The role of Honey bees in pollination within green houses as well as outside in field

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Pollination: is the process by which pollen is transferred in plants, thereby enabling fertilization and sexual reproduction. Pollination is a necessary step in the reproduction of flowering plants, resulting in the production of offspring that are genetically diverse. Honey bees are considered as an important social insect which increasingly raised and used extensively for greenhouse and other open crops. Honey bee considered as an insects important to pollinate various agricultural crops.

Open or field pollination

Near about 80% of agricultural and horticultural crops depended on honey bee to pollinate. The production of some crops increased after honey bees to pollinate of its flowers. Pollination importance back on beekeepers and farmers because after pollination by honey bees the increased in crop production and in reverse it get pollen and nectar from the crops. It has been found that honeybee improve fruits of Moracea and Cucurbit crops characterizations (El-Hefeny A.1996).

Honey Bee pollinating plum blossom

Honey bee (*Apis mellifera*) have its great economic importance in terms of increased yield and quality of commercially grown insect pollinated crops and also in assisting self pollinated crops in the world (Free, 1993; Hoehn et al.,2008). The crops like *Cucumis sativa, Citrullus lanatus Cucurbita pepo* give the highest number of mature fruits and seeds during the whole flowering period in open pollination conditions(Free 1993; Stanghellini et al 1997). Value of agricultural crops dependent on honey bee pollination was estimated to be $14.6 billion per year in the U.S.(More and Calderone,2000). In Europe, pollination by honey bee is worth approximately U4.25 billion ,and pollination by other taxa worth approximately 0.75 billion (Borneck and Merle 1989).

The estimated value of pollination services attributed to honey bees is $1.3 -$1.7 billion annually. Every year 300,000 honey bee colonies contribute to pollinate canola oilseed fields and annual yield of canola oilseed is 12.6 million tons making Canada the world largest producer of it in world. (Almuhanad et al 2010).

Honey bees play an interesting role in crops pollination due to following reasons:

- Natural food of honey bee is nectar and pollen and its resource are plants.
- Honey bee is an social insect and doesn't have been overwintering therefore it have the activity to collect food in the morning that fit to crops flowering .

- Honey bees colony are easily transferable and we can transfer these colony place to place in terms of to pollinate different crops in different flowering season and its numerical abundance makes the pollinated crops superior.
- For Pollination of a crop of choice, it is necessary to mixed the extraction of crop plant flowers in to sugar solution to attract honey bees to feed on it .

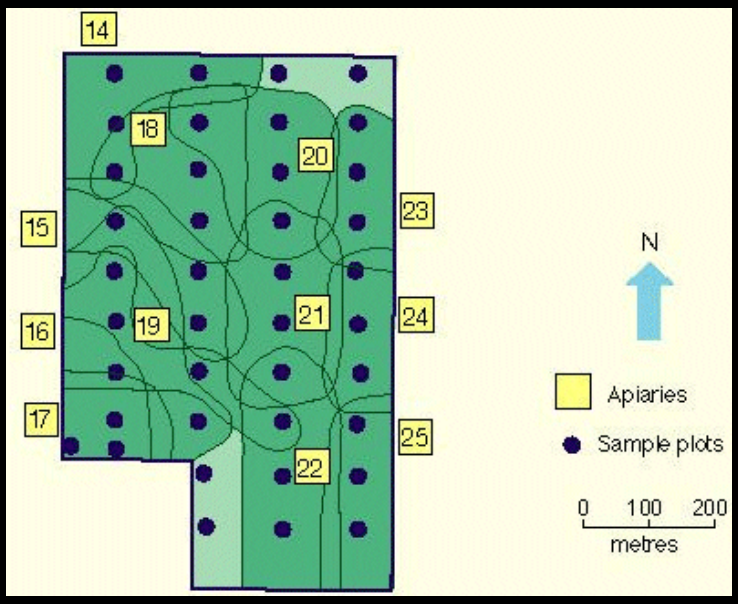
Factors which affect honey bees to pollinate the crops:

- Weather: it includes temperature, rainfall, wind speed and light.

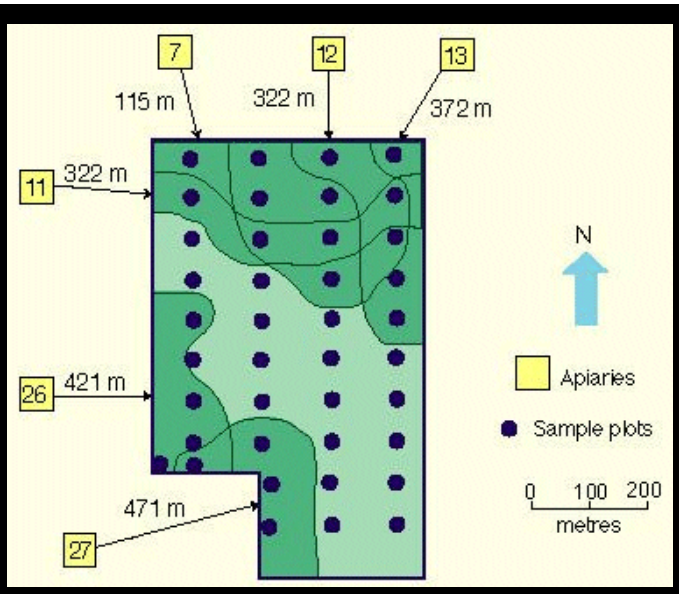
Competition: competition between some plants which have a lot of pollen grains and nectar concentration to the plants of our crop which we want its pollination because honey bees will be attracted to these plants for pollens and nectar. So it is recommended to eradicate these plants from crops or near to crops to enhance our crop pollination.

