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EVALUATION OF PROPOLIS PRODUCTION BY DIFFERENT HONEY BEE (*Apis mellifera,* L.) RACES AND COLLECTION TRAPS

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ABSTRACT

Honeybees (*Apis mellifera, L.*) are well known plant pollinators with immeasurable benefits, e.g contributing to the human and animal food sustainability and supplying hive products. The present study was carried out in apiary of Agricultural Research Station in El-Arish region, North Sinai, Egypt (31.06"46.1"N3349"37.1"E)during2022-2023years. Four honey bee races, i.e.Italian; *A.m.ligustica,* Carniolan;*A.m.carnica,* Italian hybrid; *A. m. hybrid ligustica,* and Carniolan hybrid; *A. m. hybrid carnica,* were raised to evaluate propolis production in colonies had similar conditions reared in wooden Langstroth' hives. Four different traps (normal, glass slide, plastic mesh sheet, and fiber mesh sheet) were used for propolis collection. The obtained results showed that: Fiber mesh sheet was superior compared to other collection traps (normal, glass slide, and plastic mesh sheet) and recorded means values 14.28-14.91 g/colony in 2022, and 2023. Total yield of propolis was higher in sep than in other tested months ranging between 663.3- 722.8 g/colony during 2022-2023. High values of propolis production were recorded in the tested bee purebred compared to those of hybrid ones during the of experiment.

INTRODUCTION

Honeybees (*Apis mellifera,* L.) are known to be active promoters in the development of the biodiversity of many ecosystems. They provide valuable services in crop pollination **(Calderone, 2012)** and play an essential role as ecological factors by maintaining environmental health **(Clement, 2009; Nanetti *et al.*, 2021)**. The benefits of pollinators are immeasurable, contributing to the human diet **(Klein *et al.*, 2007; Goulson *et al.*, 2015)** and economic sustainability **(Gallai *et al.*, 2009; Rucker *et al.*, 2012)**. The most crucial and commonly known pollinators, *i.e.* honeybees produce pollination services as well as hive products, *i.e.*, honey, royal jelly, bees wax, propolis, bee venom and pollen that are economically worldwide utilized in pharmaceuticals, cosmetics, food, and food supplements **(Lowore *et al.*, 2018; Jagdale *et al.*, 2021)**. Furthermore, the tremendous role of bees is positively promote farming conservation activity **(Russell, 2008)**.

Methods of collecting honeybee propolis in different environmental conditions are used.

This study aimed to evaluation of honeybee races (*Apis mellifera,* L.) and some different collection traps on propolis production in El-Arish, North Sinai during 2022-2023 years.

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MATERIALS AND METHODS

The present experiment was conducted in the apiary of Agricultural Research Station in El-Arish region, North Sinai, Egypt (31.06"46.1"N3349"37.1"E) during 2022-2023 years. Four honey bee races i.e. Italian; *A.m.ligustica,* The Italian bee race was obtained from the Queen Breeding Station in Suez Governorate - Bee Research Department.

Plant Protection Research Institute, Agricultural Research Center, Ministry of Agriculture. Carniolan *A.m.carnica,* The Carniolan bee race was obtained from the Queen Breeding Station in New Valley Governorate, Bee Research Department, Plant Protection Research Institute, Agricultural Research Center, Ministry of Agriculture. Italian hybrid; *A. m. hybrid ligustica,* This race resulted from the pollination of Italian queens with Egyptian bees; *A.m lamarckii* ,(f1)and Carniolan hybrid; *A. m. hybrid carnica,* This race resulted from the pollination of Carniolan bees with Egyptian bees; *A.m lamarckii*,(f1) were tested to compare their propolis yields at the same beekeeping conditions using four different collection traps (glass slid, plastic mesh sheet, and fiber mesh sheet, and normal) stimulated honey bees to collecting and producing the propolis.

Experimental Design

The experimental apiary was a set of 48 honey bee colonies of similarly equal strength reared in wooden Langstroth's hives and each of them had seven combs. A factorial randomized complete block design, of three factors, *i.e.* honeybee races, collection traps, and months, i.e. Jan to Dec was tested.

