

Attraction of *Idioscopus clypealis* (Leith) (Cicadellidae: Homoptera) to Sticky Colored Traps in Mango Orchard

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Received September 4th, 2013; revised October 6th, 2013; accepted October 31st, 2013

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ABSTRACT

The present study was conducted at the Faiz Chaman mango orchard, Multan to find out the attraction of mango hopper *Idioscopus clypealis* to sticky traps of different colors. The experiment was laid out in randomized complete block designed with three replications. The sticky traps were hung vertically with the branch/twig under the canopy of mango trees. Data were recorded under binocular stereoscope. Results indicated significant differences in the number of *I. clypealis* (adults) captured in the different colored sticky traps. Yellow color was found most attractive with a capture of highest number of adults of *I. clypealis* (11.53 adults/trap). While pink and purple colors were found less attractive. The peak population of mango hoppers was recorded at the 31.96°C during 25-April to 9-May. Yellow sticky traps were found most effective in trapping a considerably higher number of hoppers throughout the study period. Correlation analysis revealed a strong positive correlation between temperature and the mean number of *I. clypealis* adults. Population peaks of *I. clypealis* were recorded at temperatures >30°C, while at lower temperatures relatively low numbers of adults were recorded.

Keywords: Mango Hoppers; Sticky Colored Traps; Mango; Attraction; *Idioscopus clypealis*

1. Introduction

Mango (*Magifera indica* L.) is very popular and economically important. Nearly 87 countries are known for commercial mango production. China, India, Indonesia, Mexico, Pakistan, Philippines and Thailand are well-known as prominent mango producing countries [1]. In Pakistan, mango has a 2nd position among the production of different fruits [2]. Pakistan is ranked as 5th major producer of mango in the world [3]. Punjab and Sindh are the main provinces for mango production in Pakistan which contribute about 66% and 32.5% in total mango production, while the remaining shares *i.e.* ≤2% come from Khyber Pakhtun Khaw and Balochistan [4]. Pakistan is also a 3rd major exporter of mangoes in the world [5]. Middle East, China and Iran are the most important export markets of Pakistani mangoes [6].

Insect pest and diseases are the main factors that affect mango production and yield. Mango hoppers (*Idioscopus clypealis* Leth., and *Amritodus atkinsoni* Leth.), midge

(*Erosomya indica* Grover and Prasad), mealybug (*Drosicha stebbingii* Green), scale insect (*Aulacaspis tubercularis* Newstead), fruit flies (*Bactrocera zonata* Saunders and *B. dorsalis* Hendel), thrips (*Frankliniella occidentalis* Pergande) and bark beetle (*Hypocryphalus mangiferae* Stebbing) are the important insect pests which cause damage to mango in Pakistan [7]. Among these, mango hoppers are serious pests of mango and attack leaves, shoots, inflorescence, flowers and sometimes fruits [8]. Out of 18 species of mango leaf hoppers in the world, *Idioscopus clypealis* Leith., *Amaritodus atkinsoni* Leith., *I. niveosparus* Leith., and *I. nagpurensis* Pruthi are the most important [9].

Both nymphs and adults cause damage by egg laying in florets and suck sap from tender vegetative and reproductive parts resulting in withering, wilting and drying of these parts [10,11]. Nymphs and adults of mango hoppers inhabit blossoming and affect fruit setting. The nymphs cause maximum damage by sucking sap and secrete honeydews and as a result interfere with fertilization of flowers [12]. In case of severe infestation by

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hoppers, the trees showed the burnt appearance and photosynthetic activity of infested trees was reduced due to sooty mold [13]. Yield loss in mango due to mango hoppers may range from 25 - 60 percent [14].

Sticky colored traps are used for monitoring of insect pests in the agricultural fields [15-18]. In pest management programs, sticky traps can be used for monitoring of insect pests. Therefore, sticky colored traps can be used for monitoring of mango hoppers. The main objective of the present study was to determine the attractiveness of *I. clypealis* to colored sticky traps and monitor their activity in the mango orchard throughout the study period.

2. Materials and Methods

2.1. Experiment

The present study was conducted at Faiz Chaman mango orchard, Multan during February to May 2012. Fifteen different colors *i.e.* black, blue, brown, dark yellow, green, gray, light brown, light pink, light purple, light yellow, orange, pink, purple, red and yellow were used (as treatments) to find out the attraction of mango hoppers. The treatments were arranged in randomized complete block (RCB) design with three replications. Forty five traps were used during each fortnight.

