



IMPACT OF MALE TRAPPING TECHNIQUES THROUGH STICKY COLOR TRAPS ON THE DEVELOPMENT OF POPULATION OF MANGO MEALYBUG, *DROSICHA MANGIFERAE* (GREEN) (HEMIPTERA: MARGARODIDAE)

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ABSTRACT

Different color sticky traps are being used as monitoring and management tool for the population of many insect pests on crop plants. The current study was carried out in mango orchard, District Tando Allahyar from Nov. 2011- May, 2012 was conducted to determine the color attraction and impact of sticky traps on the population of *D. mangiferae*. The results revealed that 8 arthropod species including three mango pests namely mite, mango mealy bug (MMB) and mango hoppers were attracted to the color traps. The catches of male adults on traps were recorded from April to May, 2012. The yellow, green and blue sticky traps caught 200, 81 and 21 males of MMB, respectively. The traps installed on Sindhri variety had maximum catches (121) of male as compared to Sonaro (58), Chaunsa (52) and Langra (45). Male traps had significant impact on female fecundity. Only 60% females laid their eggs, which were collected from the branches of BSTs and GSTs, respectively. While only 30% females of YST laid their eggs. However, only 20, 30 and 10 percent females laid >100 eggs by the females collected from blue, green and yellow traps, respectively. It was concluded that YSTs effectively captured the adult males as a result majority of females went down the tree without mating. The females laid less than 100 or no egg may be due to parthenogenetic mode of reproduction.

Keywords: *Drosicha Mangiferae*, Sticky Trap, Male trapping population dynamics

INTRODUCTION

Mango plants, *Mangifera indica* L. (Anacardiaceae), originated to the Asian Subcontinent, is now being cultivated in almost all tropical regions worldwide. The mango fruits are extensively utilized for food, juice, flavor, fragrance, color and also a common ingredient in new functional foods and thus mango fruits are often called super fruits. Pakistan is ranked 5th in mango production with 916.4 MT mango yearly, accounting for 3.9% of the total world production (FAO, 2010), (MINFAL, 2011). Many mango varieties are being cultivated in Pakistan, and among those varieties Sindhri, Langra, Chaunsa, Fajri, Samar Bahist, Anwar Ratole, Dasehri, Saroli, Tuta Pari, Neelam, Maldah, Collector, Began, Palli, etc. are the most famous (Kehkishan, 2011). Insect pests are the major threat to mango production and prevailing

regularly on mango trees, the mango mealy bug, *Drosicha mangiferae* (Green) is one of them (Mohyuddin and Mahmood 1993). It is a noxious pest and severely infesting mango trees and could not be controlled through the sole use of insecticides, which prompted to develop IPM strategies by developing different treatments including the use of sticky bands along with sticky traps that significantly reduced the mealy infestation to 16% (Ishaq *et al.*, 2004). There is sexual dimorphism in mealy bugs like male arer winged but not capable to fly long and females are wingless (Barrass *et al.*, 1994). Yellow sticky traps were found effective in capturing the adult insects that other color sticky trap (Sivapragasam and Saito (1986). The certain sticky traps attract and catch winged insects and have also been used as a method for the control of some pests (Pasian and Lindquist, 1998; Shen and Ren, 2003). Ashfaq *et al.* (2005), reported that the adult males

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emerged in the month of May to mate with crawling females, which were moving down from mango trees to the ground for egg laying. Use of sticky trap is one of the environment friendly techniques to trap adult mealy bugs. The traps are cheap to prepare and easy to install on tree stem. According to (Hwang and Hung (2007) Sticky traps are the most common types of traps that efficiently trap all moving insects on its sticky surface. This technique is demonstrated to diminish the chance of mating and reproduction of *D. mangiferae* and successfully reduce damages in by this mealybug in orchards (Teshiba *et al.*, 2009; Suzanne, 2012; Nancy *et al.*, 2008) described that the pheromone sticky traps can effectively attract males from a distance of approximately 300 feet. Lua *et al.* (2012) reported the yellow sticky traps can be used for the controlling and monitoring the population of many pests. Bugs are attracted to the yellow color sticky traps and become stuck when they land on them (Noelle, 2012). The present study is planned to evaluate the effect on female mating in mango mealy bug by using various color sticky traps on different varieties. The obtained information may be exploited in devising sustainable IPM strategies for mango mealy bug.

