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**RELATIONSHIP BETWEEN HONEYBEE COMBS AGE AND THE PERCENTAGE DAMAGE BY GREATER WAX MOTH (*GALLERIA MELLONELLA*, LEPIDOPTERA: PYRALIDAE) WITH SPECIAL REFERENCE TO ITS SEASONAL ACTIVITY UNDER MINIA REGION CONDITIONS, EGYPT**

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**ABSTRACT**

The greater wax moth, *Galleria mellonella* L., is considered one of danger harmful honeybee (*Apis mellifera* L.) colonies pests. They can cause significant losses in storage combs or in apiaries. This study was conducted to, know relationship between comb damage percentage of *Galleria m.* and comb age. Also, its seasonal activity under Minia region, Egypt conditions during season 2021/2022. The results showed damage area percentage increased by increase comb age for one, two, three, four and five (28.14, 32.84, 34.36, 37.04 and 44.92%). Also, data revealed to significant differences between damage percentage of comb age one, two, three and five years but non-significant difference between comb age three and four comb age also, between four and five comb age. On the other hand, The peak abundance of larvae, pupa and adult was recorded in June 2022 (50.33, 30.67 and 39.67, respectively). While, the low mean number of *G. mellonella* stages was recorded (0.0) for all stages in January 2022. The results indicate that the optimum temperature of the greater wax moth was 25 °C and relative humidity was 55%. Finally, data analysis of regression coefficient between greater wax moth mean stages number and temperature were 0.3975, 0.7376 and 0.4718 for larvae, pupa and adults, respectively. While the relative humidity was 1.3166, 1.9053 and 1.2851% for larvae, pupa and adults, respectively.

**Key words:** : honeybee , moth, damage, greater

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## INTRODUCTION

The greater wax moth (*G. mellonella*, Lepidoptera: Pyralidae) is one of the most harmful pests of honeybee colonies and economically important pest of wax comb because of their damaged combs by making tunnels through the combs (Chandel et al. 2003). Wax is one of honeybee colonies productions, also its considered the most useful honeybee products such as pharmaceutical industry and in cosmetics Ebadi et al., (1980). Weak colonies attack by wax moth larvae to feed on wax comb during the storage of honeybee wax combs in winter. In addition to, the larvae cause economic loss all over the world for the beekeeping industry (Haewoon et al., 1995 & Caron, 1999). In the seasons of autumn and winter all empty combs must be protected and treated against wax grater moth during the storage period (Pavela, 2009). On the other hand, the peak of the greater wax moth has been determined during the summer and autumn months (Gupta, 1987). However, there is little information on the seasonal abundance of this pest. But Elbeheri et al. (2016) found that the optimum temperature of larvae moth was  $28\pm 2^{\circ}\text{C}$  and relative humidity was  $65\pm 5\%$ . Therefore, the present work aimed to study was recorded the influence of combs age on the damage caused by this pest and also, the activity of this pest in the stage: during the months of season 2021/2022

## MATERIALS AND METHODS

**Comb age:** fifteen swarm box placed on the storage room for one month. Each three replicates include different ages of honeybee combs wax from one year to

five years (Cantwell and Smith 1970 & Caron, 1999). Damage area ( $\text{inch}^2$ ) was recorded every three days intervals of August month 2022 for each age. Damage was appearance by larvae produce silken threads (Hood, et al. 2003). Damaged area was calculated by using wired grad frame divided to 1.0 inch square (De Jong, 1976).

**Seasonally activity,** seasonally activity of the greater wax moth was carried out in Minia region during season 2021/2022. Three hives placed in the same storage room, each hive contained eight combs aged above three years. Three combs were collected randomly from each hive. The inspection of tested hives for greater wax moths was done monthly Sohail et al. (2017). Records per month divided into three times: first, middle and end of month. Number of greater wax moths stages (larvae, pupa and adult) was recorded in each inspection process Hood et al. (2003) and Ellis et al. (2013).

**Statistical analysis,** Data were analyzed using Duncan, s multiple range test 1955 (Duncan 1955) and regression coefficient analyzed by method of Mead et al., (1993).

## RESULTS AND DISCUSSION

As shown in table (1), the data indicated that the damage caused by *G. mellonella* larvae was gradually increased in different combs ages by increasing the time of feeding of larvae which agree with Sohail et al. (2017). Results revealed that damage area percentage increased by increase comb age for one, two, three, four and five (28.14, 32.84, 34.36, 37.04 and 44.92%),

these results are consistent with **Anwar et al. 2014** who found that old wax comb aged > 3 years more damaged than new wax comb aged < 2 years. On other hand, comb age one year, the damage caused by the larvae was 73.1 % after 30 days of exposure, however the age five years was 99.05 % but ages combs two, three and four years came between (80.6, 74.88 and 97.38%).

