

Impacts of Climate Change on Honey Bee Production in Jalalabad City Afghanistan

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ABSTRACT

Beekeeping is emerging as a very successful, beneficial and profitable agricultural practice for local societies in Asian countries. This practice is not only related to beekeeping, but have intrinsic health benefits and importance through providing better food source with great nutritional value which is lacking in local or developed areas, beekeeping is also very important for various plant pollination and bees use pollen for their normal life. In rural areas there is almost an unlimited source of pollen and bees are having ability to pollinate natural local crops. In this regards honey bees are the most major pollinators of the cultivated crops in the world. If environmental temperature or climate changes could occur, that is significantly affecting honey bees biology, behavior, distribution and its production. But indirectly climate change or stream is natural enemy of local floral resources. Aim of this study was to evaluate the impact of climate changes on honey bee productions in Jalalabad surrounding areas. This study was completed from the surveys and inspection to identify the main climate change problems and its impact on honey bee's production. This study was focused on the emerging view that climate changes had effected reducing of feed (reduction of flowers), facilitate less area for rearing of bees, reactions of the people against bee farms, pest, diseases and also climate change can effect physiology and behavior of the bees, decrease pollination rate and affects the production and size of the colonies. The beekeepers should have awareness from the weather conditions and must be emerge their farms to safe and floral resources areas.

Keywords: Apis spp, bees, climate change, disease, environment, pollination, temperature

INTRODUCTION

Honey bees are the insects; those are having importance in the pollination of crops, plants and globally best pollinators, unfortunately changes in climate (higher or lower temperature, extreme weather) can reduce their pollination rate, production and creating problems for honey bees regarding to its physiology and behaviors (Smith et al., 2014). Many crops and plants are naturally pollinating by various kind of insects, birds and weathers. In this regard approximately the world's 73% cultivated crops are pollinating by bees, 19% by flies, 6.5% by bats, 5% by wasps, 5% by beetles and 4% by birds (Abrol, 2009). The pollinators such as insects use floral resources as nectar and pollen or both and these pollinators can affect 35% of worldwide cultivated crops, plants and increasing outputs of 87 of food crops globally (FAO, 2009). Therefore total economic importance and income of crops pollination has been counted 117 dollars yearly by globe (Gallai et al., 2009). The species *Apis mellifera* is also most economically important pollinator in this regard globally (Johnson, 2007). Honey bees are also have important role in biodiversity, because many kind of plant and food crop species pollinate by bees and need to fertilize by insects, birds or weathers (Allen et al., 1998). Climate change could decline pollination process by bees and destabilize the ecological balance and effect production rate of crops, and bees (Michene, 2000). *Apis mellifera* species are famous in the world and currently seven species of the mentioned species and 44 subspecies are recognized by the researchers (Engel, 1999). Among the *Apis mellifera* there are some other species such as African species are also reared by beekeepers in Asia (Arias and Sheppard, 2006). According to geographical conditions and regional climate changes, there are four other species of *Apis* (*cerana*, *dorsata*, *florae* and *mellifera*) have been originated from Asian countries (Verma, 1992). Honey bees are affected by various reasons such as climate changes, hungers, agro-chemicals, diseases including mites, viruses, bacterial infections and fungal diseases (AFSSA., 2009). Therefore limited availability

of bee forage (due to deforestation), shortage of honeybee colonies, backward technology, poor pre and post-harvest management has been affecting honeybee's products (FAO, 2012). To evaluate the impacts of climate changes on honey bee's production and its life.

MATERIALS AND METHODS

Nangarhar is very famous for spring because there is presents exceptional and various fauna and floras in which dominant flowering plants exist. The study area was farm 3, farm 2, Khewa and Spinghar districts.... the study method was survey and observational. Therefore, the researcher has collected exact information from 60 active bee keepers and collected information about the impacts of climate changes on honey bee production in Nangarhar province. The study was completed from 04/02/2020 to 28/11/2020, and the questioners were filled by beekeepers as close ended. Thus in spring, summer and half of autumn seasons the bees hives fed by natural flowers but in half autumn and winter seasons the bees had fed by sugar syrup 2:1. During and the end of every season the beekeepers examined their honey bee boxes and environment for diseases, flowers, insects and climate. Also the researcher has estimated honey be production (honey, broods, queens,) rate separately from every beekeeper. The data analysis tools were descriptive statistics such as percentages, frequencies, mean employed by SPSS statistical software which significantly identifies the influences of determinants of modern bee hive adoption (Aldrich and Nelson., 1984).

