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# Susceptibility of Mango cultivars against larvae of Mango midge *Procontarinina mangicola* Shi (Cecidomyiidae: Diptera)

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## Abstract

Mango midge (*Procontarinia mangicola*) is an important and severe pest of mango in a number of mango growing countries. It attacks the mango at three different stages and leaves no chance of gaining good yield. It destroys the inflorescence completely which results in reduced fruit setting. This work was carried out to evaluate the susceptibility of five different mango cultivars (Chaunsa, Anwar Ratol, Sindhri, Langra and Dusehri) against *Procontarinia mangicola* by funnel traps. The traps were mounted with the twigs under the canopy of mango trees for monitoring of larval population of *P. mangicola*. Maximum population of *P. mangicola* were recorded during 2nd week of March in Chaunsa cultivar (107.00±31.03) followed by Anwer Retol cultivar (83.86±23.37). While no significant population was observed in Dusehri cultivar. Result concluded that funnel traps best for monitoring of *P. mangicola* larvae in mango.

## 1 Introduction

Mango (*Mangifera indica L.*) is the 2nd most important fruit crop in Pakistan after citrus. Pakistan lies fourth in the list of mango producing and exporting countries (FAO 2014). Mango production has increased due to improved farm attributes and better management practices. Despite an increased production, the potential of mango export and as well as local needs has, however, not been fully achieved (Khan *et al*., 2008).

During previous decade our mango export production and local production was declined due to inapt agronomic practices and not adopting better controlling insect pest tactics. Additionally mango yield in Pakistan further declined due to increased insect pest infestation. Almost 260 species of insects and mites have been reported to infest mango in Asia (Veerish, 1989; Malik *et al.*, 2005; Masood *et al.*, 2010, Khan *et al.*, 2013).

In Pakistan major pests of mango are mango hopper (*Idioscopus clypealis*), mango midge (*Erosomya indica*), mango mealy bug (*Drosicha stebbingii*), fruit fly (*Bactrocera.Zonata, B. dorsalis*), mango bark beetles (*Hypocryphalus mangiferae*) and also thrips (*Frankliniella occidentalis*) (Brown, 1992; Talpur and Khuhro, 2003; Masood *et al.*, 2009; Grieshbach, 2011; Muhammad *et al*., 2013). Mango midge has become major pest of mango trees and it is found in almost all mango growing areas. About 70% yield loss is due to mango midges. Twenty species of mango midge related with mango have been formally described which infest the tree at three different stages (Gagne and Etienne, 2006; Ahmed *et al.*, 2005; Gagne, 2004; Gagne and Medina, 2004; Li, *et al.*, 2003). Effective management practices of mango midge are lacking (Ahmed *et al.*, 2005).

There are many species of mango midges throughout the world but most prevalent are mango leaf midge, inflorescence midge, blossom midge etc (Uechi *et al*., 2002; Nakahara, 1981; Ahmed *et al*, 2005). A gall midge producing circular spots on leaves was first noticed in 2000 at Tamagusuku Village on Okinawa Island, Japan. This specie was identified as *Procontarinia mangicola* and placed in genus Erosomyia (Nami *et al*., 2002). Due to mango midges damage leaves shows black circular galls and become curled. In severe cases fruit falls and whole tree looks like hollow (Rehman *et al.*, 2013; Uechi *et al*., 2002). Larvae are the actual damaging stage they eat out the axis of inflorescence, leaves and as well as buds. Mature larvae after attack falls down and pupate in soil while some species pupate in galls (Ahmed *et al*, 2005). *Procontarinia mangicola* attacks fresh mango leaves and produces circular blister galls, causing the leaves to crinkle (Uechi *et al.*, 2002). In most mango orchards surveyed, heavily galled leaves fell to the ground much earlier than usual and most galled leaves remaining on trees suffered from anthracnose inoculums (Harris and Schreiner, 1992).

Keeping in mind all these threats to mango tree, the present study was carried out to find the preference of different mango cultivars (Chaunsa, Sindhri, Langra, Anwar retol and Dusehri) against mango midge *Procontrinia mangicola*. Present study was conducted to monitor the larval population and suggesting eco-friendly management for this control. Mango gall midge *Procontrinia mangicola* usually attacks fresh mango leaves and produces circular galls and leaves become curl (Muhammad et al., 2013).

# 2 Materials and methods

## *2.1 Study Area*

Present study was conducted in mango orchards at Mango Research Station, Shujabad during 2014. Five different mango cultivars i.e. Chaunsa, Sindhri, Anwar Ratol, Langra and Dusehri were selected for monitoring and preference of *P. mangicola*. Funnel traps having plastic sheets were used to monitor larval population.

## *2.2 Experimental Layout*

Randomized Complete Block Design (RCBD) was selected to carry out the experiment of five different mango cultivars (Chaunsa, Anwar Ratol, Sindhri, Langra and Dusehri) were selected and seven replications (funnel traps, size one square meter) of each cultivar were made. Plant to plant and row to row distance was 15×10 meter (m).