Statistical analysis showed significant differences between damage percentage of comb age one, two, three and five years but non-significant difference between comb age three and four comb age also, between four and five comb age.

The above mentioned results showed, that feeding the *G. mellonella* larvae increased by increasing the feeding time on all the bee wax comb of different ages (the last week of exposure). Also, the current experience findings mean that of this pest preferred the fed on a very old wax diet (five years of comb age), this agreement with **Pant and Kapoor (1964)** they explained that the greater wax moth larvae more attractive to old beeswax rather than new combs because it contained essential amino acids from exuviae of immature bee stages.

Data in table (2) recorded the monthly activity of the greater wax moth stages in the storage during season 2021/2022. The percentage number of different stages wax moths changed greatly in different months during 2021/2022. The highest mean number of larvae, pupa and adult was recorded in June 2022 (50.33, 30.67 and 39.67,

respectively). While, the low mean number of *G. mellonella* stages was recorded (0.0) for all stages in January 2022 and this agree with **Charriere and Imdorf, (1999) and Sharma (2011)**. On the other hand number of moth stages increase gradually in the same month beginning, middle and end of month for 12 months of study. The results indicate that the optimum temperature for the peak population of the greater wax moth stages was 25 C° while the optimum relative humidity was 55% and this is results going in the same direction **Fathy, et al. (2017)** they found the optimum temperature and relative humidity was (29-35 °C) and (50-55 Rh%). Also, **Elbehery et al. (2016)** found that temperature of 28±2°C, 65±5 % relative humidity.

Regression coefficient between mean larvae of greater wax moth and temperature was 0.3975, which means that increasing of temperature by one degree, due to increasing number of larvae by 0.3975. The same effect of temperature on pupa and adults which increasing of temperature by one degree, due to increasing number of pupa and adults by 0.7376 and 0.4718, respectively. The same direction for relative humidity was 1.3166, 1.9053 and 1.2851 for larvae, pupa and adults respectively. Which means that increasing of relative humidity by one degree, due to increasing number of larvae, pupa and adults by 1.3166, 1.9053 and 1.2851% respectively. This data are agreement with **Abrol and Kakroo (1996)**.

**Table (1): Effect of comb age on the damage area inch<sup>2</sup> caused by larvae of *G. mellonella* in August 2022.**

Age Days	Comb age one year		Comb age two years		Comb age three years		Comb age four years		Comb age five years	
	Mean of damage	%damage	Mean of damage	%damage	Mean of damage	%damage	Mean of damage	%damage	Mean of damage	%damage
3	0.667	<b>0.476</b>	0.67	<b>0.476</b>	0.33	<b>0.238</b>	1	<b>0.714</b>	1.6667	<b>1.19</b>
6	1.833	<b>1.31</b>	7.167	<b>5.119</b>	1.5	<b>1.071</b>	4.167	<b>2.976</b>	6.5	<b>4.643</b>
9	15.83	<b>11.31</b>	15.17	<b>10.83</b>	10.67	<b>7.619</b>	17.17	<b>12.26</b>	10.667	<b>7.619</b>
12	29.33	<b>20.95</b>	21.17	<b>15.12</b>	23.17	<b>16.55</b>	31	<b>22.14</b>	29.833	<b>21.31</b>
15	38.17	<b>27.26</b>	49.83	<b>35.6</b>	36.17	<b>25.83</b>	42.83	<b>30.6</b>	53	<b>37.86</b>
18	42.17	<b>30.12</b>	50.17	<b>35.83</b>	64.5	<b>46.07</b>	50.17	<b>35.83</b>	66.5	<b>47.5</b>
21	49.5	<b>35.36</b>	54.5	<b>38.93</b>	71.33	<b>50.95</b>	64.83	<b>46.31</b>	87.167	<b>62.26</b>
24	51.83	<b>37.02</b>	69.5	<b>49.64</b>	75.33	<b>53.81</b>	83.5	<b>59.64</b>	104.33	<b>74.52</b>
27	62.17	<b>44.4</b>	78.67	<b>56.19</b>	93.17	<b>66.55</b>	87.5	<b>62.5</b>	130.5	<b>93.21</b>
30	102.3	<b>73.1</b>	112.8	<b>80.6</b>	104.8	<b>74.88</b>	136.3	<b>97.38</b>	138.67	<b>99.05</b>
<b>General</b>		<b>28.14%</b>		<b>32.84%</b>		<b>34.36%</b>		<b>37.04%</b>		<b>44.92%</b>
<b>mean</b>	39.38	<b>d</b>	45.96	<b>C</b>	48.09	<b>b</b>	51.85	<b>ab</b>	62.88	<b>a</b>

