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Impact of pesticides on pollinators or visitors during flowering period of mango, *Mangifera indica* L

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Abstract

An investigation was carried out four consecutive year (2016-19) to study the impact of pesticides spray on pollinators or visitors population during flowering period of mango at ICAR-AICRP on fruits centre, Agriculture Experimental Station, NAU, Paria (20°26'N, 72°58'E). The results revealed that intensity of pollinators or visitors found significantly high on unsprayed trees as compared to sprayed trees ($P < 0.01$). Maximum population was recorded in 7th SMW (1.84 pollinator or visitors /panicle/5 minutes) followed by 6th SMW (1.82/panicle) and 5th SMW (1.19/panicle) on unsprayed trees over to pesticides sprayed trees 6th SMW (1.24/panicle), 7th SMW (1.24/panicle) and 5th SMW (0.86/panicle), respectively. This information may be useful to known activity and impact of pesticides spray on pollinators or visitors population in mango ecosystem.

Keywords: Impact, flowering, mango, pollinators, pesticides, visitors, spray

Introduction

Mango, *Mangifera indica* L. (Anacardiaceae) considered as one of the most important fruit crops in tropical and subtropical region of India as well as the world over. It is highly cross-pollinated crop and Insect pollination has recognized as a key input in improving crop productivity (Deodikar and Suryanarayana, 1977) [3]. Most of these insects belonged to the orders Diptera, Hymenoptera, Coleoptera and Lepidoptera (Kumari *et al.*, 2014 and Usha *et al.*, 2014) [1, 5]. Bhatia *et al.*, (1995) [2] reported that fruit set zero on bagged panicles as compared with non-bagged panicles. However, many pesticides are used in the mango orchard for controlling the insect pest which having harmful effect on pollinators or visitors activity resulting reduction in fruit set as well as yield (Shinde *et al.*, 2001) [4]. Considering the significance of insect pollinators for the improved qualitative and quantitative production of mango, this study was conducted to observe the impact of pesticides spray on pollinators or visitors population during flowering periods in south Gujarat mango ecosystem.

Materials and Methods

The present study was carried out at ICAR-All India Coordinated Research Project on fruits centre, Agriculture Experimental Station, Navsari Agricultural University, Paria (20°26'N, 72°58'E) on 15-20 years old mango trees (cv. Alphonso) during 2016-19. Weekly observations of pollinators or visitors were recorded on 10 panicles /tree/ 5 minutes from 10 randomly selected trees at flowering stage (five trees selected from each sprayed and unsprayed trees).

Result and Discussion

Impact of pesticides spray on pollinators/visitors: The results pertaining to the studies revealed that mango flowering was initiated more or less in the first week of January and pollinators or visitors activity was recorded 1-10th standard meteorological weeks (SMW) during the study periods. Peak activity was observed in 5-7th SMW with ranged of 1.15 to 3.16 pollinators or visitors/panicle/5 minutes on sprayed and unsprayed trees, respectively. An average population of pollinators or visitors higher observed on unsprayed tree (0.66 to 1.39 /panicle) over to sprayed trees (0.50 to 0.80/panicle) (Table 1). In 2016, intensity of pollinators or visitors was remained high in unsprayed trees (0.11 to 3.16 pollinators /panicle) as compared to sprayed trees (0.03 to 1.87 pollinators /panicle). The maximum population was recorded in 6th SMW (3.16/panicle/5 minutes) followed by 7th SW (2.88/panicle) and 8th SMW

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(1.81/panicle) on unsprayed trees (Fig. 1). While, on sprayed trees maximum population was recorded in 7th SMW (1.87/panicle/ 5 minutes) followed by 6th SMW (1.55/panicle) and 8th SMW (1.18 /panicle), respectively. Subsequently, intensity of pollinators or visitors more in unsprayed (0.04 to 1.82 pollinators or visitors/panicle) over to sprayed trees (0.05 to 1.19 pollinators /panicle). Maximum pollinators population was recorded in 7th SMW (1.82 pollinator or visitors/panicle/5 minutes over to sprayed trees 1.19 pollinators/panicle) at full bloom stage followed by 6th SMW (1.36/panicle over to sprayed tree 1.02/panicle) (Fig. 1 & 2). In 2018, maximum pollinators was recorded in 5th SMW (1.47 pollinators /panicle) at full bloom stage followed by 6th SMW (1.34/panicle) and 4th SMW (1.13/panicle) in unsprayed trees.

