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A REVIEW ON: IMPORTANCE AND ROLE OF HONEY BEE

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ABSTRACT

Honey bee is vital for pollination and ecological services, boosting crops productivity in terms of quality and quantity and production of colony products: wax, royal jelly, bee venom, honey, pollen and propolis. Honey bees are most important plant pollinators and almost one third of diet depends on bee's pollination, worth billions of dollars. Hence the role that honey bees have in environment and their economic importance in food production, their health is of dominant significance. Honey bees can be infected by various pathogens like: viruses, bacteria, fungi, or infested by parasitic mites. At least more than 20 viruses have been identified to infect honey bees worldwide, generally from Dicistroviridae as well as Iflaviridae families, like Acute Bee Paralysis Virus, Black Queen Cell Virus,Kashmir Bee Virus, Sacbrood Virus, Chronic bee paralysis virus, Slow Bee Paralysis Virus along with Israeli acute paralysis virus, and Deformed Wing Virus are prominent and cause infections harmful for honey bee colonies health.

INTRODUCTION

Honey bees can serve as a model One Health organism to investigate the interactions between environmental change and antimicrobial resistance due to their inseparable symbiosis with the determinants of environmental health. For example, environmental pollutants in water, soil, and air can negatively impact honey bee and hive health through leaching into pollen and honey foodstuffs.

Moreover, warming temperatures and other climatic factors related to climate change can increase the prevalence and spread of honey bee diseases and decrease the efficacy of antimicrobials in treating pests and pathogens. Drug efficacy is further challenged by years of liberal antibiotic use, contributing to an increase in multidrug-resistant microorganisms. Apiaries globally are reporting greater colony losses than ever before. It is generally believed that complex interactions between multiple environmental, pathogenic, and climatic factors are responsible for the majority of these losses, which have come to be referred to under the umbrella term of "colony collapse disorder". Interdisciplinary research into these interactions is therefore highly beneficial and inherently relevant to honey bee health.

The western honey bee Apis mellifera provides highly valued pollination for a wide variety of agricultural crops and ranks as the most frequent single species of pollinator for crops worldwide. A long history of domestication and intentional transport of A. mellifera by humans has resulted in its current cosmopolitan distribution that includes all continents except Antarctica and many oceanic islands. Given the advanced state of knowledge concerning this species and its role in agriculture, it seems surprising that the importance of A. mellifera as a pollinator in natural habitats remains poorly understood.

Clarifying the role of A. mellifera as a pollinator in natural habitats is important for several reasons. First, animal-mediated pollination represents a vital ecosys- tem service an estimated 87.5% of flowering plant species are pollinated by animals. Quantification of the pollination services provided by the cosmo- politan, supergeneralist A. mellifera will thus provide insight into the functioning of many terrestrial ecosystems. Second, non-A. mellifera pollinators are declining as a result of habitat loss, habitat degradation and other factors including pesticides, pathogens, parasites and climate change. In cases where A. mellifera populations can withstand these perturbations, the degree to which they replace pollination services formerly performed by extirpated pollinators deserves scrutiny. Third, recent increases in the mortality of managed.

A. mellifera colonies in some regions of the world may extend to populations of free-living A. mellifera. Threats to A. mellifera populations could thus affect the reproduction and population dynamics of plants in naturalareas, with potential shifts in the composition of plant assemblages and in turn, the ecosystem services that these plants provide. Lastly where introduced populations of A. mellifera attain high densities they may compete with other pollinators or compromise plant reproductive success. These phenomena are of broad ecological, evolutionary and conservation importance, but to our knowledge, there currently exists no global quantitative synthesis of the numerical importance of A. mellifera as a pollinator in natural ecosystems in their native or introduced ranges.

We address questions concerning the importance of A. mellifera by exploiting a recent trend in pollination research the documentation of community level, plant pol linator interaction networks. Quantitative pollination network studies document the iden- tity and frequency of each type of pollinator visiting each plant species within a locality. Network data are used to address a variety of questions but key for our goals here, they provide an underused opportunity to gauge the importance of A. mellifera in natural habitats, particularly because the role of A. mellifera has rarely been the focus of these studies.

Natural History of bees

The social behavior of bees is highly varied ranging from solitary to highly eusocial forms. A solitary bee makes her own nest and provides food to her offspring with no help from other bees, and she usually dies before maturation of her offspring. On the other hand, highly eusocial bees have division of labor among cooperating adult females of two generations. The queen cannot survive on their own because she depends on workers for food, while the workers cannot survive on their own as they are not mated and hence cannot reproduce. Between the solitary and eusocial bee life, there are different social forms. For example, sub social life where the solitary bee feeds and cares for the emerging young ones, and the communal form where bee colonies lack division of labor and all members behave in a similar way and are united by one nest. While it is easy to recognize highly eusocial bees, other social forms are quite variable and bees may pass through many ontogeny stages of sociality. The stingless bees are also widely distributed in the pan tropical world. Their role as pollinators and honey producers is gaining popularity and there is growing market in their utilization for crop pollination.

