The Protection of an Important Pollinator: Honey Bees

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Summer is my favorite time of the year. From backyard pool parties to 4th of July festivities, each event has three things in common: close friends, delicious barbecue, and America's favorite fruit- watermelon. Imagine yourself on one of these hot summer days waiting to bite into a cold, crisp slice of watermelon. While anxiously anticipating a delicious bite, you cut open your perfectly selected watermelon only to find a large gaping hole in the heart of the watermelon. This is known as hollow heart disorder and is caused by the flower receiving a low amount of pollen during fruit set. Not until you have had a disheartening experience like this do you think about the role of pollination in the agriculture industry. In fact, without honey bees, our most utilized pollinator, we would not enjoy a majority of fruits, vegetables, and nuts that make up one third of the human diet (U.S. Food and Drug Administration, 2018).

When most people think of the purpose of a honey bee, they likely imagine a delicious jar of honey. However, the greatest importance of honey bees to agriculture is not a product from the hive, rather it is their work as pollinators. According to the USDA's Honey and Pollination Report, in 2016 the value of pollination services was estimated at $354 million, surprisingly $18 million higher than the value of honey production (U.S. Department of Agriculture, 2016a, 2017). More significantly, honey bee pollination adds $15 billion of increased production value in over 50 major crops grown across our nation (U.S. Department of Agriculture, 2016b). Therefore, the apiary industry is a key component of our success in fruit, vegetable, and nut production. The continued success of these industries rely upon agriculturalists and researchers overcoming the threats facing apiculture production.

Today the apiary industry is facing a monumental challenge. In April of 2016, researchers reported that beekeepers lost 44% of their colonies, marking the second year in

history that beekeepers lost more bees during the summer than in the winter, suggesting that something is amiss in their foraging process (Bee Informed Partnership, 2016). Many factors have contributed to colony loss. The use of harmful insecticides, increase of monoculture, and rapid spreading of pest and diseases are the three significant issues affecting honey bees that beekeepers, like myself, are facing (U.S. Environmental Protection Agency, n.d.).

The first threat facing honey bees is the application of insecticides (Ellis et. al., 2017). One current viewpoint in the United States is to limit or ban the use of insecticides due to pollinator loss. However, growers gain $23 billion in increased production value from protecting their crops with these chemicals (Pimentel, 2005). While farmers need to protect their crops from harmful insects, insecticides contribute to pollinator loss by impairing the sensory and motor systems of honey bees (Hopwood et. al, 2016). Is there a way to protect our pollinators from this exposure while still using insecticides?

Farmers can help protect honey bees by spraying insecticides near dusk when honey bees will be inside the hive instead of out foraging (Pollinator Partnership, n.d.). Additionally, hives can be relocated before spraying crops as outlined in a written pollination contract (Ellis et al., 2018). While these practices are helpful, there are more dynamic solutions currently being researched.

In collaboration with leading honey bee experts at the University of Florida, I had the opportunity to research effective, non-lethal repellents for honey bees that could be sprayed on to crops such as watermelon (Roberts, 2016). I found three products that showed promising repellency features, the most interesting being a love bug solution (Roberts, 2018). The next phase is finding repellents that could be sprayed in conjunction with insecticides. Once both the

repellent and insecticide degrade, honey bee pollination would be safe to occur without concern of insecticide exposure.

The second threat affecting the honey bee population lies in our nation's agricultural practice of monoculture. While planting thousands of acres of the same crop is an effective way of producing a large amount of food, honey bees are struggling to find varied sources of pollen and nectar (Matasci, 2013). To help address this issue farmers can use the unplanted areas around their field to grow hearty varieties of wildflowers (Project Apis M., n.d.). The presence of wildflowers increases biodiversity and provides honey bees with additional sources of forage that can boost their immune systems.

The third and most harmful threat to bee colonies is the transmission of lethal viruses caused by the Varroa mite. Researchers claim the mite issue is partly due to beekeepers' failure to control pest through integrated pest management practices (Dr. Jamie Ellis, *personal communication*). However, following these methods will not guarantee mite protection (Honey Bee Health Coalition, 2018). As another defense, the USDA developed a Varroa sensitive breeding program that allows beekeepers to purchase bees with the Varroa sensitive trait to reduce the chance of mite infestation (U.S. Department of Agriculture, 2009). While hives are better protected from mites, bees with this trait are showing a lower honey production. This breeding drawback is one that genetic engineering could potentially solve in the future (Arista Bee Research, n.d.).

The threat of not enjoying that cool, crisp slice of watermelon on a hot summer day in our future is becoming real. The reality is, honey bees' weakened immune systems from insecticides, poor diet from monoculture, and stress of dealing with pests dramatically increases the risk of

colony loss (U.S. Environmental Protection Agency, n.d.). If the current decline continues, managed honey bees will disappear by the year 2035 (Amandeo, 2017).

Intuitive research of effective methods when handling pesticides, and mindful actions when spraying and planting are critical to overcoming problems facing the apiary industry. As passionate agriculturalists and consumers, we must continue to spread honey bee education and support the research being conducted to save honey bees. By protecting these small hard workers, we can plan on enjoying watermelon and other agricultural crops at our summertime celebrations for many years to come.

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