## *2.3 Monitoring of larvae Procontarinia mangicola*

### *2.3.1 Dimension of Funnel Trap*

Larval population was monitored by using funnel trap which was constructed by funnel (Made by wire that is wide at the top and narrow at the bottom) so dimension was 8 inch, plastic sheet (1m×1m), circular iron rod (0.61 m diameter of the circle) and white tape (Figure a). Five cultivars were selected and seven traps were installed in each cultivar to study the susceptibility of mango cultivars to *P. mangicola.*

### *2.3.2 Installation of funnel traps*

Funnel traps were suspended on mango tree twigs where inflorescence was emerged. Funnel traps were hanged 2–3 m above the ground with the help of plastic strips. Each funnel trap was installed on east side of the tree. Total 35 traps were installed in five mango cultivars seven in each.

### *2.3.3 Data recording*

Larvae captured in traps were brought to mango hybridization laboratory at mango research station, Shujabad and counted under stereoscope. Larvae that fall down for pupation in soil were trapped in installed funnel traps and monitored. Data of population dynamics of *P. mangicola* were recorded on weekly basis.

Collected larvae were counted under stereoscope or by using magnifying glass. Adults of *P. mangicola* were identified by the description described by Gagne 1994.

## *2.4 Statistical Analysis*

Data of *P. mangicola* larvae were analyzed by using analysis of variance and means were compared by Tukey's test using the software Statistix 8.1 (Statistix" version 8.1, Analytical Software, 2000).

# 3 Results

## *3.1 Population dynamics of Procontarinia mangicola*

*3.1.1 Population of P. mangicola in February*

Larval population of *P. mangicola* varied significantly among the five different tested cultivars during February. No population was observed at the start of month which gradually increased to maximum in the last week of February. There was no significant difference among the mango cultivars regarding population dynamics of *P. mangicola* during 2nd and 3rd week of February. Significantly highest population was recorded in Anwar ratol i.e. 64.93±21.05/trap, while the lowest population (19.36±6.55/trap) was observed in Dusehri cultivar (P<0.03, F=3.36, n=7) (Fig. 1).

*3.1.2 Population of P. mangicola in March*

Susceptibility of five mango cultivars was observed by the preferences of larval population of *P. mangicola*. The estimation was made through larval population of *P. mangicola* in each tree by funnel traps hanged under the tree canopy. In 1st week of March significant mean population was observed in Anwar retol (37.57±14.24/trap), while least population was observed in Dusehri i.e. 11.93±5/trap (P<0.03, F=3.10, n=7). During the month of March the highly significant population was observed in all five mango cultivars but the highest population was recorded in 2nd week of March in Chaunsa variety (107±31.03/trap) and minimum observed in Langra cultivar (66.29±19.54/trap) (P<0.42, F=1.02, n=7). While in 3rd week highly significant population was observed in Anwar retol (84.43±49.29/trap) and lowest observed in Dusehri cultivar i.e. 6.14±4.58/trap (P<0.38, F=1.09, n=7). In last week slightly significant population was recorded in Sindhri, Chaunsa, Anwar retol, Dusehri and as well as in Langra cultivar (30.43±11.54/trap, 20.14±8.03/trap, 10.79±7.12/trap, 2.86±1.90/trap, and 0 respectively) (P=0, F=5.82, n=7) (Fig 2).

*3.1.3 Population of larvae in the month of April*

Larval population of *P. mangicola* was reduced in the month of April except in first week. In 1st week of April highly significantpopulation was recorded in Sidhri (82.43±37.17/trap) followed by Langra cultivar (76.79±22.29/trap), while remaining cultivarz viz, Chaunsa, Anwar retol and Dusehri didn't show any population (P=0, F=5.81, n=7) (Fig. 3). During 2nd week again highly significant population was recorded in Sindhri variety (22.79±18.82/trap), while minimum population was observed in Anwar retol i.e. 0.36±0.36/trap (P<0.28, F=1.34, n=7). Rest of the weeks revealed no significant population of *P. mangicola* in all five mango cultivars. No population was recorded in Dusehri cultivar in whole month (Figure 3).

# 4 Discussion

*Procontarinia mangicola* is one of the important specie of midge that can cause severe losses to mango industry (Ahmed *et al*, 2005).

Midges are protected by the galls so they are difficult to control via insecticides so resistant cultivars can be used for their management. In this study we used some less common technique to monitor the population of larvae of *P. mangicola*. Funnel traps can be effectively use for monitoring larval population of *P. mangicola*. Wali (2013) evaluated that sticky colored traps can be effectively use for monitoring of adult midges. Larval population can be controlled by placing plastic sheet below the canopy and after catching them just destroy the captured population of larvae and pupae. For initiating control activities in IPM program trapping of adult midges could be effective. Trapping techniques reduce the need of pesticides (Muhammad *et al*., 2013). Variation in infestation of mango midges among different cultivars can be due to difference in biochemical composition of different cultivars (Githure, 1998) and he studies the susceptibility of 11 different mango cultivars (Heidi, Tommy Atkins, Sabre, Zill, Peach, Kensington, Haden, Keitt, Kent, Irwin and Sensation) to mango gall fly *Procontarinia matteiana*. In his study sensation was resistant to mango gall fly and the remaining cultivars showed different levels of susceptibility. It is observed that mango cultivars grown in all mango growing areas in world showed different susceptibility levels (Githure *et al*., 1998).

