



SURVEILLANCE OF POLLINATORS AND THEIR BEHAVIOUR IN MANGO FLOWERS

D. Anitha Kumari, Jyothirmayee Madhavi, A. Bhagwan and M. Raj Kumar

Grape Research Station, Rajendranagar, Hyderabad (Dr. Y.S.R. Horticulture University), Andhra Pradesh, India.

Abstract

Mango, *Mangifera indica*, is the king of fruits in India, one of the popular fruits in the world due to its attractive color, delicious taste and excellent nutritional properties. Mango is not only known for its sweet fragrance and flavor, but also due to the increasing domestic demand and export potential of the fruit. Fruit set in mango is dependent on successful pollination which depends on the availability of high quality pollen, the presence of a high number of suitable pollinators, and optimal weather conditions, and must be optimized to limit fruit drop, which is extremely high in mango trees. Typically, mango trees are pollinated via wind, flies, butterflies, and moths.

Systematic surveillance was done in the mango orchard at Fruit Research Station, Sangareddy, Andhra Pradesh and pollinators were observed and recorded during peak flowering stage in fifty tagged inflorescences of five trees. Foraging behaviour of pollinators were observed on mango flowers for 7 am to 9 am and 4 pm to 6 pm.

Most of these insects belonged to the orders diptera and hymenoptera. The important pollinators are honey bees (*Apis dorsata*, *A. florae*, *A. cerana indica*), *Meliponas sp.*, *Coccinella septumpunctata*, housefly (*Musca nebulosa*) and other moths and butterflies. Among the pollinators, honey bee was found to be the major pollinator (30%).

The maximum population of different pollinators were recorded during 5th meteorological were (8.5) and there after the number of pollinator decreased. The maximum number of pollinators were observed in the medium height of the tree. The pollinators activity was maximum in the north direction followed by east and west. The population of pollinators is maximum in the full bloom flowering stage of mango and population of pollinators is negatively correlated with mean temperature (r value = -0.3499) and relative humidity (-0.1265).

There was no fruit set on completely bagged panicles. Some setting took place when bags were opened for 24, 48, and 72 hours in bloom. Insecticidal spraying affected activity of the pollinators and thus fruit set.

Key words : Systematic surveillance, insects, pollinators, *Mangifera indica*.

Introduction

Despite profuse flowering in mango, the fruits carried to maturity are comparatively meager. Pollination is major yield-limiting constraint, due to the large number of flowers on trees and low fruit set. Studies on pollinators on mango indicated that large native insect species were shown to pollinate mango (*Mangifera indica* L.) in northern Australia. Most mango cultivars are self-fertile, but benefit from cross pollination. Flowers open in the morning about 8 am and anthesis is generally completed by noon. Receptivity of the flowers usually lasts up to about 72 hr. Although, only one stamen per flower produces pollen, large number of flowers on the tree assures an abundant supply of pollen. Although mango is self-pollinated crop, adequate pollinators are needed for pollen transfer to

increase fruit set Mango flowers may pollinated by flies, bees, thrips and other insects, with flies probably the most important. (Singh, 1954; Free and Williams, 1976).

The kinds and biology of pollinators of mangos have been studied in India and Israel, and their results demonstrated that insects of the Diptera and Hymenoptera play major roles in pollinating of this fruit. The pollinators, in decreasing order of efficiency, were wasps, bees, large ants and large flies. Large Diptera and the native bee, *Trigona* sp., frequently moved from tree to tree and thus were probably the most effective cross pollinators. Of randomly selected hermaphrodite mango flowers, 36% were pollinated (Singh, 1988; Bhatia *et al.*, 1995; Singh, 1997; Dag and Gazit, 2000).

Major pollinating insects of mango was found to be from order diptera *i.e.* *Melioponasp.*, *Syrphus* sp,

Table 1 : Observations on insect pollinators in relation to weather parameters in mango at Fruit Research Station, Sangareddy during 2009-2011.

Std week	Temperature		Relative humidity (%)		Rainfall (mm)	Upper height (4-6 mt)				Middle height (2-4mt)				Lower height (upto 2mt)				Total
	Min (°C)	Max (°C)	FN	AN		E	W	N	S	E	W	N	S	E	W	N	S	
1(Jan)	12.4	29.6	95.5	31.9	0	0.5	0.4	0.3	0.4	1.1	0.4	0.2	0.4	0.4	0.4	0.5	0.3	5.3
2	8.8	31.4	95.2	11.8	0	0.5	0.5	0.5	0.8	0.6	0.4	0.3	0.7	0.9	0.4	0.6	0.9	7.1
3	11.8	33.3	88.7	16.6	0	0.5	0.3	0.6	0.3	0.7	0.6	0.6	0.6	0.8	0.5	1.0	0.8	7.3
4	12.8	33.1	86.3	16.9	0	0.9	0.3	0.7	0.6	0.7	0.6	0.7	0.6	0.8	0.5	0.6	0.8	7.8
5(Feb)	14.3	33.1	82.3	19.5	0	0.6	0.5	0.5	0.4	0.5	0.7	0.6	0.4	0.9	0.4	0.5	0.3	6.3
6	13.3	34.7	74.4	11.9	0	0.7	0.9	0.8	0.6	0.8	0.9	0.6	0.9	1.1	0.9	0.8	0.5	9.5
7	16.5	34.0	64.5	19.3	0	0.6	0.6	0.6	0.7	0.8	0.8	0.6	0.8	1.0	0.8	0.8	0.7	8.8
8	19.5	33.8	86.5	29.7	0	0.5	0.6	0.3	0.6	1.1	0.4	0.8	0.4	0.8	0.6	0.5	0.3	6.9
R value	-0.3499	-0.2608	-0.1265	-0.02911														

