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**Influence of mobile phone radiation on brood area, pollen gathering and inoculation virgin queen in honeybees *Apis mellifera* (Hymenoptera: Apidae) colonies**

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**Abstract:**

The present study was done at a private apiary at Ayash village in Gharbia Governorate during October–November, 2020. Twelve colonies were used, nine colonies equipped with cell phone mobiles in working conditions for 3, 6 and 10 minutes, three colonies for each and the remained three colonies acts as a control without a cell phone. This experiment was taken 39 days. In general, significant differences were found between all the measured parameters. The maximum brood area was found the control colonies (354.33 inch<sup>2</sup>), while the lowest was detected with 10 min \* of mobile phone radiation (214.00 inch<sup>2</sup>). The highest average of gathering pollen was found in the control colonies (125.33 g) and the lowest was found in colonies exposed to 10 min \* of radiation (37.33 g). Cell phone mobile affected significantly in the inoculation of virgin queen, since no inoculation was done with 10 min exposure. The remarkable decline in brood area, gathering pollen and inoculation of queen virgin was observed in the course of study due to exposure to cell phone mobile radiation.

**Introduction**

Honeybees are one of the most important industry in the world. Bees are liable to attack by viruses, bacteria, and pesticides and recently cellular equipment which blame the unprecedented honey bee decline. New experiments suggest a strong correlation between population decline and cellular equipment. The massive amount of radiation produced by towers and mobile phones is frying the navigational skills of the honey bees and preventing them from returning back to their hives (Sahib, 2011). The thriving hives suddenly left with only queens, eggs and hive bound immature worker bees.

The behavioral pattern of bees alters when they are in close proximity

to mobile phones and towers. The vanished bees are never found but thought to die singly far from home. Bee keepers were told that several hives have been abruptly abandoned. If towers and mobile phones increase the honey bees might be wiped out in ten years. In North America, the National Agricultural Statistics reported in February 2008 stated that hives honeybees decreased from 5.9 million in 1947 to 4.5 million in 1980 then 2.44 million in 2008 (Gerber, 2007). In South Lebanon losses reached 30 – 35 % where 100 of 450 hives were lost (Taylor, 2011). The present work aims to study the effect of cell phone radiation on brood-rearing activity, quantity of gathering pollen and inoculated virgin queen.

## Materials and methods

The effect of cell phone radiation on the behavior of bees (*Apis mellifera*) was studied in a private apiary at Gharbia Governorate from October- November,2020 (Figure 1). Twelve colonies having the bee strength of 8-9 frames were selected for this study. Nine colonies were used as test colonies for radiation and the remained three colonies acted as control. The tested colonies were provided with mobile phones in working conditions for 3, 6 and 10 minutes , three colonies for each.

The experimental observation

hive had one mobile phone placed in the hive. The experimental observation hive had one mobile phone placed in the hive. The control colonies were not provided with mobile phones.

Observations on brood-rearing activity in inch<sup>2</sup> were measured before exposure, and after exposure, two weeks intervals in all the colonies, observation on collecting pollen loads was recorded weekly from 1<sup>st</sup> October to 10<sup>th</sup> November,2020, while inoculated mating of queen was measured at the end of the exposure.



Figure ( 1 ): Honeybee colonies with cell phone of 900 MHZ frequency.

## Results and discussion

### 1. Brood-rearing area:

Data in (Table 1) showed that after 39 days the brood-rearing activity significantly decreased after exposure (Table 1). In general, the control treatment was found to be maximum (354.33 inch<sup>2</sup>). Ten minutes of exposure significantly was found to be the minimum (214.00 inch<sup>2</sup>). No significant differences were found between 3 min (284.66 inch<sup>2</sup>) and 6 minutes of exposure (269.66 inch<sup>2</sup>).

Mall and Kumar (2014) found that maximum brood area in the colonies kept near towers measured by (537.85cm<sup>2</sup>), followed by the brood area in the colonies equipped with cell phone (534.82 cm<sup>2</sup>), compared to the brood area in the control colonies ( 560.36 cm<sup>2</sup>). Sharma and Kumar (2010) found a significant decline in colony strength and in the egg laying rate of the queen due to EMRs. On the contrary, Mall and Kumar (2014) reported no apparent effect of EMR on brooding

behavior of *A. mellifera*, colonies.

## 2. Gathering pollen:

Data in Table (1) the amount of pollen gathering, showed a significant decline at all the periods of exposure compared to the control colonies. The control colonies found the maximum rate of pollen gathering (125.33g). However, the 10 minutes of cell phone exposure were found the minimum rate

**Table (1): Effect of bee colonies to cell phone on brood-rearing activity, collected pollen and inoculated mating virgin queen at different periods mobile radiation.**

Treatment	Brood-rearing activity inch <sup>2</sup>		Collected pollen / gm.	Inoculated mating queen %
	Before Treat.	After treat.		
3 minutes	112.66	284.66 b	87.33 b	0.33 ab
6 minutes	158.33	269.66 b	56.00 c	0.33 ab
10 minutes	141.66	214.00 c	37.33 d	0.00 b
Control Untreated	150.66	354.33 a	125.33 a	1.00 a
L.S.D. at 0.05%		21.38	16.11	0.69

## 3. Inoculation of mating queen:

No significant differences were found between 3 minutes (0.33), 6 minutes (0.33) of cell phone exposure comparative as the control colonies (1.00) concerning with the inoculated virgin queens.

The massive amount of radiation produced by mobile phones is actually frying the navigational skills of the honey bees and preventing them from returning back to their hives resulting in decline in brood area and pollen gathering (Warnke, 1975 and 1976). Solutions to the problem will not be as simple as eliminating the towers or cell mobile phone. Communities need to be given the opportunity to reject cell towers and national Governments need to consider ways of growing their cellular networks without constantly exposing people to radiation. More research is essential on how to protect the bee hives from the electromagnetic exposure, but perhaps more to study the impacts on humans.

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Sharma and Kumar (2010) reported that there was neither honey nor pollen, brood and bees sustained in the colonies resulting in complete loss of the colony. The massive amount of radiation produced by towers and mobile phones is actually frying the navigational skills of the honey bees and preventing them from returning back to their hives (Sahib, 2011).

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