

Effects of Electromagnetic Radiation on Honey Bees in the United States

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ABSTRACT

This paper examines the current state of the research literature regarding electromagnetic radiation and its possible impacts on honey bees (*Apis mellifera*) and its potential role in the development of colony collapse disorder. Through a meta-analysis of peer reviewed findings, it is the conclusion of this paper that the decline in the population of honey bees can be attributed, at least in part, to the advancements in telecommunications and the inundation of our ecosystem with new sources of electromagnetic radiation. Electromagnetic waves are appear to cause discomfort to the honey bees and may contribute to abandoning of their hives, which eventually results in dead colonies.

(Keywords: honey bees, electromagnetic radiation, colony collapse syndrome, biological impacts, pollinators)

INTRODUCTION

Electromagnetic radiation is one of the essential topics in physics that explains how radiation from electromagnetic waves propagate through space and how that radiation affects living organisms. Waves from electromagnetic radiation have a vast range of uses within human society. For example, radio waves are significant in the process of communication between people.

Electromagnetic radiation consists of a vast array of waves, of which, each has a particular purpose. However, these effects are not consistent for all living organisms (Paxton, 2010). In this paper, the authors shall research the effects of electromagnetic radiation on honey bees through a review of various studies that have been done to establish these effects.

LITERATURE REVIEW

Potash (2011) explores the effects of electromagnetic frequency on worker bees and their contribution to colony collapse disorder. Honey bees form a significant part of the ecosystem due to their role in the pollination of flowers. However, recent decades have witnessed a significant pattern in the decline of honey bees in most of the hives (Watson and Stallins, 2016). This phenomenon has become dominant in various areas around the world.

Over the years, bees and other insects have mutated and developed complex immune systems, which have enabled them to survive over millions of years through various conditions (Pattazhy, 2012). The sudden death and disappearance of worker bees from the hives, therefore, point towards new players in the ecosystem that have contributed to the events that have been experienced with many beehives being deserted by the worker bees.

Research findings have established a pattern between the decline in worker bees within the ecosystem and cellular equipment. To support this theory, a mobile phone was placed at the entrance of a beehive for a period of five to ten days. The researchers established that the worker bees did not return to the hives.

Over the years, technological advancement in the communication industry has seen various developments in the number of towers that have been erected to improve the communication networks and the vast number of mobile phones that have been created that are currently owned in almost every household internationally. While this development has significantly improved human life through improving interactions between people, the honey bees have

significantly been affected by the increase in the cellular activities due to the high amount of electromagnetic radiation that results from this equipment (Watanabe, 2008). Most insects have thin skin tissue and are relatively small, which has made exposure to this radiation extremely fatal as the electromagnetic waves pass directly through the insects leading to their deaths.

The increased cell phone towers interfere with the flying patterns of bees, thereby preventing them from returning to their hives, hence the colony collapse disorder whereby a hive is only left with the queen and the younger bees that are not able to sustain the beehives.

The colony collapse disorder has been reported by beekeepers in various countries. While most countries are taking measures that limit the proliferation of mobile towers through strict rules, other countries such as India are still reluctant to take significant strategies to limit the proliferation of mobile towers (van Engelsdorp, et al., 2017). However, with the advancement in technology and the increase in communication activities, the honey bees are at the brink of extinction as finding a solution to the effects of electromagnetic radiation on honey bees may not be as simple as doing away with the mobile towers and cellular phones.

Kumar (2018) weighs in on the issue of the colony collapse disorder that has been experienced in various areas by many beekeepers. The article points out the significance of bees in the ecosystem due to their role as pollination agents. There has been a drastic decrease in the number of pollinators as many bee colonies have collapsed due to the trends in many honey bees abandoning their hives with the queen and young bees that are not developed enough to handle the responsibilities of the worker bees (Kumar, 2018).

In the recent past, the shortage of pollinators was attributed to the excessive use of pesticides and certain crop practices that were harmful to the bees. However, in recent decades, the researchers have shifted their studies to the establishment of how the patterns of the honey bees are affected by the electromagnetic radiation from mobile towers and cellular phones that have seen a drastic increase in recent years.