Bees comprise seven main families of which only a few are currently utilized for crop pollination. Except A. mellifera, other bees, e.g., Bombus spp., Megachile spp., and Osmia spp. are reared for pollination of highly priced crops such as greenhouse tomato or alfalfa seed crops. Rearing of bees other than A. mellifera is practiced in several countries where the need for better pollination of crops is highly regarded. In other countries, inputs of crop production other than pollination, e.g., fertilizer or pesticides are given priority in policy formulation and have masked the importance of pollination in crop productivity. Apis mellifera rearing in these countries is more for honey and wax production and less for provision of pollination. The main food resource of bees is nectar and pollen, which they get from flowers of different plant species. In some instances, bees may forage for floral oil in specific plants. Therefore, both plants and pollinators could have co-evolved, such that flowers of different plants would require specific bee pollinator for effective pollination to occur. However, agricultural crops have been manipulated by breeders over many decades, with resulting negative impacts on the role of flowers as a possible advertiser/attractant to pollinators. Many bees visiting crop flowers have been gain access to pollen or nectar. Some bees perforate holes on the flower side to extract nectar from the nectarines. This denies the flower all possibilities of being pollinated. Other bees glean on the fallen pollen after a larger bee has visited the given flower. These are mainly small bees that cannot access or forcefully open such flowers, as observed by Gikungu.

Apart from food, bees require plants for other purposes such as for nest material, hiding, mating or just as resting sites. Undisturbed habitats provide the best home for different bees, as here there are enough dead logs, leaves, etc. for the bees to construct their nests. There are also holes left by wood-boring beetles, tree cavities, pithy hollow plant stems, abandoned rodent burrows, soils of suitable texture, depth and slope, vegetation cover and moisture etc. suitable for use as nests. Bees also require mud, resins, pebbles or plant hairs for nest construction, which can only be provided optimally in undisturbed areas. Lack of safe sites causes bees to seek other areas. This can lead to decimation of bees as long as people do not recognize their importance, do not know how to handle them, and government policy does not address the need for their conservation.

Human activities and Its effect on bees and pollination

There are many natural and human made challenges that decline many groups of pollinators. Declines are associated with habitat loss, fragmentation, and deterioration, non target pesticide exposure, and invasive species. Human activities concern with the establishment of monocultures, overgrazing, land clearing, irrigation so as to modify their habitat in the area of agriculture affect the population of bee species and their abundance. Some crop management approaches, such as pesticide sprays or smoking, kill or repel foraging bees especially when applied during the flowering period. But as compared the effect of zero tillage with that of mechanical farming, it has minimum negative effect, because zero tillage does not disturbing soil nesting bees. Any human activities that decrease population size of bees will usually results in inadequate pollination, unless the dominant bee is an effective pollinator and its population size is sufficient. Even if so, many other crops will undergo shortage of pollination and may not produce optimally, as the dominant bee may not be a pollinator of these crops. Farmers Knowledge of bees and pollination has been shown in many parts of the world to improve sustainable use of pollinating agents especially when they expect income. There are also natural factors that reduce bee population such as drought, flooding, pests, fire and other disease through the negative effects on bee forage, nests and on individuals, or a mixture of these.

Economic and ecological Consequences of Pollinator declines

Pollination is a valuable ecosystem service, on condition that a variety of benefits including food and fibre, plant-derived medicines, ornamentals and other aesthetics, genetic diversity, and overall ecosystem resilience. Declines in pollinator population and species diversity more broadly have potential risks to global food security and economic development, particularly in countries where agriculture is a large portion of the economy and this risk has global concern. From an ecological perspective, declining of pollinator has effect on ecosystem stability and loss of biodiversity and the plants they pollinate by insects Evidence exists of local and regional declines of both managed and wild insect pollinators which appear to be a result of pests, diseases, pesticides, habitat destruction, and agricultural intensification. Flowering plants require pollination to produce seed or fruit. Some plants are depending on wind-pollination and others are self-pollinated, but many plant species require animal- mediated cross-pollination. Even self pollinated plants require additional animal pollinator to raise quality and quantity of the crop production. At the global level, 75 percent of primary crop species and 35 percent of crop production rely on some level of animal pollination.

Animal pollinators include many insect species and several species of birds. Animal pollination of agricultural crops is provided by both managed and feral pollinators. European honey bees are the most common managed pollinator species. They are generalist pollinators that are capable of pollinating many different plant species because they are physically huge body, they exist in large number of perennial colonies with up to 30,000 individuals that are available for crop pollination year-round, are able to forage over large distances, so that their placement within large monoculture fields allows them to provide pollination services over a wide area, they communicate with other members of the hive regarding location of food sources, making them highly efficient pollinators, honey bees produce honey which is valuable, commercially marketed product.

Pollinator dependency is a measure of the level of impact that animal pollination has on the productivity of particular plant species. The level of pollinator dependency varies dramatically among crops. Fruits, vegetables, and nuts are highly dependent. Crops that are essentially dependent on animal pollination include Brazil nuts, cantaloupe, cocoa beans, kiwi fruit, pumpkins, sq ash, vanilla, and watermelon. Many crops have reduced production in the quantity or quality of the plant part consumed directly by humans, while other crops have reduced production of seeds that are used to produce the vegetative parts of plants that humans consume.

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