These colonies were divided into four groups, then into Four sub-groups, i.e. three colonies/bee race/ trap type. Propolis from each colony were monthly collected in all treatments during the period from Jan 2022 to Dec 2023.

Collection Traps

Normal collection

Propolis was hand collected from each hive (entrance, bars of combs, and under inner covering) by scraping with a putty knife. Then, was placed in a suitable clean dark glass bottle.

Glass slides

Transparent glass slides, each of 48 cm length, 6 cm width, and 6 mm thickness, was placed contiguously on top bars of combs, with a regular space between slides of about 1 mm (**Breyer, 1995**).

Plastic mesh sheets

Polypropylene plastic sheet (dimensions 45 × 35 cm each) with round holes (2 mm diameter each = 156 hole/inch^2) was placed onto the top bars of the combs.

Fiber mesh sheets

Fiber screen, dimensions 45 × 35 cm, with circular holes (1 mm diameter = 625 hole/ inch^2) was put onto the top bars of the combs.

Propolis Harvest

Propolis / colony/ treatment was monthly collected during 2022-2023 years, and weighted (g). Then, it was placed in a dark clean glass bottle and kept in fridge with - 5 ° C .

Statically Analysis

A completely randomized experimental design was tested. Data were analyzed using SAS program (**SAS Institute, 1989**). The general linear models were carried out to test differences (alpha = 0.05) and the least significant difference (LSD) mean separation tests were determined.

RESULTS AND DISCUSSION

Effect of Honey Bee Race on Propolis Production

Effect of honeybee race of propolis yield was expressed as means and total values during 2022 and 2023, respectively (Table 1).

Table 1. Effect of honeybee races on propolis production (mean values (g/colony) at El-Arish region during 2022-2023 years

Honeybee race	2022		2023	
	Mean (monthly)	Total (yearly)	Mean (monthly)	Total (yearly)
Italian	10.45	1504.16	11.38	1638.23
Carniolan	9.70	1397.37	10.52	1514.14
Italian hybrid	8.90	1282.16	9.80	1411.55
Carniolan hybrid	8.23	1184.45	9.08	1307.49
Standard deviation(±)	**0.96**	**138.76**	**0.98**	**141.49**
LSD (0.05%)	**0.16**		**0.07**	

Data revealed that the monthly means (10.45 and 11.38 g/ colony) and total yearly values (1504.16 and 1638.23 g/ colony) of propolis production of Italian race was superior compared to other tested races in 2022, and 2023, respectively. While, Carniolan hybrid recorded the least values (8.23; 1184.45 and 9.08; 1307.49 g/ colony) for the same periods, respectively. Moreover, the two other tested races had in-between values.

Effect of Trap Type on Propolis Yield

Data in Table 2 show effect the potential effect of trap type on propolis production during 2022 and 2023 years.

Generally, data reveal that the mean and total values of Fiber mesh sheet on propolis production superior on all other collection traps in 2022, and 2023. Where, recorded 14.91, and 2147.44 g for mean and total values in 2023, respectively. While, Control (Traditional method) recorded 4.52, and 651.26 g with lowest mean and total values in 2022.

Main effect of months

Concerning the positive effect of months on propolis yield represented in average and total values, the results in Table 3 pointed to the main effect of months on propolis production during 2022 and 2023.

Generally, data reveal that the mean and total values in September on propolis production superior on all other months in 2022, and 2023. Where, recorded the highest values with 15.06, and 722.83 g for mean and total values in 2023, respectively. While, it recorded in January 3.96, and 190.14 g with lowest mean and total values in 2022

Interaction Effect between Honeybee Races, Collection Traps, and Moths on Propiles Production (g) During 2022-2023

Interaction effect between honeybee races, and collection traps

Concerning the positive effect of honeybee races, and collection traps on propolis yield represented in average values, the results in Table 4 pointed to the interaction effect between honeybee races, and collection traps on propolis production during 2022 and 2023.

Regarding the interaction effect between honeybee races, and collection traps on propolis production during 2022 and 2023, data indicate that the highest rate between all treatments was 17.07 g under Italian races with Fiber mesh sheet in 2023. While, recorded the lowest rate was 4.07 g under Carniolan hybrid races with control treatment.