**For general means followed by the same letters are not significantly different at 5% level of probability (Duncan multiple range test at 5%)**

**Table (2): Number of the greater wax moth *G. mellonella* L stages from July 2021 to June 2022 in Minia region.**

Stages		Larvae				Pupa				Adult				Temp. °C	RH %	
		Beginning of month	Middle of month	End of month	Mean	Beginning of month	Middle of month	End of month	Mean	Beginning of month	Middle of month	End of month	Mean			
Months	2021	July	33	41	28	<b>34</b>	22	15	10	<b>15.67</b>	34	28	30	<b>30.67</b>	30	55
		Aug.	23	29	23	<b>25</b>	12	14	9	<b>11.67</b>	37	31	29	<b>32.33</b>	33	50
		Sept.	19	26	20	<b>21.67</b>	15	16	15	<b>15.33</b>	35	36	28	<b>33</b>	30	54
		Oct.	18	15	12	<b>15</b>	8	6	5	<b>6.33</b>	31	28	25	<b>28</b>	28	61
		Nov.	9	3	1	<b>4.33</b>	2	1	1	<b>1.33</b>	10	7	4	<b>7</b>	23	62
		Dec	1	0	0	<b>0.33</b>	0	0	0	<b>0</b>	2	0	0	<b>0.67</b>	20	68
	2022	Jan.	0	0	0	<b>0</b>	0	0	0	<b>0</b>	0	0	0	<b>0</b>	16	72
		Feb.	0	0	5	<b>1.67</b>	0	0	0	<b>0</b>	0	0	0	<b>0</b>	18	71
		Mar.	10	10	11	<b>10.33</b>	4	4	5	<b>4.33</b>	0	0	0	<b>0</b>	20	65
		Apr.	18	20	22	<b>20</b>	6	6	6	<b>6</b>	0	0	3	<b>1</b>	22	60
		May	31	40	45	<b>38.67</b>	6	7	7	<b>6.67</b>	18	22	24	<b>21.33</b>	23	59
		June	51	52	48	<b>50.33</b>	28	34	30	<b>30.67</b>	38	41	40	<b>39.67</b>	25	55
Reg. No./Temp.		<b>0.3975</b>				<b>0.7376</b>				<b>0.4718</b>						
Reg. No./RH		<b>1.3166</b>				<b>1.9053</b>				<b>1.2851</b>						

\*Reg. = Regression coefficient  
Temp.= Temperature

No.= Number of stage  
RH= Relative humidity

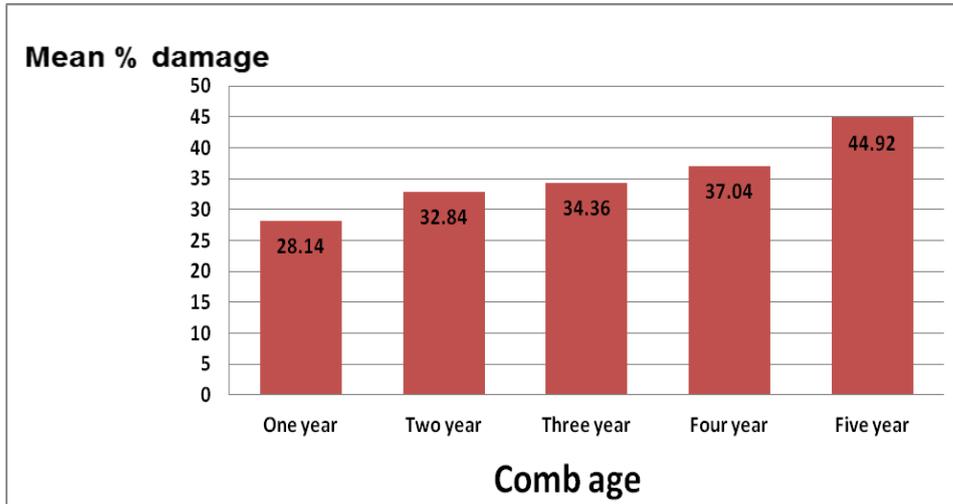


Figure (1): Effect of comb age on the damage area  $\text{inch}^2$  caused by larvae of *G. mellonella* in August 2022.

