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POLLINATORS VISITING SESAME (*SESAMUM INDICUM* L.) SEED CROP WITH REFERENCE TO FORAGING ACTIVITY OF SOME BEE SPECIES

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ABSTRACT. A study was conducted to determine the insect pollinator orders visiting sesame, fluctuation percent of Hymenopterous fauna during flowering period, foraging activity of the pollinating insects belonging to Hymenoptera, Coleoptera, Lepidoptera and Diptera orders and foraging activity of *Apis mellifera*, *Anthidium* sp. and *Xylocopa* sp. from July 15 to September 4, 2011 at four time periods i.e., 9-11 am, 11-1 pm, 1-3 pm and 3-5 pm. Results revealed that insect percentage of Hymenoptera order was high followed by Lepidoptera, Diptera and Coleoptera. The highest activity of Hymenopterous fauna was in fourth week of flowering period and decreased gradually in the last weeks. Total number of pollinators was highest at 9-11 am followed by that at 11-1 pm, 1-3 pm and 3-5 pm. Among the bees, the number of *Apis mellifera* was the maximum followed by *Xylocopa* sp. and lastly *Anthidium* sp. at all time periods. It was also evident that temperature, wind and relative humidity also affect the percentage of insects visiting sesame flowers.

Key words: Sesame; Pollinators; Foraging activity.

INTRODUCTION

Sesame (*Sesamum indicum* L.), which originated in Africa, is probably the most ancient oil seed plant cultivated in many parts of the world. Currently, China, India, and Myanmar (Burma) are the world's largest producers of sesame, followed by Sudan, Nigeria, Pakistan, Bangladesh, Ethiopia, Thailand, Turkey and Mexico (Desai, 2004).

Sesame is self-pollinating, although differing rates of cross pollination have been reported by Yermanos (1980), Ashri (2007) and Sarker (2004). The pollination process occurs at the time the flowers open (Kafiriti and Deckers, 2001; Langham, 2007). Yermanos (1980) found less than 1% when the sesame was

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surrounded by cotton and other crops. In Moreno, California, he found 68% in a field where the sesame was the only blooming plant in a semi-arid area. Langham (2007) found considerable cross pollination in the Arizona nurseries where many farmers maintained bees forpollinating other seed crops, but little cross pollination in the Texas nurseries.

Both open pollination and bee pollination treatments were effective to increase the seed yield of sesame upto 22 to 33 percent more than that in "pollination without insects" (Panda *et al.* 1988). In addition to increasing the yield, cross-pollination also helps to raise quality through a more unified ripening period and an earlier harvesting time. The purpose of this research was to observe major pollinators visiting sesame flowers and their peak foraging.

MATERIALS AND METHODS

The study was carried out at the University of Suez Canal, Faculty of Agriculture, Ismailia, Egypt during crop season 2011. Shandawil three variety of sesame (*Sesamun indicum* L.) was sown for seed production on May 31, 2011 in 12 plots measuring 8 × 10 m^2 each and separated by a clean space of 0.5 m^2.

Experimental observation starting weekly from initial flowering to the final session (7 weeks) during four periods of the day 9-11 am, 11-1 pm, 1-3 pm and 3-5 pm. Observation time was ten minutes in each period. Fifty sweeps per plot were taken to collect the pollinators. The collected insects were killed in a killing bottle and transferred to the laboratory. The large insects were pinned, labeled and preserved in the collection box. The smaller insects were mounted, labeled and preserved too. Insects were identified to species where possible through the use of published systematic keys and direct comparisons with museum specimens housed at the Department of Plant Protection, Ismailia. Data were recorded for pollinators belonging to different insect orders.

The weather data like temperature, relative humidity and wind speed were also recorded during the flowering period of sesame in the growing season of study. The correlation coefficient of number of *Apis mellifera*, *Anthidium* sp. and *Xylocopa* sp. visiting sesame flowers with temperature, relative humidity and wind speed was calculated.

