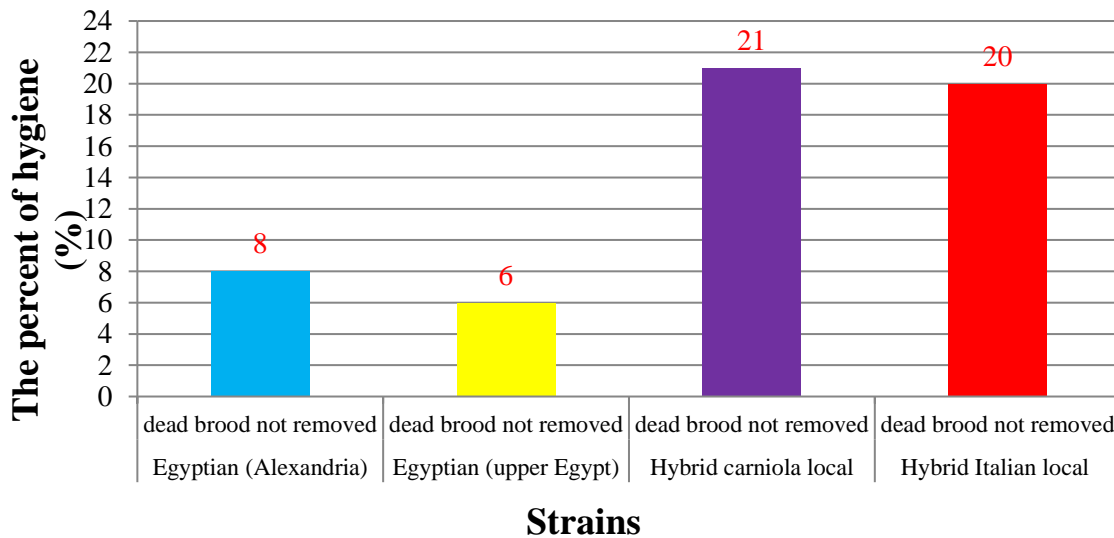


Fig (5): percentage of dead brood not removed After 48 hours.

Comparisons between four exceptional lines of honey bees in the USA indicated that strains selected only for usual hygienic behavior and those selected for varroa sensitive hygiene removed freeze killed brood at about the same percent in 48 h. However, mites had been

removed to a lesser diploma in the strains selected for everyday hygienic conduct (14%) than in the group chosen for Varroa Sensitive Hygiene (66%) (Danka, Harris, Villa, & Dodds, 2013). This suggests that beekeepers ought to select for each behavior to get most sickness and varroa resistance.

CONCLUSION

The purpose of the guessing experiments was to determine the percentage of varroa infestation in the honey bee colony's covered brood, adult

workers, and grooming and hygiene practices. The regular analysis of worker samples, both adult and brood, from honey bee races infested with varroa mites revealed significant differences between the races. The Italian hybrid had the

highest mean infestation percentage (19.20%), followed by the Egyptian hybrid with the lowest percentage (11%) and Carniola and Egyptian (Upper Egypt) with moderate infestation percentages (12.2 & 13.60), respectively.

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الملخص العربي

دراسة و فحص مدى انتشار الفاروا على شغالات وحاضنات مستعمرات نحل العسل وتقييم السلوكيات الصحية للسلاسل المختارة

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الأفة الرئيسية التي تصيب نحل العسل هي طفيل الفاروا الذي يحتل المرتبة الأولى بين الأمراض والآفات الأكثر ضرراً للنحل في الوطن العربي وعالمياً. يعد طفيل الفاروا خطيراً لأنه يتكاثر بسرعة وينتشر على نطاق واسع، مما يؤدي إلى قتل وتدمير مستعمرات النحل. الغرض من هذه الدراسة هو فحص وتقييم مدى انتشار الفاروا على شغالات النحل. وحاضنات مستعمرات نحل العسل حيث أجريت اختبارات الحساسية لقياس مدى انتشار عدوى الفاروا في الطوائف ذات الحضنة المغطاة، وعلى العمال البالغين، وعلى ممارسات النظافة الشخصية ككشف تحليل عينات الشغالات والحضنة من سلالات نحل العسل المصابة بالفاروا عن وجود اختلافات ملحوظة بين السلالات. وسجل الهجين الإيطالي أعلى متوسط نسبة إصابة (19.20%)، بينما سجل الهجين المصري أقل معدلات الإصابة (11%). وأخيراً، كانت معدلات الإصابة في مصر (الصعيد) وكارنيولا متوسطة (12.2 و 13.60 على التوالي). بالإضافة إلى ذلك، تم دراسة تقييم السلوكيات الصحية للسلاسل المختارة المختلفة. وبحسب البيانات فإن مصر (صعيد مصر) سجلت أعلى متوسط نسبة للحضنة الميتة التي تم إزالتها وتركها مكشوفة بعد أربع وعشرين ساعة، 40.4، وتتراوح بين (40:42)، أي الطوائف السليمة. أما سلالة الكارنيولا الهجينة المحلية، 34.2، فقد حصلت على أدنى قيمة، حيث تتراوح من تعتبر غير صحية وتقع في المدى المتوسط 30:39. حصلت كل من السلالة المصرية (الإسكندرية) والسلالة الهجين الإيطالية الأصلية على درجات 34.4 و 39.8 على التوالي. وفي المصري (صعيد مصر) بلغ متوسط نسبة الحضنة المنزوعة والمكشوفة 94، بمدى (98:95). أما سلالة الهجين كارنيولا 79 المحلية فقد حققت أقل متوسط نسبة حيث تراوحت بين (69:90). وبعد 48 ساعة سجلت السلالة الهجينة الإيطالية من المنطقة والمستعمرة المصرية (الإسكندرية) 92 و 80 على التوالي. وكانت سلالة هجين كارنيولا أعلى نسبة سجلت 65.8 وتراوحت بين (61-70)، وأقل قيمة سجلت في مصر (الصعيد) بلغت 59.6 وتراوحت بين (58-61). استندت هذه النتائج إلى متوسط النسبة المئوية للحضنة الميتة التي لم تتم إزالتها أو تغطيتها بعد 24 ساعة. وحصلت السلالة المصرية (الإسكندرية) على درجة 60.2، بينما حصلت السلالة الهجين الإيطالية المحلية على درجة 65.6. كما حصلت السلالة الهجينة المحلية كارنيولا على أعلى متوسط نسبة للحضنة الميتة التي لم تتم إزالتها بعد 48 ساعة، وفقاً للنتائج. وسجلت السلالة الهجين الإيطالية المحلية والسلالة المصرية (الإسكندرية) 20 و 8 على التوالي، بينما سجلت السلالة المصرية (الصعيد) أقل قيمة وهي 6 والتي تراوحت بين 2 و 10.