2.2. Description of Traps

Colored sticky traps were prepared by cutting of hard-board cards with a paper cutter. These cards were covered by plain paper sheets of 15 different colors. Insect gum was used as a sticky material. Then, a thin layer of polybutene insect gum was coated on both sides of the traps. The size of each sticky trap is about 10 × 10 inches. The sticky traps were hung vertically with the branch/twig by rope under the canopy of mango trees. The height of traps was approximately 2 meters. Colored sticky traps were replaced and re-randomized with fresh sticky traps fortnightly to remove the effect of a one specific color in the attraction of mango hoppers. After every fortnight, traps were removed from the trees and taken to Bio-Ecology laboratory, Department of Entomology, BZU, Multan for data recording, preservation and future concerns.

2.3. Insect Counting

Data on each colored sticky trap was recorded fortnightly under binocular stereoscope and numbers of adults captured were counted.

2.4. Statistical Analysis

Statistix 8.1 software was used for statistical analyses. Data was subjected to analysis of variance (ANOVA)

and treatment means were separated by Tukey's (HSD) test at P = 0.05. Mean number of adults were also correlated with average temperatures.

3. Results

During the study period, the mean number of adult mango hopper (*I. clypealis*) trapped on sticky colored traps were ranged from 0.86 to 11.53/trap (**Table 1**). Statistically significant differences were found in the number of adults of *I. clypealis* captured on the sticky traps of different colors at P = 0.05. Yellow color was found most attractive for adults of *I. clypealis* (11.53 adults/trap) followed by dark yellow and light yellow, while attraction to other colors was not significantly different (**Table 1**). Pink and purple colored sticky traps were less attractive for the *I. clypealis* adults *i.e.* 0.86 and 1.13 adults/trap respectively.

Results indicated that the peak population of *I. clypealis* was recorded at the 31.96°C during 25-April to 9-May as shown in **Table 2**. Yellow sticky traps were found most effective in trapping a considerably higher number of hoppers throughout the study period with maximum number of adults (29.00/trap) during 25-April to 9-May. Whereas lowest numbers of adults were recorded during 24-February to 10-March and pink color was found least attractive to adult mango hoppers (**Table 2**).

Correlation analysis revealed a strong positive correlation ($r^2 = 0.7217$) between temperature and the mean number of *I. clypealis* adults (**Figure 1**). Population peaks were recorded at temperatures >30°C, while at lower

Table 1. Mean number (\pm SEM) of *I. clypealis* adults on different colored sticky traps.

| Trap Color | Mean \pm SEM |
|--------------|----------------------|
| Black | 1.80 \pm 0.87 CDE |
| Blue | 1.46 \pm 0.58 DE |
| Brown | 3.86 \pm 1.57 BCDE |
| Dark yellow | 6.40 \pm 2.13 B |
| Green | 1.26 \pm 0.35 E |
| Grey | 3.80 \pm 1.07 BCDE |
| Light brown | 2.06 \pm 0.87 CDE |
| Light pink | 1.73 \pm 0.75 CDE |
| Light purple | 3.40 \pm 1.04 BCDE |
| Light yellow | 5.46 \pm 2.08 BC |
| Orange | 5.26 \pm 0.70 BCD |
| Pink | 0.86 \pm 0.40 E |
| Purple | 1.13 \pm 0.37 E |
| Red | 4.13 \pm 1.43 BCDE |
| Yellow | 11.53 \pm 3.49 A |
| F | 11.69 |
| DF | 14,224 |
| P | 0.000 |

Means followed by same letters do not differ significantly at P = 0.05.

Table 2. Population dynamics of *I. clypealis* (number of adults per trap) during different fortnights.