RESULTS AND DISCUSSION

Investigations carried out on the major insect orders visiting sesame during flowering period from July 15 to September 4, 2011. *Figure 1* revealed that four groups of pollinators visited the sesame belonging to order Hymenoptera, Diptera, Lepidoptera and Coleoptera of class insecta during the flowering period. The number of Hymenoptera was higher, followed by Lepidoptera, and then both of Coleoptera and Diptera. The results indicate that Hymenopterans and Lepidopterans are the major pollinators visiting sesame flowers. These findings are in close agreement with Viraktmath *et al.* (2001) who studied the relative abundance of pollinator fauna of sesame during two successive seasons. Hymenopterans insects were

higher, followed Dipterans and Lepidopterans. Also, Kamel (1997) reported nine species of Hymenopterans as predominant visitors of sesame flowers.

Interestingly, the types as well as the number of insect visitors changed with time during the flowering span of the sesame crop. Results in *Figure 2* revealed that insects belonging Hymenopterous order increased by increasing the percentage of flowers. A great majority of the sesame flowered between third and fifth week. The flowering lasted 42-50 days and this period was remarkably constant from year to year. Most bees were recorded when the number of flowers per plant was maximum (at the fourth week of flowering). Bee population decreased with diminishing of flowers per plant due to advancing age of the crops.

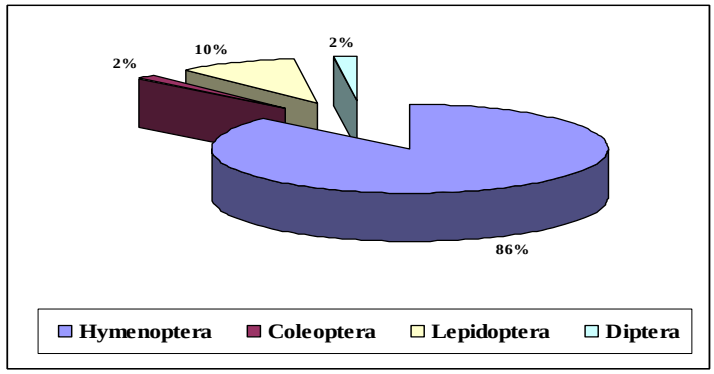

Figure 1 - Percentage proportion of the major insect orders visiting sesame during flowering period from July 15 to September 4, 2011

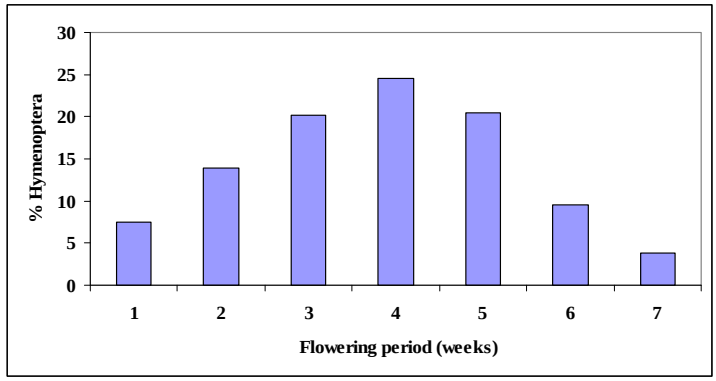

Figure 2 - Fluctuation percent of Hymenopterous population during flowering period from July 15 to September 4, 2011

Data in *Figure 3* showed the foraging activity of the major insect orders visiting sesame during flowering period. Peak of foraging activity was observed in Hymenoptera order during 9-11 am in our study, whereas peak foraging activity was noticed at 8-9 am by Munir and Aslam (2002).

The comparison among number of different bee species clearly showed that the number and foraging activity of *Apis mellifera* was higher than *Anthidium* sp. and *Xylocopa* sp. at all four time period i.e., 9-11 am, 11-1 pm, 1-3 pm and 3-5 pm *(Figure 4*). The maximum number of *A. mellifera* was observed during 9-11 am and decreased with time during the day. This is because nectar flow is copious in the sesame crop especially in the morning period; there after the nectar concentration gradually diminishes.