The mobile phone network providers have often refuted claims that electromagnetic radiation from mobile towers has any significant effect on living

organisms. In their defense, they state the fact that the issue of colony collapse disorder is mostly experienced in rural areas where mobile phone services are relatively low. The studies have, however, been limited as there are no conclusive results that point directly towards the effect of the electromagnetic radiation on the population and patterns of the honey bees (Odemer and Odemer, 2018).

Another significant issue that comes up in the article is whether the intensity of the radiation plays a role in colony collapse disorder. Her article points to a study that was carried out in Belgium. The honey boxes were placed in two categories. In the first category, cell phones were placed in the boxes while the other boxes did not have cell phones in them. Various patterns were noticed between the two boxes. The bees were hesitant to enter in the box with the cellular phones and gave distinctive warning sounds to the other bees about the possibility of danger (Paxton, 2010). The influx of bees in the boxes without mobile phones, however, was relatively high, thereby depicting that there is a significant relationship between the electromagnetic waves and the honey bees. Most studies, however, do not depict any effects on the lifecycle of the honey bees regarding the change in behavior pattern.

METHODOLOGY

In the study, the authors perform a meta-analysis which relies on various research studies that have been conducted to establish the effects of electromagnetic radiation on honey bees. To have a more detailed study, we gave preference to articles that focused on the effects of the behavior patterns of the honey bees and those that focused on the colony collapse disorder. This paper also limited the scope of the studies to the last ten years to ensure that the research was based on the latest information on the topic.

RESULTS

From the meta-analysis of existing journal articles, we established that there is a significant relationship between the increased electromagnetic radiation and the colony collapse disorder among honey bees. Most of the articles reported significant patterns in the behavior of bees when mobile phones were placed in the

hives. For example, bees did not enter the hives in which mobile phones were placed. This finding suggests that electromagnetic radiation has a significant effect on the behavior of the bees. The articles also point towards the dramatic increase in the colony collapse with the advancement of the telecommunication industry. This pattern points directly to the relationship between the electromagnetic radiation and behavior patterns of the bees.

DISCUSSION

The effects of the electromagnetic radiation on honey bees can be attributed to the fact that the honey bees are relatively small and have thin skin tissue on their bodies. The thin skin makes it easier for the electromagnetic radiation to pass through their bodies, thereby causing them a lot of discomforts (Shepherd, et al., 2019). It can be attributed to the reason why the honey bees did not enter the hives in which the mobile phone was placed. However, none of the honey bees died during the experiment; therefore, the effect of the electromagnetic radiation cannot be attributed to the declining number of the honey bee population.

The articles, therefore, only portray the electromagnetic radiation as a cause of colony collapse based on the assumption that the honey bees are bound to change their location and stay away from the hives whenever they feel threatened or sense danger (Vanbergen et al., 2019). It causes colony collapse disorder because the honey bees abandon their hives, thereby leaving the queen bee and the younger bees that are not capable of sustaining the hive. Eventually, the situation results into a dead colony though the articles do not specify any cases where the death of the honey bees are caused by the electromagnetic radiation, we can assume that most of the bees die because of the radiation because of the adverse effects that the radiations have on human beings who have more complex body parts as compared to the insects.

CONCLUSION

In summary, the decline in the population of the honey bees can be attributed, at least in part, to the advancements in telecommunications and the inundation of our ecosystem with new sources of electromagnetic radiation. Electromagnetic waves are most likely to cause discomfort to the honey

bees because their small nature and thin skin allow the waves to pass through their bodies. Due to this effect, the honey bees abandon their hives, which eventually results in dead colonies. However, the effect of electromagnetic waves is depicted to be quite controversial because the colony collapse disorder is mostly experienced within rural areas. More studies should be dedicated to establishing the effects of electromagnetic waves on honey bees, especially how the radiation affects the life cycles of the honey bees.

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