•**Power and colonies number**: It was found that the strong colonies and higher colonies number have the good ability to pollinate the crops after winter season. (El-Hefny 1996).

•**Beehive placement to pollinate the crops**: Colonies distribution is an important factor. Colonies should be placed in all area. From the Experiment demonstration it has been found that placing of ٢-3 colonies to an acre such as field of *Medicago sativa* crop or 1-2 /ha of cucurbit 2-3/ha of solenaceae 2-3/ha of citrus 1-2/ha to oil plants and one colony each 1000 m^2 in protected cultivation.



Map of lucerne crop showing foraging territories of bees from apiaries placed within



Map of lucerne crop showing foraging territories of bees from apiaries placed at various distances from the field edges .

•Honey bee in pollination behavior : Bees collecting the pollen grains ,pollinate large number of flowers more than bees which collect the nectar it has been found that small bees which always active outside have the extra efficacy to pollinate dioecious flowers because they look on flowers less crowded by bees and too richin food (El-Hefny ١٩٩٦)

•Amount of brood stimulate bees to collect more pollen grains hence more pollination.

•Bees feeding on sugar solution inside the hives stimulate the ability to collect more pollen grain.

•Existence of water near by bees hives convert water gathering into pollen gathering .

•Cultivated crop type ,cultivated area, kind of flowers, period of flowering also affect pollination .

Recent studies : Honey bee are generally used in field to pollinate the crop as a result increased seed set and yield of many crops. In ٢٠٠٩ study conducted on *Nigella sativa* crop in order to increase seed set had performed because this crop produce abundant pollen, which attract bees and act as a good source of nectar (Amin ١٩٩١;Dantuono et al.,٢٠٠٢)

In order to determine the effect of honey bee pollination on annual dicotyledonous Black seed (*Nigella sativa*)yield, an experiment was conducted with three treatments:(1) open visits of bees and other pollinator,(2)caged plants with bees and(3) plants caged without bees (control)

The seed of *Nigella sativa,* a traditional medicinal plant extensively used for healing various respiratory disorders from Morocco to Pakistan and Southern Europe (Amin,١٩٩١). As a result honey bees increase (%٢٨)in the *Nigella sativa* total yield ٨٧٨.٧)kg), while the yield of the self-pollinated was (٦٣٢.٣kg)/ ha (Munawar et al.,٢٠٠٩).

In Egypt, study was conducted on honeybee which affect in seed set of watermelon (*Citrullus lanatus colothynthoides* L.) and fruit matururity. It has been found that the field of watermelon pollinated by honeybee give high percent of yield from fruit/m^{٢}, was ٣٠.٠٧ & ٠.٠٠fruit/m^{٢} in field of squash caged without bees, while seed yield/m^{٢} were ٠.٠٠ &٢٤٣.٧٩ g/m^{٢} of squash field. The number of fruits and seed depend on percent no. of flowers opened in a time of day (El-Kathafy et al.,2009)

Distance and visitation frequency: Honey bee decreases its visitation to collect pollen grains and nectar when the crop is away. In Argentina, study conducted on the visitation number of honey bees. They put bees hives at different distances for example ١٠m, ١٠٠m, ٥٠٠m and ١٠٠٠m around grape crop, they found that visitations number of honey bee decreases to grape field when the hives located at distance of ١٠٠٠m from grape field (Chacoff et al., ٢٠٠٤)

Close pollination or pollination in protected houses: There are many physiological and behavioral factors of honey bee which control of its usage for pollination is limited in greenhouse production areas (Kaftanoglu et al.,1997)

These factors includes:

- **Temperature and relative Humidity:** usually temperature in greenhouses particularly in midday and early afternoon during sunny conditions when humidity is about ٧٠%, is best especially to Tomato crop. Greenhouse temperature should be kept above ٦٥°F(١٥° C) at night and below ٨٥°F(٢٩° C) during the day)Jensen 2009)
- **Pesticide:** we known effect pesticide on honey bees, therefore in greenhouse honey bees will be died, while bumble bees can adapt with it.
- **The light:** light period it important factor of any crop therefore may be differenced for honey bees .
- **Crop type:** flowers kind and flowers form .

Honey bees are not capable of pollinating plants efficiently and do not perform in cold and rainy climate conditions(Goulson،2003)

During the field experiment, it was observed that after placing the bumble bees into the cages they started performing right away, while the honey bees waited on the cage walls for a while and began performing after ٣٠ -٤٠ min. Due to the fact that honey bee aren't able to perform activity in covered areas (under a cover, greenhouse)

Sun flower

it was distinctly observed that bees displayed less activity at dawn, increased their movement between ١٠:٠٠ am to ١٢:٠٠ pm, following a decrease between ١٢:٠٠ to ١٤:٠٠ pm and the temperature increased the activity increased repeatedly between ١٥:٠٠ to١٧:٠٠ pm. In the same study they counted the total number of seed(No.head$^{-١}$) ,seed yield (g head$^{-١}$), seed setting efficiency (%), ١٠٠٠ seeds weight (g), seed oil content(%) and head diameter(cm) of sunflower crop in plots of both bees were determined respectively as ٤٨٠, ٣٧, ٧٥, ٩٧, ٣١, ١٤ for bumblebees and respectively as ٢٥٢, ٢٤, ٤٦, ٩٨, ٣١, ١٧for honey bees
(Aslan M. and Yavuksuz C,.2010)

Thank your to attention