Table 2. Main effect of some different collection traps on propiles production (g) during 2022-2023

Collection Traps	2022		2023	
	Mean (monthly)	Total (yearly)	Mean (monthly)	Total (yearly)
Control	4.52	651.26	5.23	752.39
Glass slid	8.06	1160.49	9.03	1300.32
Plastic mesh sheet	10.41	1499.61	11.61	1671.26
Fiber mesh sheet	14.28	2056.78	14.91	2147.44
Standard Deviation(±)	**4.10**	**590.43**	**4.10**	**589.68**
LSD (0.05%)	**0.16**		**0.07**	

Table 3. Main effect of different months on propiles production (g) during 2022-2023

Months	2022		2023	
	Mean	Total	Mean	Total
January	3.96	190.14	4.83	231.95
February	4.56	218.78	5.40	259.19
March	5.94	285.02	6.83	327.98
April	9.13	438.29	9.96	478.22
May	10.05	482.15	10.65	511.37
June	10.98	527.04	11.64	558.67
July	11.98	574.96	13.02	625.13
August	13.18	632.78	14.07	675.55
September	13.82	663.32	15.06	722.83
October	12.56	603.01	13.43	644.79
November	9.11	437.40	9.95	477.44
December	6.57	315.25	7.46	358.29
Standard Deviation(±)	**3.39**	**162.78**	**3.44**	**165.08**
LSD (0.05%)	**0.28**		**0.12**	

Table 4. Interaction effect between honeybee races and collection traps on propiles production (g) during 2022-2023

Honeybee races	Collection Traps								S. D (±)	
	Cont.		G. slid		P. m. sheet		F. m. sheet			
	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023
Italian	5.05	5.78	8.83	9.84	11.33	12.82	16.58	17.07	**4.84**	**4.77**
Carniolan	4.59	5.40	8.25	9.18	10.84	11.70	15.14	15.78	**4.44**	**4.36**
I. hybrid	4.39	4.88	7.87	8.83	9.77	11.20	13.59	14.30	**3.84**	**3.97**
C. hybrid	4.07	4.84	7.29	8.28	9.72	10.70	11.83	12.50	**3.33**	**3.31**
S.D (±)	**0.41**	**0.45**	**0.65**	**0.65**	**0.80**	**0.91**	**2.04**	**1.97**	**0.73**	**0.68**
LSD (0.05%)	**0.32**	**0.13**								

On the other hand, this results showed highest significant under over all treatments.

Interaction effect between honeybee races, and months

Concerning the positive effect of honeybee races, and months on propolis yield represented in average values, the results in Table 5 pointed to the interaction effect between honeybee races, and different months on propolis production during 2022 and 2023.

Regarding the interaction effect between honeybee races, and months on propolis production during 2022 and 2023, data indicate that the highest rate between all treatments was 16.11 g in September, 2023 with Italian races treatment. While, recorded the lowest rate was 3.45 g in January, 2022 with Carniolan hybrid races treatment. On the other hand, this results showed highest significant under over all treatments.

Interaction effect between collection traps, and months

Concerning the positive effect of collection traps, and months on propolis yield represented in average values, the results in Table 6 pointed to the interaction effect between collection traps, and different months on propolis production during 2022 and 2023.

Regarding the interaction effect between honeybee races, and months on propolis production during 2022 and 2023, data indicate that the highest rate between all treatments was 21.62 g in September, 2023 with Fiber mesh sheet treatment. While, recorded the lowest rate was 1.73 g in January, 2022 with Control treatment. On the other hand, this results showed highest significant under over all treatments.

Interaction effect between honeybee races, collection traps, and months

Concerning the positive effect of honeybee races, collection traps, and months on propolis yield represented in average values, the results in Table 7 (a, and b) pointed to the interaction effect between honeybee races, collection traps, and different months on propolis production during 2022 and 2023.