MATERIALS AND METHODS

The experiment was carried out in mango orchard infested with mango mealy bug near Kamaro Sharif, District Tando Allahyar from Nov. 2011- March, 2012. The orchard has four mango varieties including Sindhri, Sonaro, Chausa and Langra. 5 mango plants from each variety were randomly selected, with one from center and four from different sides (North, South, West and East) of the particular area of the varieties planted in mango orchards. The sticky traps of different colors i.e. yellow, blue and green were installed at different sides of each plant i.e. east, south and west of mango plants at 5-7 feet above the ground. The traps were made of clean plastic sheets with 5mm gauge. The size of each trap was maintained as 12"x12". Grease as adhesive material was applied to the trap for sticking flying male of mango mealy bugs and the associated predators and parasitoids. The adhesive material was replaced at weekly intervals. The adults female of mango mealy bugs were collected separately while down ward movement from those mango branches having color traps installed. The collected females were then released into separate buckets (18" high and 12" dia), in which soil clods were provided to facilitate the females to lay eggs. There were ten buckets for each color trap and one female was released in each bucket. After release of the females, the clods were gently taken out from each bucket twice a week to count the number of egg laid by the females. The impact of male catches on female mating was determined by the total number of eggs laid by the females. The females who laid 100 or more eggs were considered as mated females, the eggs laid less than 100 by the female might be the result of parthenogenesis reproduction, and those did not lay their eggs were considered virgins. The photography of captured mango mealy bug

adults and predators were taken through a digital camera 8.0 Mega Pixels. The data were statistically analyzed through analysis of variance using (SPSS student package Statitix 0.8).

RESULTS

The data shown in Table-1 depict that five different groups of predators i.e black ants, spiders, Brumus beetle, Z. zag beetle, damsel fly and three groups of mango pests namely mites, mango mealy bug and mango hoppers were stuck to the color traps. The maximum catches of predators and pests were recorded on yellow sticky traps (514) followed by green (238) and blue sticky traps (143). Maximum male mango mealy bug were attracted on yellow sticky traps (200) compared with green (81) and blue (21). Further, it was observed that traps did not show any catches of male mealy bugs before 10-04-2012. The adult was recorded from 10-04-2012 till 01-05-2012, with maximum catches on 24-04-2012. Among the traps of different colors, yellow traps attracted significantly more insects ($F = 11.83$, $df = 2$, $P < 0.01$). Non-significant difference ($P < 0.05$) was observed male catches between blue and green sticky traps.

The data in Table 2 reveals that maximum catches of male mealy bug were recorded on Sindhri variety. The traps installed on the branches of Sindhri variety attracted (7), (35) and (89) on blue, green and yellow sticky traps, respectively. While traps installed on Sonaro variety had (3), (13) and (42) on blue, green and yellow sticky traps, respectively. The traps installed on Chaunsa had (6), (16) and (36) on blue, green and yellow sticky traps, respectively. Similar trend of catches were recorded on Langra variety. The total catches of all three traps indicated that the traps installed on Sindhri variety had maximum catches (121) male mealy bugs followed by Sonaro (58), Chaunsa (52) and Langra (45). To determine the impact of male trapping on female mating rate and subsequently fecundity, the selected adult females of mango mealy bug were taken from the branches of mango plants installed with traps, and were observed for oviposition in the laboratory. Data in Table 3 reveal that only 60% females laid eggs, for females collected from the branches having blue traps. Among those egg-laying females, 20% females laid >100 egg while remaining 40% laid <100 eggs. Similarly, 60% of the females laid their eggs that were collected from the branches having green sticky trap. Only 30% of female laid >100eggs. Thirty % of female laid their eggs, which were collected from the branches having yellow sticky traps. 20% of them laid <100 eggs. It was concluded from the results that the females laid less than 100 or no egg were considered as unmated females; however, less than 100 eggs could be due to the parthenogenesis reproduction. Since the sticky traps especially yellow color effectively captured the male mealy bug that reduced the chance of mating to females, consequently majority of females went down the tree without mating. Hence, reduced the eggs production in mango mealy bug.

Table 1

Catches of population of mango mealy bug and other arthropods on different varieties of mango.

