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## Organic management of fruit fly in jujube ecosystem

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**Abstract** The study on organic management of fruit fly species on jujube (ber) ecosystem was carried out in the laboratory of Sindh Agriculture University, Tando Jam from November 2008 to March 2009. The data on efficacy of bio-pesticides on fruit fly specie was recorded from heaps of ripened fruits during harvesting and from fallen fruits on ground. The data from heaps of ber fruits indicated that infestation was 1.5, 5.5 and 12.1 % when treated with neem powder, tobacco extract and control, respectively on 7<sup>th</sup> October. The maximum was 8.11, 20.5 and 50.75 % infestation was observed when treated fruits by neem powder, tobacco extract and control, respectively on 21<sup>st</sup> November. Infestation percentage decreased and it reached 0.75, 3.12 and 10.75 % after the spray of neem powder, tobacco extract and control, respectively. The data revealed the overall mean efficiency of different bio-pesticides was neem powder (4.12), followed by tobacco extract (10.16) and control (27.11) respectively. The infestation of fruit flies of fallen fruit was started from 7<sup>th</sup> October and it was 9.02, 18.5 and 30.76 % when treated with neem powder, tobacco extract and control, respectively. The maximum was 40.22, 56.6 and 79.9 % infestation was observed when treated by neem powder, tobacco extract and control, respectively on 21<sup>st</sup> November. After that, infestation percentage decreased and reached 6.66, 7.14 and 19.51% after the spray of neem powder, tobacco extract and control, respectively. It is found that three species of fruit fly infest the jujube fruits. The fruit fly *Bactrocera zonata* occurs in large numbers up to 80.1% population. The rest of two species *Bactrocera dorsalis* and *Corpomyia vasuviana* occur 12.3 and 7.6 % respectively. In the light of experiment, it could be recommended that neem powder and tobacco extract can be applied for controlling of pests on jujube (ber) orchards.

**Key words:** Jujube, Organic, Neem Powder, Tobacco extract, fruit fly

### Introduction

Tephridea flies are the most economically important members of order Diptera. Fruit flies are distributed all over the world and about 4500 species are presented in different regions (Hardy, 1988). Almost 800 species of fruit flies are reported from oriental regions, including 300 species from South and South East Asia (Singh, 1988). The larvae are herbivorous and their range is

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considerably wide. The larval host includes the broad area of fruit vegetable. *Bactrocera zonata* was identified as one of the most important pests of agriculture in South East Asia Waterhouse (1993). The major hosts of fruit flies are Guava, Mango, Jujube, Sapota, and vegetables. Qureshi *et al.* (1991) reported *B. zonata* as a significant pest in India and Pakistan.

The fruit fly species were divided into two broad morphological categories on the bases of their body structure and biology. The first group includes the genera *dacus* and *collantra* the members of this group damage all kind of fruits. The most destructive pest is *dacus cucurbitae* coq: *Dacus ciliatus* loew *Dacus zonatus* Sanders and *Dacus dorsalis* Handle. Among fruit fly complex, in Pakistan *Dacus zonatus* and *Dacus dorsalis* are the serious pests of Ber, Guava and Mango fruits. In recent years, it has been observed that *Dacus dorsalis* has also become endemic to almost all the grafted fruits in Sindh.

Ber, *Zizyphus jujube* belongs to family Rhamnaceae is grown in the warm regions of Sindh and Punjab in Pakistan. It is grown in an area of 2927 hectares having 16744 tons average yield in Pakistan (Anonymous, 2003, 2004). It is very delicious fruits and is eaten, preserved and used in cooking and making candies. The Ber fruits are a source of vitamin A and B, calcium, protein, fat, carbohydrates and phosphorus. In Sind, a number of grafted indigenous jujube varieties are grown. The areas of cultivation under the jujube increasing due to export of Ber fruit to Middle East counties.

The jujube trees are vulnerable to a wide variety of phytophagous insect pests. The Ber fruits are attacked by fruit fly such as Ber fruit fly, *Carpomyia vasuviana* costa and *Bactrocera zonata*. Sayed and Qureshi (1963) from Pakistan reported 67 to 73 percent damage by fruit fly species in different varieties of jujube. However Sachan (1984) reported 3.74 to 19.6 percent damage of jujube fruit by *Carpomia vesuvana*. The damage could be even higher, when there is server infestation of flies.

Keeping importance of the Ber fruit fly, it was decided to carry the experiment on organic management of fruit fly species on jujube (Ber) ecosystem in the laboratory of Sindh Agriculture University, Tando Jam from November 2008 to March 2009.