Table 2 : Percentage of pollinators (different orders) observed on mango at Fruit Research Station, Sangareddy during 2009-2011.

S. no.	Pollinators	Percentage
1.	Honey bees (Hymenoptera)	35.8%
2.	House flies, Blue flies Blow flies (Diptera)	30.3%
3.	Coccinellid Beetles (Coleoptera)	25.6 %
4.	Butterflies (Lepidoptera)	5.4%
5.	Others	5.3%

Table 3 : Diversity of pollinators on mango flowers at Fruit Research Station, Sangareddy during 2009-2011.

S. no.	Common name	Scientific name	Order
1.	European honey bee	<i>Apis mellifera</i>	Hymenoptera
2.	Gaint honey bee	<i>Apis dorsata</i>	Hymenoptera
3.	Indian honey bee	<i>Apis cerana indica</i>	Hymenoptera
4.	Wasp	<i>Vespula orientalis</i>	Hymenoptera
5.	Syrphid		Diptera
6.	Blue bottle fly	<i>Calliphora</i>	Diptera
7.	Monarch butterfly	<i>Danius pleippus</i>	Lepidoptera
8.	Cabbage butterfly	<i>Pieris rapae</i>	Lepidoptera
9.	Lady bird beetle	<i>Coccinella septumpunctata</i>	Coleoptera

housefly. A few beetles *Coccinella septumpunctata*. Effective pollination by honey bees would require 3 to 6 colonies per acre (Singh, 2006). Hence, the role of pollinators on fruit set in mango in relation to the occurrence of high and low temperatures was taken up.

Materials and Methods

Systematic surveillance was taken up in the mango orchard for pollinators in mango cv. Banganpalli during the flowering period at Fruit Research Station, Sangareddy, Andhra Pradesh (India) during 2009-11. The flowering period was between December to January months during both the years. Weekly observation on pollinators were recorded on 50 panicles per tree from 10 randomly selected trees at different height of the tree from all the four directions (north, south, east and west) in a fixed plot at three different heights of the tree (upper height 4-6mt; medium height 2-4 mt and lower height 0-2 mt) and the field was free from pesticide sprays.

Foraging behaviour of pollinators was observed on mango flowers for 7 am to 9 am and 4 pm to 6 pm. It was found that the most efficient pollinators were those that carried large numbers of pollen grains on their thoraces and used a short proboscis or short mouth parts to feed on nectar. Data was correlated with weather parameters.

Results and Discussion

Systematic surveillance was done in the mango orchard at Fruit Research Station, Sangareddy and

pollinators were observed and recorded during peak flowering stage. The important pollinators are honey bees (*Apis dorsata*, *A. florea*, *A. cerana indica*) stingless bees (*Trigona* sp, *Melipones* sp, *Coccinella septumpunctata*) housefly (*Musca nebulosa*) and other moths and butterflies. Among the pollinators, honey bee was found to be the major pollinator (35.8%).

The maximum population of different pollinators were recorded during 5th meteorological were (8.5) and there after the number of pollinator decreased. The maximum number of pollinators were observed in the medium height of the tree. The pollinators activity was maximum in the north direction followed by east and west. The population of pollinators is maximum in the full bloom flowering stage of mango and population of pollinators is negatively correlated with mean temperature (r value = -0.34991) and relative humidity (-0.1265).

Studies conducted on major pollinating insects of mango indicated that major pollinators were found to be from order Diptera, that is, *Melipona* sp, *Syrphus* sp. A few beetles especially *Coccinella septumpunctata* was quite important. *Rhynchaenus mangiferae* Marsh., although a pest helped in pollination and increased fruit setting when its population was below the damaging level. Presence of Hymenoptera and honey bee was negligible. There was no fruit set on completely bagged panicles. Some setting took place when bags were opened for 24, 48, and 72 hours in bloom and also in insect released bags. Insecticidal spraying affected activity of the pollinators and thus fruit set (Singh, 2006). The present studies were in confirmation with above results.

Conclusion

Most of these insects belonged to the orders diptera and hymenoptera. The important pollinators are honey bees (*Apis dorsata*, *A. florea*, *A. cerana indica*), *Meliponas* sp, *Coccinella septumpunctata*), housefly (*Musca nebulosa*) and other moths and butterflies. Conservation of pollinators during flowering time helps in increased fruit set and yields by avoiding insecticidal sprays during flowering period.

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