Arthropods	Color sticky traps		
	BLUE	GREEN	YELLOW
Mealy Bug	21	81	200
Black Ants	41	57	102
Spiders	9	11	10
L. B. Beetle	4	6	9
Z. zag beetle	4	2	2
M. Hopper	64	91	191
Mite	4	1	5
Damsel fly	1	3	1
Total	143	248	514

Table 2

Population of mango mealy bug and other arthropods on different varieties of mango from 10-04-2012 -01-05-

Arthropods	Variety											
	Sindhri			Sonaro			Chaunsa			Langra		
	Sticky trap			Sticky trap			Sticky trap			Sticky trap		
	Blu	Grn	Yllw									
Mealy Bug	7	35	89	3	13	42	6	16	36	5	17	33
Black Ants	5	16	34	6	9	23	6	23	26	24	9	19
Spiders	3	2	1	2	3	4	1	5	3	3	1	2
L. B. Beetle	1	4	2	1	0	2	1	1	2	1	1	3
Z. zag beetle	1	1	1	2	1	0	0	0	1	1	0	0
M. Hopper	12	36	49	17	31	55	24	4	38	11	20	49
Mite	1	0	1	1	1	1	1	0	1	1	0	2
Damsel fly	0	1	0	1	1	0	0	1	0	0	0	1

Table 3

Fecundity of mango mealy bug females collected from the branches having different color traps installed for male adult caches.

Sticky trap	No. of females released	No. of females laid egg	No of females laid >100 eggs	No of females laid < 100 eggs
Blue	10	6	2	4
Green	10	6	3	3
Yellow	10	3	1	2

DISCUSSION

In the present study insects and non- insect arthropods were found attracting to the color sticky traps. Pasian and Lindquist (1998) mentioned the usefulness of sticky for early detection of many soft bodied insect pests and their population management. Shen and Ren (2003), Hwang and Hung (2007) and Gu *et al* (2008) also favor the use of this technique, they reported that sticky traps are the most common types of traps in use, and it provides a sticky surface to immobilize the attracted insects. Sticky traps are generally more efficient at catching the attracted insects. Lua *et al.* (2012) reported that yellow sticky traps can be used for monitoring and controlling many pests. Since, males of mango mealy bug are pterous,

therefore, they were caught in the traps. Suzanne (2012) also suggested yellow sticky cards to be used to trap the flying male mealy bugs. Present study also revealed that the yellow sticky traps attracted maximum MMB male as compared to green and followed by blue sticky traps. The results are in agreement with those of Sivapragasam and Saito (1986) who reported that more adults of *Plutella xylostella* were attracted to yellow sticky traps as compared to clear, blue and red color traps. Result further showed that the appearance of adults was recorded from 10-04-2012 to 01-05-2012, which also the emergence period of males, however, maximum catches were recorded on 24-04-2012. These finding are in agreement with those of Ashfaq *et al.* (2005) reported the emergence of male mealy bug during May. Kumar *et al.* (2009) mentioned the

emergence period of adults from April to May. The traps installed on the branches of Sindhri variety caught maximum male followed by Sonaro, Chaunsa and Langra variety. The maximum male catches on the branches of Sindhri variety reflects maximum population of mealy bug on Sindhri variety. However, the findings of Karar (2010) are little deviated; who reported that Chausa retained maximum population. This could be due to maximum plantation of Chausa variety in Panjab. Whereas; Sindhri variety is being cultivate at large scale in Sindh. The impact of male trapping on population of mealy bugs was determined through the fecundity of females, only 30% females laid their eggs, which were collected from the branches having yellow color sticky traps followed by the female collected from the braches having green and blue sticky traps. The trapping of males reducing the chance of mating with females, consequently, majority of females went down the tree without mating. Suzanne (2012) mentioned that trapping of flying adult male mealy bugs is nothing but to preventing them from mating. Similarly, Teshiba *et al.* (2009) mentioned that catching of male through pheromone sticky traps diminishing the chance of mating and reproduction of *Planococcus kraunhiae* and successfully reduce damages on fruits by this mealy bug in Japanese persimmon orchards.

CONCLUSION

It is concluded that yellow sticky traps caught more male mango mealy bug and predators than the green and blue ones. The traps installed on the branches of Sindhri variety caught maximum males, followed by the traps in Sonaro, Chaunsa and Langra variety. The trapping of adult males reduced the mating rates of females to only 30%, 60% and 60% when treated with yellow, green and blue stick traps, respectively.

RECOMMENDATIONS

To reduce the fecundity in female mealy bug, yellow sticky traps should be installed to trap male mealy bugs.

AUTHORS' CONTRIBUTION

Abdul Ghani lanjar, Kanya Lal Khatri and Aslam Bukero conceived the idea. Tarique Jan Mirbahar, conducted the experiment. Abdul Waheed Solangi and Mehar Ul Nissa Rais conducted the data analysis. Arshad Ali Kaleri, Rameez Raja Kaleri wrote the paper.

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