## **Materials and methods**

The study on organic management affecting to øf fruit fly in jujube ecosystem was conducted at the laboratory of Sindh Agriculture University, Tando Jam. The efficacy of bio-pesticides i.e. Neem powder and tobacco extract were observed on the fruit flies. The data were recorded from heaps at harvesting time and from fallen fruit on ground at weekly intervals.

Ten trees were selected for each treatment and replicated for five times at jujube Research garden, Tandojam. The trees were spread with neem powder solution and tobacco extract. For making the neem solution 2 kg neem powder was mixed with 10 kg of water. In sprayer 20% concentration of tobacco extract and 80% water was combined to spray the trees. The trees were sprayed fortnightly for entire fruiting season. One hundred fruits randomly were cut from each treatment and one hundred fallen fruits were collected from underside of the trees. Separate plastic basket is used for each replication to bring the fruits in the laboratory. Plastic bottles 8” in size with 4” mouth, rubber bands, sand, and muslin clothes were used in the experiment. One inch sand was put in the plastic bottles and damaged fruits of each treatment were kept in the bottles for rearing the different fruit fly species. The mouths of plastic bottles were covered by muslin cloth and tightened with rubber bands. After emergence the species of fruit flies were identified through electronic magnifying glass and counted in for data Statistical analysis. For computing infestation percentage the Abbott’s formula (1925) was used. The data were analyzed on Statistix 8.1.

## **Results**

The data on efficacy of bio-pesticides on fruit fly species were recorded from heaps of ripened fruits during harvesting and from fallen fruits on ground (Fig-1-7).

### ***Relative infestation percent of fruits by fruit fly species recorded from harvested heaps of ber fruits***

From data it was observed that infestation was 1.5, 5.5 and 12.1 % when treated with neem powder, tobacco extract and control, respectively on 7th October. The maximum was-8.11, 20.5 and 50.75 % infestation was observed when treated ber fruits by neem powder, tobacco extract and control, respectively on 21st November. Infestation-decreased and reached 0.75, 3.12 and 10.75 % after the spray of neem powder, tobacco extract and control, respectively.

### ***Comparative efficacy of bio-pesticides***

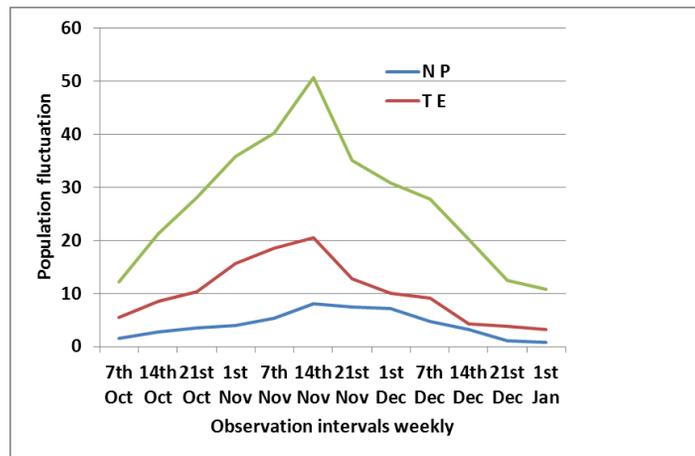
The data revealed the overall mean efficiency of different bio-pesticides was neem powder (4.12), followed by tobacco extract (10.16) and control (27.11) respectively. The analysis (ANOVA) revealed that plant extracts efficacy varied significantly with each other ( $F=16.75$   $df=2$ ,  $P < 0.01$ ). Multiple

Range Test (DMRT) indicated that neem powder treatment was most efficient followed by tobacco extract due to less infestation rate of pests on fruits.

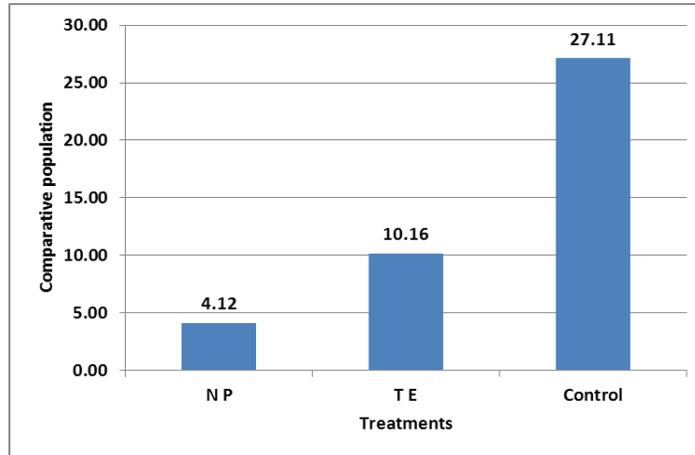
***Consolidated population of sucking insect pests***