Regarding the interaction effect between honeybee races, collection traps, and months on propolis production in 2022, data indicate that the highest rate between all treatments was 23.65 g in September, under Italian races with Fiber mesh sheet treatment. While, recorded the lowest rate was 1.45 g in Janury, under Carniolion hybrid races with Control treatment. On the other hand, this results showed highest significant under over all treatments.

Regarding the interaction effect between honeybee races, collection traps, and months on propolis production in 2023, data indicate that the highest rate between all treatments was 24.30 g in September, under Italian race with Fiber mesh sheet treatment. While, recorded the lowest rate was 2.11 g in January, under Carniolan hybrid race with Control treatment. On the other hand, this results showed highest significant under over all treatments.

Assessment in this respect, due to discovering the importance of propolis on behavior healthy activity and prevented fungal and insect infections that may threaten honey bee colonies. Addition to using propolis in production of many cosmetics and natural antibiotics which beneficial to human health **(Pereira *et al.*, 2015; Reddy *et al.*, 2012).** Inside every colony there are some bees specialize in foraging for resin and it may possess a genetic component similar to specialized pollen and nectar collectors **(Nakamura and Seeley, 2006)**. In contrast to collecting nectar and pollen, a few bees at specific tunes in the hive are tasked with collecting resin, which returns to the activity of collecting nectar and pollen when needed. After collection, worker bees chew the resin and mix it with salivary enzymes, beeswax, and some pollen to produce propolis **(Nakamura and Seeley, 2006; Alvarez-Suarez, 2017)**.

Table 5. Interaction effect between honeybee races and different months on propiles production (g) during 2022-2023

Months	Honeybee races							
	Italian		Carniolan		*I. hybrid*		*C. hybrid*	
	2022	2023	2022	2023	2022	2023	2022	2023
Jan.	4.71	5.57	3.82	4.69	3.87	4.78	3.45	4.29
Feb.	5.44	6.32	4.82	5.62	4.42	5.23	3.55	4.43
March	7.75	8.63	5.91	6.83	5.54	6.45	4.55	5.43
April	10.57	11.45	9.78	10.50	8.52	9.40	7.66	8.51
May	11.31	12.04	10.64	10.81	9.73	10.51	8.50	9.26
June	12.19	12.89	11.39	12.36	10.61	10.73	9.74	10.58
July	13.39	13.80	12.77	13.65	10.86	12.89	10.90	11.76
Aug.	14.13	15.03	13.59	14.47	12.82	13.72	12.20	13.08
Sept.	13.71	16.11	14.47	15.30	13.84	14.70	13.26	14.13
Oct.	13.79	14.65	13.03	13.91	12.18	13.03	11.25	12.14
Nov.	10.52	11.31	9.61	10.52	8.66	9.53	7.66	8.44
Dec.	7.85	8.73	6.62	7.53	5.80	6.67	6.00	6.93
S. D (±)	**3.30**	**3.42**	**3.62**	**3.61**	**3.36**	**3.41**	**3.35**	**3.35**
LSD (0.05%)	**0.55**	**0.23**						

Table 6. Interaction effect between some different collection traps and different months on propiles production (g) during 2022-2023

Months	Collection traps							
	Control		Glass slid		Plastic mesh sheet		Fiber mesh sheet	
	2022	2023	2022	2023	2022	2023	2022	2023
Jan.	1.73	2.50	2.45	3.44	4.47	5.51	7.21	7.88
Feb.	2.06	2.84	2.96	3.95	5.17	6.18	8.05	8.63
March	2.88	3.69	4.34	5.33	6.74	7.80	9.78	10.51
April	4.11	4.93	7.72	8.54	10.43	11.49	14.27	14.89
May	4.90	5.34	8.16	9.14	11.54	11.79	15.58	16.33
June	5.70	5.61	9.01	9.98	12.38	13.52	16.83	17.45
July	6.02	6.82	11.01	11.99	12.53	14.75	18.36	18.54
Aug.	6.11	6.91	12.25	13.25	14.92	16.01	19.46	20.13
Sept.	6.25	7.21	13.03	13.99	15.04	17.41	20.96	21.62
Oct.	5.85	6.65	12.01	13.00	14.08	15.12	18.31	18.96
Nov.	4.88	5.56	8.09	9.07	10.69	11.68	12.80	13.48
Dec.	3.79	4.65	5.70	6.69	6.98	8.01	9.80	10.52
S. D (±)	**1.61**	**1.58**	**3.63**	**3.62**	**3.73**	**3.97**	**4.71**	**4.67**
LSD (0.05%)	**0.55**	**0.23**						