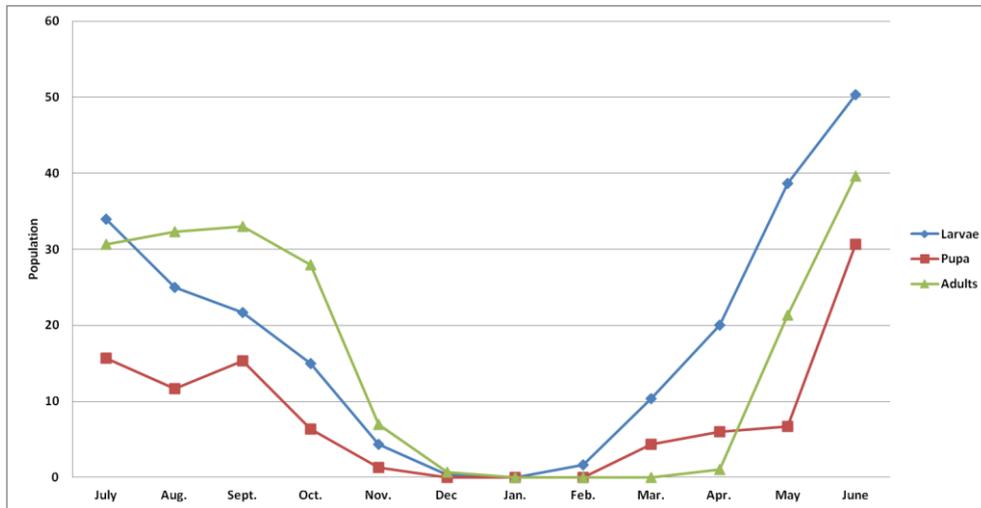


Figure (2): Number of the greater wax moth *G. mellonella* L stages from July 2021 to June 2022 in Minia region.

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العلاقة بين عمر أقراص نحل العسل والنسبة المئوية للضرر بفراشة الشمع الكبيرة مع الاهتمام  
بنشاطها الموسمي تحت ظروف منطقة المنيا ، مصر

محمود جمعه درويش

قسم وقايه النبات – كليه الزراعة – جامعه المنيا

تعتبر دودة الشمع الكبيرة واحدة من اخطر آفات طوائف نحل العسل الضارة . وقد تسبب خسائر كبيرة لأقراص الشمع في المخزن أو في المناحل. أجريت هذه الدراسة لمعرفة العلاقة بين نسبة الضرر بدودة الشمع الكبيرة وعمر الأقراص. وأيضاً نشاطها الموسمي تحت ظروف منطقة المنيا مصر خلال موسم 2022/2021. أظهرت النتائج زيادة نسبة المساحة المتضررة بزيادة عمر القرص لعمر واحد ، اثنان ، ثلاثة ، أربعة وخمسة (28.14 ، 32.84 ، 34.36 ، 37.04 و 44.92%). كما أظهرت النتائج عن وجود فروق معنوية إحصائية بين نسبة الضرر لعمر القرص الأول والثاني والثالث والخامس ، لكن ليس هناك فرق معنوي بين القرص ذو عمر ثلاثة وأربعة سنوات وكذلك بين عمر أربعة وخمسة سنوات. من ناحية أخرى ، تم تسجيل ذروة اعداد اليرقات والعذارى والحشرات البالغة في يونيو 2022 (50.33 و 30.67 و 39.67 على التوالي). بينما تم تسجيل اقل متوسط للاعداد 0.0 لجميع الأطوار في شهر يناير 2022. وتشير النتائج إلى أن درجة الحرارة المثلى لفراشة دودة الشمع الكبرى كانت 25 درجة مئوية والرطوبة النسبية 55%. أخيراً ، كان معامل الانحدار بين متوسط مراحل فراشة الشمع الكبرى ودرجة الحرارة 0.3975 و 0.7376 و 0.4718 لليرقات والعذارى والحشرات البالغة على التوالي. بينما كانت الرطوبة النسبية 1.3166 و 1.9053 و 1.2851% لليرقات والعذارى والحشرات البالغة على التوالي.

الكلمات المفتاحية: نحل العسل – فراشة – ضرر – الكبرى