The consolidated data (Figure-3) showed that the pest infestation was highest of 26.45 % on 14<sup>th</sup> November. The regression equation showed that the infestation growth with time interval was highly significant. The slope rate of infestation increased 3.89X. The R<sup>2</sup> was 0.99 which explained that about 99 % variation in infestation increased which was observed by date interval. Subsequently, population decreased and reached its minimum with a declining curve-2.94X it also showed a highly significant relation among population and dates. The R<sup>2</sup> was 97. It indicated that 97 % decrease in infestation rate that was due to dates. Later, the infestation rate decreased as fruit advanced towards the completion. From the data it was observed that ber orchards were attacked by different species of fruit flies.

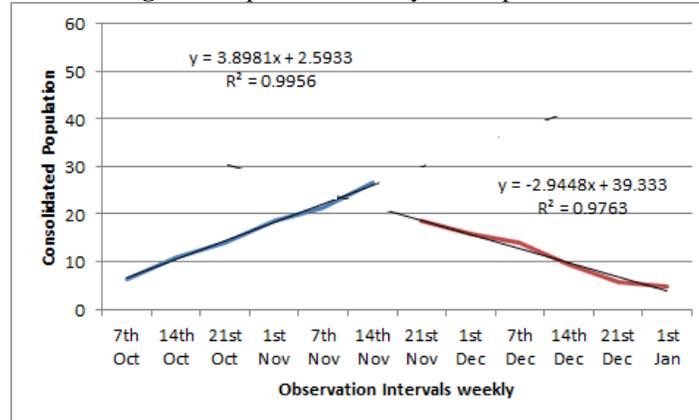
The seasonal mean infestation percent was highest in 21<sup>st</sup> of November to 3<sup>rd</sup> week of December 2008 with the temperature range during this period was 17.89°C to 24°C which seem to be favorable for the pest attack.



**Fig. 1.** Population fluctuation of fruit fly species recorded from harvested heaps ber fruits



**Fig. 2.** Comparative efficacy of bio-pesticides



**Fig. 3.** Consolidated population of sucking insect pests

***Relative infestation percent of fruits by fruit fly species recorded from harvested fallen of ber fruits***

The infestation of fruit flies of fallen fruit was started from 7<sup>th</sup> October and it was 9.02, 18.5 and 30.76 % mean percent when treated with neem powder, tobacco extract and control, respectively. The maximum was 40.22, 56.6 and 79.9 % infestation was observed when treated by neem powder, tobacco extract and control, respectively on 21<sup>st</sup> November. After that, infestation percentage decreased and it reached 6.66, 7.14 and 19.51 % after the spray of neem powder, tobacco extract and control, respectively (Fig-4).

### ***Comparative efficacy of bio-pesticides***

The data revealed that efficacy of different plant extracts was (21.01) after application neem powder, followed by tobacco extract (30.91) and control (44.31) respectively. The analysis (ANOVA) revealed that bio-pesticide efficacy varied significantly with each other ( $F=167.68$   $df=2$ ,  $P < 0.01$ ). Multiple Range Test (DMRT) indicated that neem powder treatment was most efficient and followed tobacco extract due to less infestation rate of pests on fruit (fig-5).

### ***Consolidated population of sucking insect pests***

The consolidated data (Fig-6) showed that the pest infestation population highest (0.84 %) percent on 24<sup>th</sup> October. The regression equation showed that the infestation growth with time interval was highly significant. The slope rate of population increased was 6.38X. The  $R^2$  was 0.98 which explained that about 98 % variation in infestation increase that was observed by date interval. Subsequently, population decreased and reached its minimum with a declining curve-4.65X it also showed a highly significant relation among population and dates. The  $R^2$  was 97. It indicated that 97% variation in infestation decrease was related to dates. Later, the infestation rate decreased as fruit advanced towards the complication.

From the data it was observed that ber orchard was attacked by different species of fruit flies.

### ***Relative abundance of fruit fly species emerged from infested ber fruits under laboratory conditions***

The infested fallen ber fruits collected from ground were kept in plastic bottles for recording the abundance of species of fruit flies of jujube under laboratory condition from November 2008 to March 2009.

It is found that three species of fruit fly infest the jujube fruits. The fruit fly *Bactrocera zonata* occurs in large numbers up to 80.1% population. The rest of two species *Bactrocera dorsalis* and *Corpomyia vasuviana* occur 12.3 and 7.6%, respectively (Fig-7).