Table 7.a. Interaction effect between honeybee races and collection traps and months on propiles production (g/colony) in 2022

H.R.	*C.Traps*	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Carniolion Italian	**Control**	2.25	2.67	3.28	5.01	5.39	5.94	6.30	6.19	6.41	6.24	5.77	5.15
	G. slid	2.83	3.55	6.60	8.49	9.02	9.72	11.84	12.49	13.04	12.37	9.44	6.54
	P.m.sh.	5.65	6.53	9.53	11.24	12.33	13.12	14.23	15.50	11.74	15.79	12.12	8.12
	F.m.sh.	8.10	9.02	11.60	17.53	18.51	19.97	21.17	22.34	23.65	20.75	14.74	11.59
	Control	1.60	2.17	2.99	3.94	5.11	6.02	6.24	6.13	6.26	5.86	5.06	3.64
	G. slid	2.34	3.04	3.72	8.16	8.51	9.23	11.39	12.29	13.22	12.37	8.89	5.83
	P.m.sh.	4.25	5.64	6.98	11.22	11.79	12.08	14.00	15.07	16.07	14.88	11.34	6.81
	F.m.sh.	7.08	8.44	9.95	15.80	17.13	18.22	19.44	20.87	22.33	19.01	13.17	10.20
I.hybrid	**Control**	1.60	1.86	3.04	3.85	5.01	5.69	5.93	6.10	6.22	5.78	4.36	3.21
	G. slid	2.41	2.87	3.96	7.66	8.13	8.81	10.58	12.41	13.33	11.93	7.43	4.89
	P.m.sh.	4.31	4.57	5.69	9.92	11.60	12.43	9.12	14.40	15.97	13.14	10.10	6.00
	F.m.sh.	7.16	8.37	9.48	12.65	14.19	15.49	17.81	18.36	19.84	17.86	12.75	9.11
C.hybrid	**Control**	1.45	1.54	2.23	3.64	4.08	5.15	5.59	6.04	6.10	5.53	4.31	3.17
	G. slid	2.21	2.37	3.08	6.57	6.98	8.25	10.24	11.75	12.53	11.38	6.59	5.56
	P.m.sh.	3.65	3.95	4.78	9.33	10.45	11.91	12.76	14.71	16.36	12.50	9.21	6.98
	F.m.sh.	6.48	6.36	8.10	11.09	12.49	13.65	14.99	16.28	18.03	15.61	10.53	8.29
S. D. (±)		**2.26**	**2.51**	**3.01**	**4.11**	**4.32**	**4.46**	**4.82**	**5.14**	**5.63**	**4.79**	**3.28**	**2.43**
LSD (0.05%)		**1.10**											

Table 7.b. Interaction effect between honeybee races and collection traps and months on propiles production (g) in 2023

