

Short Communication

Impact of mobile phones on the density of honeybees

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Apiculture has developed into an important industry in India as honey and bee-wax have become common products. Recently, a sharp decline in population of honey bees has been observed in Kerala. Although the bees are susceptible to diseases and attacked by natural enemies like wasps, ants and wax moth, constant vigilance on the part of the bee keepers can overcome these adverse conditions. The present plunge in population (< 0.01) was not due to these reasons. It was caused by man due to unscientific proliferation of towers and mobile phones.

Key words: Electromagnetic radiation, apiculture, colony collapse disorder.

INTRODUCTION

Bees and other insects have survived and evolved complex immune system on this planet over a span of millions of years. It is not logical that they would now suddenly die out now due to diseases and natural parasites. This suggests another factor has been introduced to their environment that disrupts their immune system. This man made factor is the mobile towers and mobile phones.

The public is not being informed of the threat due to deliberate attempts on the part of mobile phone makers to mask the direct causal relationship. Over the past several months a cadre of scientists, funded by the deep pockets of the mobile phone industry, has suggested viruses, bacteria, and pesticides are to blame for the unprecedented honey bee decline. Rather than critically assessing the problem, the industry is dealing with it as a politics and public relation problems thus manipulating perception of the appropriate remedy. Sadly, this deceptive practice is business as usual for the mobile phone industry.

If the reason behind the population decrease were biological or chemical there would be a pattern of epidemic spread. Observers would be able to trace the spread of bee disappearance from a source similar to the spread of SARS a few years ago. This pattern did not occur, however mobile towers and mobile phones meet the criterion.

New experiments suggest a strong correlation between population decline and cellular equipment. 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. The thriving hives suddenly left with only queens, eggs and hive bound immature worker bees. Thus electromagnetic radiation exposure provides a better explanation for Colony Collapse Disorder (CCD) than other theories. The path of CCD in India has followed the rapid development of cell phone towers, which cause atmospheric electromagnetic radiation.

Insects and other small animals would naturally be the first to obviously be affected by this increase in ambient radiation since naturally they have smaller bodies and hence less flesh to be penetrated by exposure to microwaves. 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. Radiation of 900 MHz is highly bioactive, causing significant alternation in the physiological function of living organisms (Aday, 1975).

MATERIALS AND METHODS

Six colonies of honeybees (*Apis mellifera*) were selected. Three colonies were selected as test colonies (T₁, T₂ and T₃) and the rest were as control (C₁, C₂ and C₃). The test colonies were provided with mobile phones in working conditions with frequency of 900 MHz for 10 min for a short period of ten days. EMF (Electromotive field) power density was measured with the help of RF Power density meter. The control colonies were not provided with mobile phones. Queen prolificacy was calculated in terms of egg laying rate of the queen (Sharma, 1958). Flight activity and returning ability were measured as number of worker bees leaving and

Table 1. Change in colony status of honeybees exposed to mobile phones.

Parameter	Control (mean \pm SD)	Treated (10 min exposure for 10 days)
No. of worker bees leaving the hive entrance/ minute		
Before exposure	40.7 \pm 15	38.2 \pm 12
During exposure	41.5 \pm 14	18.5 \pm 13
After exposure	42.4 \pm 14	Nil
Returning ability		
Before exposure	41.5 \pm 14	
During exposure	42.5 \pm 15	39.5 \pm 14
After exposure	43.6 \pm 14	15.6 \pm 13
	44.6 \pm 13	Nil
Bee strength		
Before exposure	9 Frame	9 Frame
During exposure	9 Frame	5 Frame
After exposure	9 Frame	1 Frame
Egg laying rate of queen /day		
Before exposure	365.25	355.10
During exposure	362.15	198.60
After exposure	350.15	100.00

returning respectively to the hives per minute: before exposure, during exposure and after exposure.