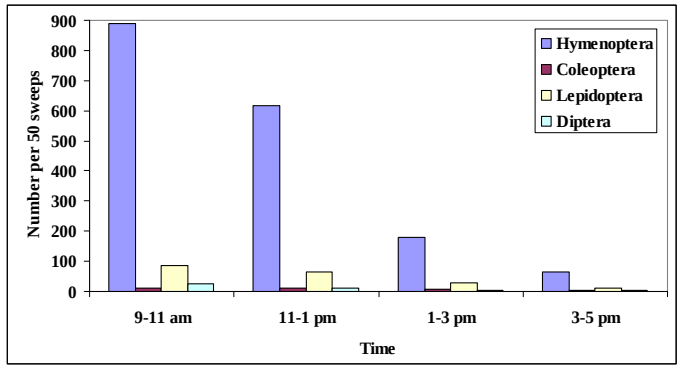

Figure 3 - Foraging activity of the major insect orders visiting sesame during flowering period from July 15 to September 4, 2011

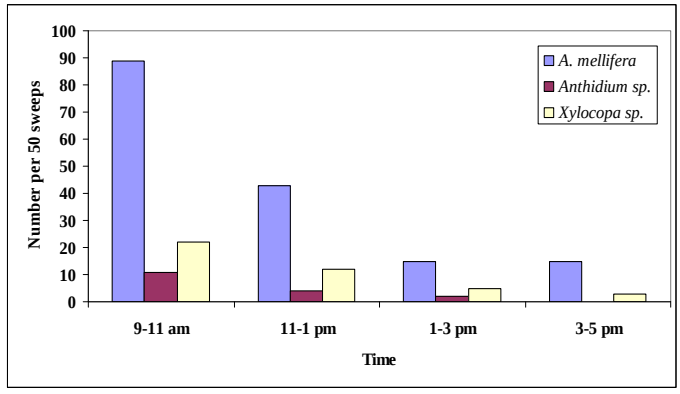

Figure 4 - Foraging activity of *Apis mellifera*, *Anthidium* sp. and *Xylocopa* sp. during flowering period from July 15 to September 4, 2011

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Figure 5 - *Apis mellifera* (1), *Anthidium* sp. (2) and *Xylocopa* sp. (3) foraging in sesame flowers

Figure 5 illustrate foraging of *Apis mellifera*, *Anthidium* sp. and *Xylocopa* sp. as predominant pollinators on sesame flowers during the period of study. The results indicate that *A. mellifera* was the most important pollinator in sesame crop. Other bee species, although present in the field, might not have the big role in pollination because their number was very low. According to Rakesh Kumar and Lenin (2000) Apoidea were the predominant flower visitors (96%) of sesame. Among these, *A. mellifera* was the most abundant (44.9%) followed by *A. dorsata* (31.4%) and *A. florea* (19.7%). *A. mellifera* comprised 30 and 32% of the foraging population on sesame crops in Egypt where species of *Megachile*, *Polistes* and *Eristalis* were also important (Rashad *et al.,* 1979).

Number of bees was drastically reduced at 3-5 pm. These findings can help to save the pollinators by applying insecticides late in the afternoon. By protecting the pollinators high yields can be ensured. Bee pollination not only ensures the increase in yields of sesame but also improve its quality. It ensures uniform maturity and early harvest of crop. Provision of bee colonies during the flowering period of crop is a simple but essential input.

A significant positive correlation was noted between mean temperature, relative humidity and pollinates visiting sesame flowers (R^2 = 0.5911 and 5817, P = 0.05), indicating that temperature and relative humidity affect the insect visits sesame flowers.

CONCLUSION

Pollinators could be protected by rational pest management tactics, i.e., pesticide application, if needed, should be done in the late afternoon to protect the pollinators for high seed yield or spray at a time of day when crop flowers are closed.

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