H.R.	*C.Traps*	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Italian	**Control**	3.06	3.48	4.09	5.82	5.49	6.20	7.08	6.99	7.88	7.03	6.24	5.96
	G. slid	3.82	4.54	7.59	9.47	10.13	10.71	12.83	13.54	14.11	13.32	10.44	7.54
	P.m.sh.	6.69	7.57	10.58	12.30	13.38	14.17	15.29	16.56	18.14	16.84	13.16	9.17
	F.m.sh.	8.71	9.68	12.26	18.19	19.17	20.50	20.01	23.02	24.30	21.39	15.39	12.24
Carniolan	**Control**	2.42	2.98	3.80	4.75	5.93	6.77	7.06	6.84	7.04	6.65	5.87	4.67
	G. slid	3.32	4.01	4.72	8.48	9.52	10.22	12.37	13.27	14.07	13.40	9.89	6.83
	P.m.sh.	5.30	6.68	8.07	12.30	10.02	13.66	15.06	16.19	17.09	15.93	12.39	7.78
	F.m.sh.	7.73	8.82	10.74	16.45	17.76	18.76	20.10	21.57	22.99	19.67	13.92	10.85
I.hybrid	**Control**	2.42	2.54	3.82	4.66	5.16	3.50	6.74	6.96	7.00	6.62	5.15	4.00
	G. slid	3.41	3.87	4.95	8.65	8.96	9.76	11.52	13.38	14.29	12.91	8.39	5.85
	P.m.sh.	5.36	5.48	6.72	10.97	12.65	13.48	14.83	15.52	17.02	14.17	11.13	7.05
	F.m.sh.	7.92	9.03	10.29	13.31	15.27	16.18	18.46	19.02	20.50	18.44	13.44	9.77
C.hybrid	**Control**	2.11	2.35	3.04	4.46	4.80	5.96	6.40	6.85	6.91	6.29	4.99	3.96
	G. slid	3.20	3.36	4.08	7.56	7.96	9.23	11.22	12.79	13.50	12.37	7.56	6.52
	P.m.sh.	4.70	5.00	5.83	10.40	11.13	12.75	13.81	15.77	17.41	13.55	10.02	8.03
	F.m.sh.	7.14	7.01	8.76	11.62	13.14	14.37	15.58	16.93	18.68	16.35	11.17	9.21
S. D. (±)		**2.20**	**2.43**	**2.98**	**4.07**	**4.38**	**4.74**	**4.53**	**5.12**	**5.57**	**4.76**	**3.30**	**2.37**
LSD (0.05%)		**0.47**											

Human has realized the importance of propolis as a medicine and has been used in folk medicine for thousands of years where, Propolis was used at the time of Egyptian and Greek civilizations which recognized its healing qualities. Different civilizations have accepted propolis as natural drugs for a long time because that has antibacterial, antifungal, antitumor, antioxidant, immune boosting and other beneficial activities for human **(Sung *et al.*, 2017)**. Until nowadays propolis used in different countries of the world due to its healing and health-beneficial activities, it is among the few best natural products that have been used, maintained and propagated over a long period of time, and is available in either pure form or combined with other natural products in over-the-counter preparations, cosmetics, and as a constituent of health foods **(Bhargava *et al.*, 2021)**. For this reason, in recent years, several researchers have investigated the bioactive components of propolis, a wide range of its biological activities such as antibacterial, antioxidant, antifungal, anti-inflammatory, anticancer, immune boosting and other beneficial activities, and their mechanisms of action as nutritional, cosmetic and pharmaceutical benefits **(Pasupuleti *et al.*, 2017)**.

The time spent from the beginning of the collecting process of the resin until obtaining a full corbicular load of resin was, on average, about seven minutes **(Kumazawa *et al.*, 2008)**, but can take from fifteen minutes and to hour depending on the weather **(Haydak, 1953)**. Resin is collected is between 10:00 AM and 3:30 PM, that on sunny day, it may be easier to collect due to its flexibility at higher temperatures **(Meyer, 1956; Hoyt, 1965)**. Resin activities within the hive are carried out by middle-aged bees which often tasked with building the nest as well as by those bees foraging for resins **(Simone-Finstrom and Spivak, 2010)**.

The amount and quality of propolis collected by honey bees is related to many factors including plant sources, season of collection, propolis collection techniques and even the genetic origin of honey bee strains, due to different preferences for plant sources **(Crane, 1990; Souza *et al.*, 2016).** With regard to the effect of the method of collecting propolis on productivity, it has been shown that traditional methods of collecting propolis such as scraping tires and boxes which is a cumbersome work for beekeepers and does not give large and pure amounts of propolis, despite this, is still used by many propolis collectors **(Kosonocka, 1990; Clay, 2002)**. Propolis was first produced on a commercial scale in the 1950s. It has been produced by a grid or grids, with holes about 2 mm. **(Crane, 1997)**. The most commonly used collection methods employ special traps placed on top of a hive, below the covers or next to lateral walls inside the hives so that bees do not mix wax with the propolis and no contamination occurs during harvesting. Honey bee worker try to seal the holes and fill the trap with propolis. Frozen propolis is removed from frozen nets by bending them or brushing them **(Clay, 2002; Galeotti *et al.*, 2018)**. Honeybees are much more active in filling smaller cracks than bigger. This may be due to the ease of filling the smaller cracks than compared with the bigger **(Afrouzan *et al.*, 2007; Tsagkarakis *et al.*, 2017).** Investigated the effect of method production on yield of propolis produced by used net (mesh 8), tarpaulin, fibre, and roland bell trap were used for propolis production and reported that the maximum amount of harvested propolis was 51.27 g/hive, using the fiber method.