RESULTS

The results of the studies are presented in Table 1. The present study showed that after ten days the worker bees never returned to the hives in the test colonies. The massive amount of radiation produced by mobile phones and towers is actually frying the navigational skills of the honey bees and preventing them from returning back to their hives (Sharma, 1958; Wellenstein, 1973; Warnke, 1975; Warnke, 1976). It was shown that the total bee strength was significantly higher in the control colonies being nine comb frames as compared to the one in the test colony at the end of the experiment. The thriving hives suddenly left with only queens, eggs and hive bound immature worker bees. The queens in the test colonies produced fewer eggs/day (100) compared to the control (350). It has previously been reported that there is low egg laying rate in queens exposed to high voltage transmission lines (Greenberg et al., 1981) or exposure of the queen bees to cell phone radiation stimulated her to produce only drones (Brandes and Frish, 1986). Thus electromagnetic radiation (EMR) exposure provides a better explanation for Colony Collapse Disorder (CCD) than other theories. The path of CCD in India has followed the rapid development of cell phone towers and cell phones, which cause atmospheric electromagnetic radiation.

DISCUSSION

Some countries have sought to limit the proliferation of mobile towers with strict rules. But in India no such rules have been formulated or implemented. Given the proliferation of mobile phone towers and their vital role in communications, solutions to the problem will not be as simple as eliminating the towers. One possibility is shielding the bee hives with EMR resistant materials.

Another solution would be granting local communities the ability to control whether or not to install mobile towers. On one hand, community members would be able to exert some control over their environment and determine whether the benefits outweigh the costs and risks. On the other, it is highly susceptible to manipulation by powerful influences, especially since the bee keepers have significantly less influence, power and wealth than the mobile phone companies.

However, Indians could risk losing even this right to self determination if the cellular providers can impose a country wide mandate prohibiting regulation against them, similar to the Telecommunications Act of 1996 in the United States. The Act prohibited local governments from making sitting decisions based on the perceived health impacts of wireless facilities. Indian advocates are concerned that such regulations might be upheld in India as they were in the United States in order to "eliminate service gaps in its cellular telephone service area."

In Kerala there are about 600,000 beehives and over 100,000 workers are engaged in Apiculture. A single hive may yield 4 to 5 kg of honey. Moreover, the destruction of

bee hives could be a major environmental disaster. Honeybees are responsible for pollinating over 100 commonly eaten fruit and vegetable crops and without bees the food system would be in serious trouble. Rural village dependent on locally grown foods would be most vulnerable. The need of the hour is to check unscientific proliferations of mobile phone towers. More research is essential on how to protect the bee hives from the electromagnetic exposure, but perhaps more to study the impacts on humans.

All mobile phone towers emit microwave radiations, which is in the radio frequency radiation (RFR), part of the spectrum of electromagnetic waves. Though RFR, like Ultra-violet (UV) and Infra-red light, is a source of non-ionizing radiation, these radiations, together with ionizing electromagnetic radiations such as X-rays, gamma rays make up the electromagnetic spectrum. Radio frequency of the electromagnetic waves ranged from 100 kilo hertz (KHz) to 300 Giga hertz (GHz). Radio frequency radiation is a source of thermal energy and in adequate doses, has all the known effects of heating on biological systems (Aday, 1975). Despite a growing number of warnings from scientists, like the author, the Government has done nothing to protect people and the environment. Steps must be taken to control the installations of mobile phone towers by imposing restrictions. Installation of towers should be regulated near thickly populated areas, educational institutions, hospitals etc. Sharing of towers by different companies should be encouraged, if not mandated. To prevent overlapping high radiations fields, new towers should not

be permitted within a radius of one kilometer of existing towers.

More must also be done to compensate individuals and communities put at risk. Insurance covering diseases related to towers, such as cancer, should be provided for free to people living in 1 km radius around the tower. Independent monitoring of radiation levels and overall health of the community and nature surrounding towers is necessary to identify hazards early. 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.

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