Present study inclined as Chaunsa and Anwer Retol cultivars were susceptible to *P. mangicola* as the greater number of larvae/trap ware recorded in both these varieties. Dusehri variety was proved to be safe from mango midge attack. Based on the results it is also concluded that population of larvae of mango midges can be monitored by installing funnel traps below the canopy.

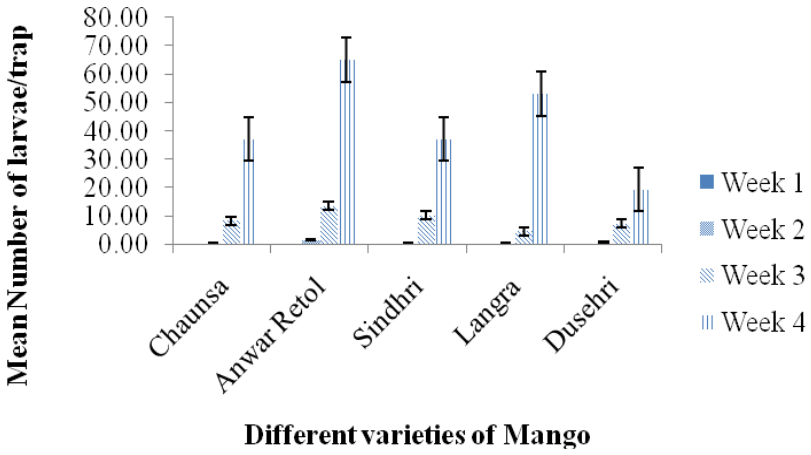


**Figure 1.** Mean population ± SEM of larvae of *Procantrinia mangicola* on five different varieties of *Mangifera indica* in the month of February, n=7

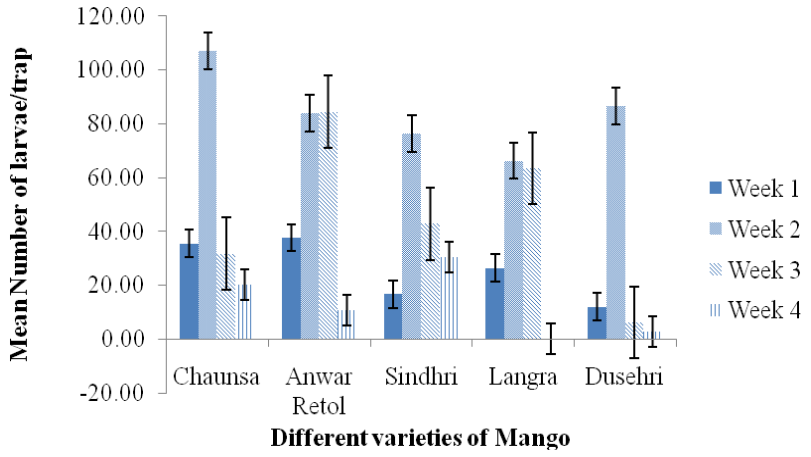


**Figure 2.** Mean population ± SEM of larvae of *Procantrinia mangicola* on five different varieties of *Mangifera indica* in the month of March, n=7

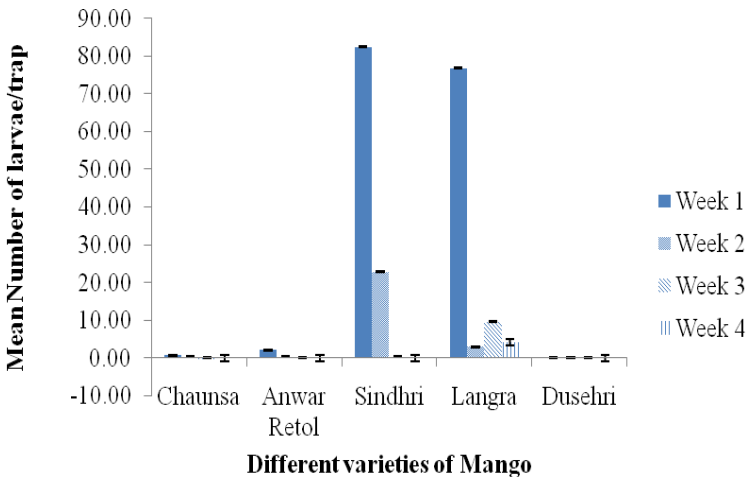


**Figure 3.** Mean population ± SEM of larvae of *Procantrinia mangicola* on five different varieties of *Mangifera indica* in the month of April, n=7

## 5 Conclusions

According to susceptibility of mango cultivars So, farmers should keep their orchards dry by acceptable pruning it will ultimately decrease the population of different pests of mango, as suggested by Uechi *et al.* (2002) for *P. mangicola.* In the present study, Anwar Ratol cultivars were highly susceptible to *P. mangicola* attack as the greatest number of galls/leaf and larvae/trap was recorded on these two varieties in February. Chaunsa in March, Dusehri in April. So the *P. mangicola* attack has been found different in different seasons

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