Ability of colonies producing simultaneously propolis and royal jelly (RJ) could be attributed to their foraging capacity and pollen collection **(Akongte *et al.*, 2023)**. Higher (RJ) producing bees have higher levels of foraging capacity, brood pheromone recognition and pollen collection compared to low (RJ) producing bees **(Han *et al.*,**

2017). Foraging honey bees were found to collect raw materials from living plants to make propolis after mixing with wax **(Hegazi, 1998; Bankova *et al.*, 2000). (Boutin *et al.*, 2015; Scannapieco *et al.*, 2016)**. Reported that variation in the hygienic behavior of colonies at different periods could be attributed to environmental factors (temperature, season and nectar flow) and workers performing other tasks changes.

Propolis yield of honey bee colony ranged from 50-600 g for different honey bee races **(Ghisalberti, 1979)**. Differences morphological in honey bee subspecies led to differences propolis gathering behavior **(Winston, 1991)**. There are relation between honey bee gathering behaviors of propolis with external morphological structures which include corbicula on the hind leg, and mouthparts **(Thorp, 1979; Ajao *et al.*, 2014)**.

Conclusion

The following conclusion could be pointed to:

The experimental results showed highest significant under over all treatments with main, and interaction factors addition to superior honeybee propolis production in 2023 more than 2022, on the other hand, recorded highest rate on propolis yield under Italian race with fiber mesh sheet in September in 2022, and 2023.

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الملخص العربي

تقييـــم إنتـــاج البـروبوليـــس بواســطة ســلالات نحـل العســل المختلفة ومصائد التجميع

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يعد نحل العسل (*Apis mellifera*, L.) من اهم الملقحات في الطبيعة حيث تساهم في تنوع النظم الغذائيه وتحقيق الاستدامة الاقتصادية من خلال إنتاج العديد من منتجات نحل العسل. لذلك أجريت هذه الدراسة بمنحل محطة البحوث الزراعية بالعريش بشمال سيناء خلال عامي ٢٠٢٢ -٢٠٢٣ بتربية ٤ سلالات مختلفة من نحل العسل (الإيطالي، الكرنيولي، الهجين الإيطالي، الهجين الكرنيولي) لتقييم ودراسة إنتاجية البروبوليس كأحد منتجات نحل العسل تحت تأثير استخدام ٤ أنواع مختلفة من مصائد جمع البروبوليس وهي (الكنترول، الشرائح الزجاجية، الشباك البلاستيكية، مصائد البروبوليس) لتحفيزنحل العسل على جمع وإنتاج البروبوليس. حيث أظهرت النتائج الأتي: تفوق استخدام مصائد البروبوليس الفيبر كأحد طرق التجميع علي بقية طرق التجميع الأخرى للبروبوليس (الكنترول والشباك البلاستيكية والواح الزجاج) حيث سجلت متوسط انتاج ما بين ١٤,٢٨-١٤,٩١ جم/طائفه لعامي ٢٠٢٢ و٢٠٢٣. كان الوزن الإجمالي للبروبوليس في شهر سبتمبر أعلى من جميع الأشهر حيث تراوح بين ٦٦٣,٣ – ٧٢٢,٨ جرام خلال الأعوام ٢٠٢٢-٢٠٢٣. ارتفاع قيم إنتاج البروبوليس المسجلة في سلالات النحل الأصيلة مقارنة بسلالات النحل الهجين خلال الأعوام ٢٠٢٢-٢٠٢٣.

الكلمات الاسترشادية: سلالات نحل العسل، ،البربوليس، مصائد التجميع.

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