Whereas, on sprayed maximum population of pollinators was recorded in 6th SMW (1.15 pollinators/panicle/5 minutes) followed by 5th SMW (1.09 pollinators /panicle). Afterwards, intensity of pollinators or visitors more in unsprayed as compared to sprayed trees (Fig. 1 & 2). Based on the pooled results, number of pollinators or visitors significantly reduced on pesticide sprayed trees with only 1.29 pollinators/panicle/5 minutes (over 1.84 pollinators/panicle/5 minutes in unsprayed trees) which indicate detrimental effects of pesticides on the population build up of insect pollinators or visitors of mango flowers (Table 2 and Fig. 3). Kumari *et al.*, 2014 ^[1] reported that insecticidal spraying affected activity of the pollinators as well as fruit set of mango.

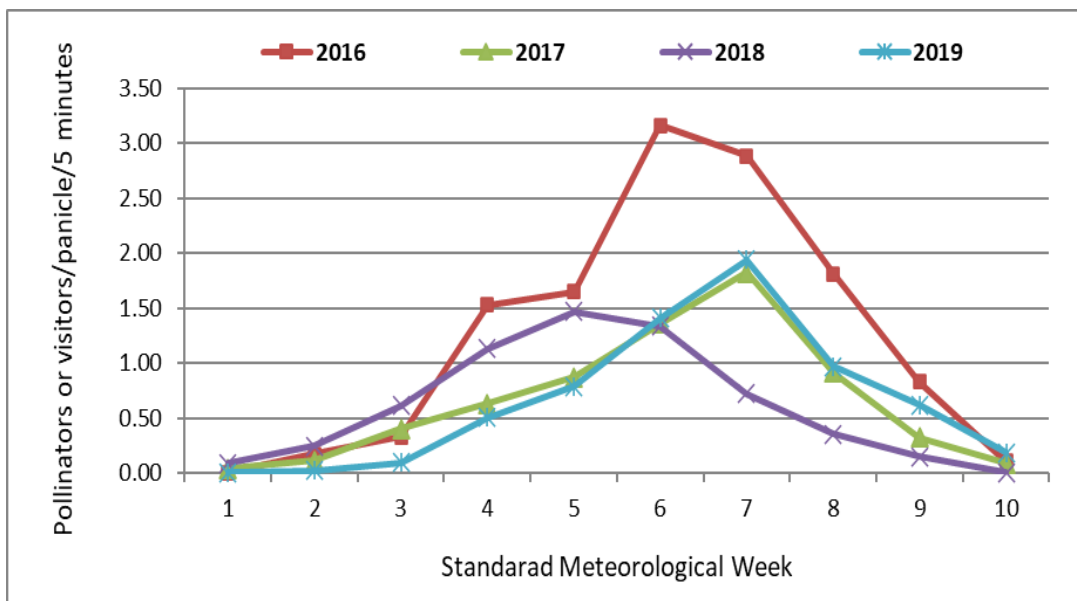


Fig 1: Abundance of pollinators or visitors on unsprayed trees of mango during 2016-19