| Trap Color | 24/2/2012 to 10/3/2012 | 11/3/2012 to 25/3/2012 | 26/3/2012 to 9/4/2012 | 10/4/2012 to 24/4/2012 | 25/4/2012 to 9/5/2012 |
|-------------------------|------------------------|------------------------|-----------------------|------------------------|-----------------------|
| Black | 0.00 A | 0.00 A | 2.66 B | 0.33 A | 6.00 CD |
| Blue | 0.00 A | 0.00 A | 4.33 B | 0.33 A | 2.66 CD |
| Brown | 0.00 A | 0.00 A | 10.00 B | 2.00 A | 7.33 CD |
| Dark Yellow | 0.66 A | 1.66 A | 4.00 B | 4.00 A | 21.66 AB |
| Green | 0.00 A | 2.00 A | 2.00 B | 1.33 A | 1.00 D |
| Grey | 0.00 A | 2.00 A | 9.33 B | 1.00 A | 6.66 CD |
| Light Brown | 0.00 A | 0.00 A | 1.66 B | 1.33 A | 7.33 CD |
| Light Pink | 0.00 A | 1.00 A | 1.00 B | 0.66 A | 6.00 CD |
| Light Purple | 0.00 A | 1.66 A | 8.66 B | 0.00 A | 6.66 CD |
| Light Yellow | 0.00 A | 0.00 A | 9.33 B | 2.33 A | 15.66 ABC |
| Orange | 0.33 A | 2.33 A | 5.00 B | 3.33 A | 15.33 ABC |
| Pink | 0.00 A | 0.00 A | 1.66 B | 1.33 A | 1.33 D |
| Purple | 0.00 A | 1.33 A | 1.00 B | 0.66 A | 2.66 CD |
| Red | 0.00 A | 0.66 A | 6.66 B | 0.66 A | 12.66 BCD |
| Yellow | 0.66 A | 0.33 A | 24.33 A | 3.33 A | 29.00 A |
| Temperature (°C) | 21.46 | 25.00 | 30.66 | 28.93 | 31.96 |

Means followed by same letter do not differ significantly at $P = 0.05$.

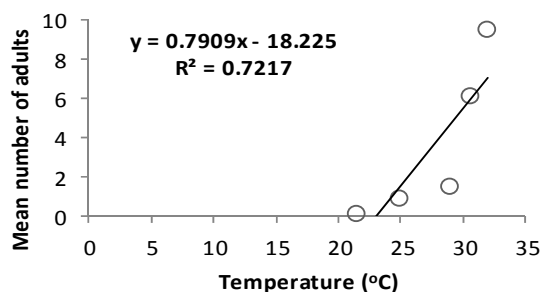


Figure 1. Correlation between mean number of adult *I. clypealis* and temperature.

temperatures relatively low numbers of adults were recorded.

4. Discussion

The significant effect of trap colors was found in attraction of *I. clypealis*. The response of *I. clypealis* was also influenced by date (Tables 1 and 2). In the present study, among different colored sticky traps evaluated, yellow color was found most effective for capturing a higher number of hoppers. These findings are in agreement with [19] reported a significantly higher number of potato hoppers adults on yellow sticky traps. [20] reported attraction of sharp nosed leaf hoppers to yellow color in

blueberry fields.

Results indicated that the temperature ($\geq 25^{\circ}\text{C}$) in the February and March and flowering in mango helped in the gradual buildup of *I. clypealis* population. The results are similar to [21] found hoppers in large numbers on the mango trees during the hot weather, particularly in the flowering season. [22] reported the effect of environmental factors on the population of *I. clypealis* and found that the peak population was recorded during March-April whereas least during December-January. The peak population of *I. clypealis* was recorded during the last week of April to 1st week of May at 31.96°C . This seems to be associated with the increase in temperature. The same results were also reported by [23] that the population started increasing with the beginning of flowering season in January and adult count increased from March onwards but decreased gradually after July. [24] studied the seasonal incidence of mango hoppers and reported similar results.

Strong positive correlation ($r^2 = 0.7217$) was found between temperature and number of *I. clypealis*. Peak populations were recorded at 30.67°C and 31.96°C and very less number of *I. clypealis* were recorded at temperatures ranged from 21°C - 25°C . According to [25], *A. Atkinsoni* population was kept under control at tempera-

tures less than 20°C and outbreak of the pest could occur between 20°C - 25°C. The results are very much similar to [26] reported maximum numbers of mango hopper per shoot during March and positive significant correlation between mango hopper population and temperature. Mild temperature between 28.86°C - 32.68°C, relative humidity (69 - 80.5 percent) and onset of inflorescence with new flushes of leaves during January-March and September to October favored pest multiplication. [27] studied the seasonal abundance of *A. atkinsoni* and *I. clypealis* on Dasherri and reported that the period from March to May was reasonably favorable for multiplication of these pests and it coincided with the emergence of inflorescence.

5. Findings of the Research

Among the different colors of sticky traps tested, yellow color was found most attractive for *Idioscopus clypealis*. So, yellow color was suggested for monitoring of *Idioscopus clypealis* in the mango orchards. Spraying of mango orchards in March with insecticides recommended for *Idioscopus clypealis* can prevent further buildup and infestations of hopper populations in April.

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