RESULT

In present research the forums have filled by researcher and survey inspection are completed from listed beekeepers in selected districts. According to the research questions, the researcher has discussed impacts of the climate changes on honey bee productivity rate with the beekeepers and they share their own experiences during survey and direct inspection. The factors of climate change effecting areas are diseases, feed reduction, bad adaptation, people negative reactions and beekeepers economy losing problems.

Table 1: The impacts of climate changes on honey bee keeping

| No | Factors of the climate change effects | Percentage% |
|----|---|-------------|
| 1 | Reduction of feed | 88,80% |
| 2 | Less area facilities | 84,72% |
| 3 | Bad adaptation condition | 80, 55% |
| 4 | Economy losing rate of the farmers | 65,17% |
| 5 | Diseases | 59,44% |
| 6 | Reactions of the people against bee farms | 45,50% |

Table 2: The impacts of climate change on honey bee productivity

| No | Production type | Percentage% |
|----|-------------------------------------|-------------|
| 1 | Honey | 90,82% |
| 2 | Colony population decreasing rate | 50,72% |
| 3 | Physiology and behavior of the bees | 60.2% |

DISCUSSION

Climate change occurs due to severe weather and streaming conditions that affect the productivity rate of beekeepers. Impacts of climate change and severe weather is varying in scale from one region to another (Davis and Ali, 2014). This study result confirms the descriptions of Davis and Ali about climate changes. Some researchers predicted that regions would experience different weather condition, which will be drier, while some regions will experience warmer and some others cooler climate conditions, resulting with rising temperatures and leading to changes in the growth of fauna and flowers and reduction of the colonies productions (Roncoli et al., 2010). This study is also confirming the findings of Roncol and its colleagues regarding to production rate and flowers growth. Consequently, bad climatic conditions lead to decrease in production, which affects the socio-economic conditions of many beekeepers and agricultural farmers (Kassman, 8, 1999), affecting the source of income of the society, because the beekeepers losing their honey bee full boxes, food crops and fauna, which is easily destroyed by unpredictable nature of ecological systems (Ruttner, 2013; IPCC, 2007). This study

population is similarly effected through unpredictable nature of climatic change conditions, and climate change is causing to effect the source of beekeepers income.

Plants and food crops are growing in different environmental condition based on climatic factor, soil sort, humidity, pH and productiveness (Robinson and Page 1989). Bees collect nectar and pollen from plants and crops during pollination, which is essential for honey production and normal honey bee life (Brodschneider et al., 2010). The pollen is very important source for colony growth and increases the life of bees, brood and larvae production, colony survival rate, resistance against disease, increase immunity and the development weight of the bee (Gebrekirstos, 2015). Finally, plants, crops and bees live in a joint relation, climate change have to break this connection and staying the process of pollination too (Hegland et al., 2009; Schweiger et al., 2010). The climate change has negative impact on the population of honey bees that tends to be largely depending in local areas with extensive presence of the flora (Grundel et al., 2010; Tschardt et al., 2012). Thus this study result is confirming the theories and ideas of the mentioned researchers.

CONCLUSION

The current study has showed that Climate change is causing to leave bees their hives and unable to pollinate the plants and crops in time. Honey bees are hugely weak to severe weather and climate change has caused flora to emerge and bud earlier. Because honey bees are unable to acclimatize among changing climate, they are unable to pollinate plants, food crops and also do not be able to collect nectar for their colony to use throughout the winter season. Finally, climate change will alter the equilibrium between the colonies, its floral environment and cause to affect immune system. The government must be support beekeepers in such conditions and facilitate them better environment.

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