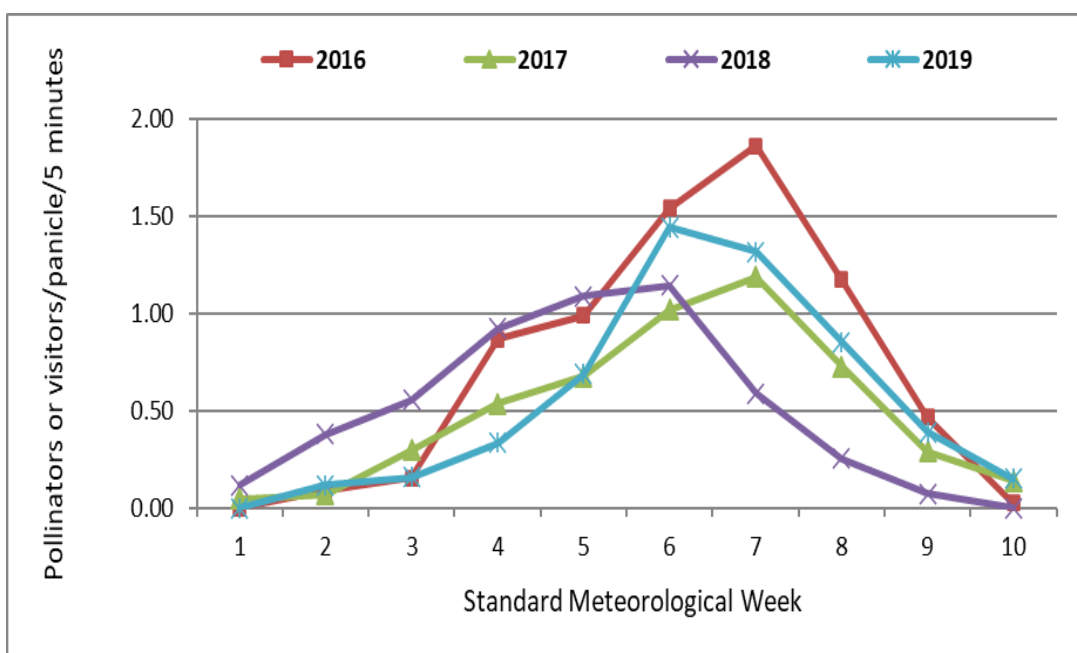


Fig 2: Abundance of pollinators or visitors on sprayed trees of mango during 2016-19

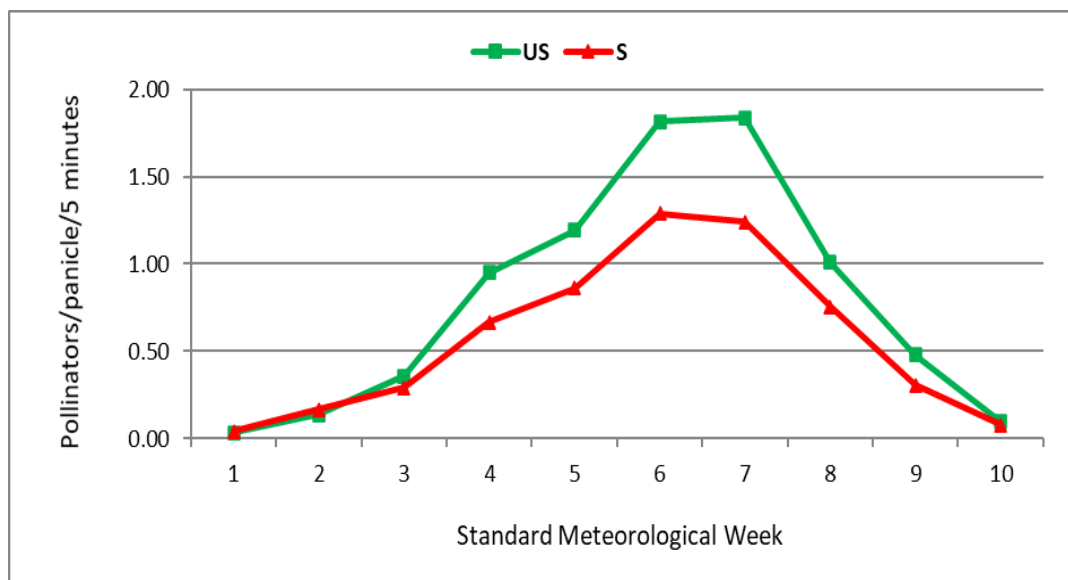


Fig 3: Effect of pesticide application on pollinators population (green = unsprayed trees and red = sprayed trees) during 2016-19

Table 1: Abundance of pollinators or visitors on unsprayed and sprayed trees of mango during the study periods

Parameters	Pollinators or visitors/panicle/5 minutes							
	2016		2017		2018		2019	
	US	S	US	S	US	S	US	S
Average population	1.39	0.80	0.66	0.50	0.68	0.57	0.72	0.61
Peak population	3.16	1.87	1.82	1.19	1.47	1.15	1.94	1.45
Peak activity (Standard week)	6	7	7	7	5	6	7	6

Table 2: Comparison between population of pollinators or visitors in unsprayed and sprayed tree during 2016-19

Paired 't' test	Pollinators or visitors/panicle/5 minutes	
Treatment	Unsprayed	Sprayed
Mean	0.79	0.57
Standard Deviation	0.68	0.46
Variance	0.46	0.21
T statistic	3.17*	

*, Significant at 0.05 level

Conclusions

On the basis the results, this study clearly indicated that intensity of pollinators or visitors significantly higher on unsprayed trees as compared to sprayed trees.

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