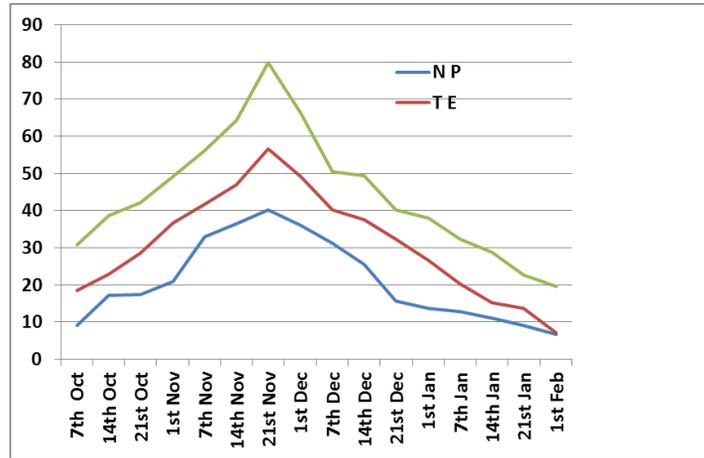


Fig. 4. Population fluctuation of fruit fly species recorded from harvested fallen ber fruits.

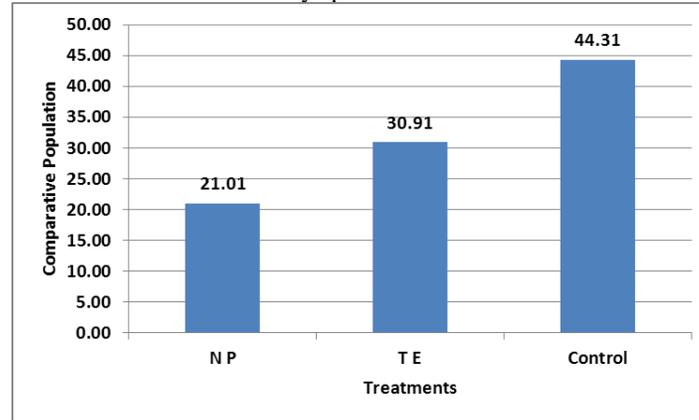


Fig. 5. Comparative efficacy of bio-pesticides

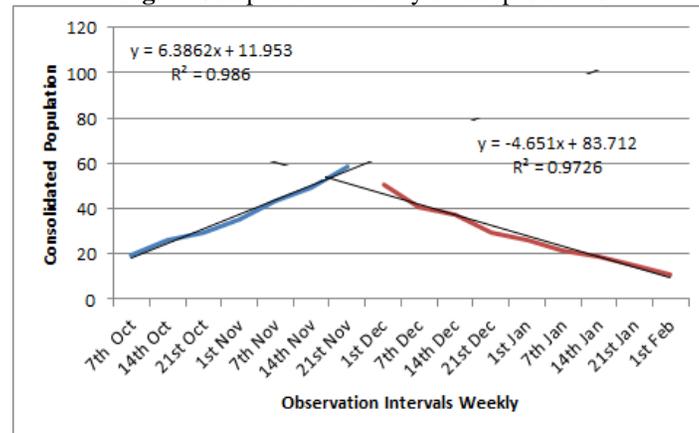
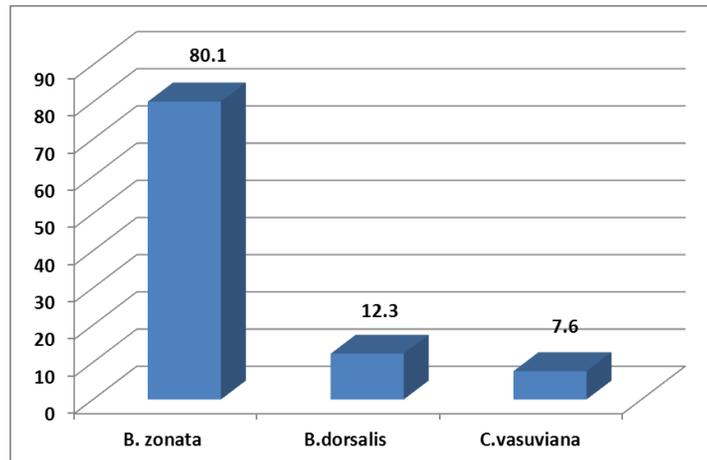


Fig. 6. Consolidated population of sucking insect pests



**Fig. 7.** Relative abundance of fruit fly species emerged from infested ber fruits under laboratory conditions

## Discussion

The neem based insecticides is used against the population of the western cherry fruit fly (Randen *et al.*, 1998) and it significantly reduced 81.8%, 75.11% and 82.2% infestation of fruit flies in mango, muskmelon and guava, respectively as compared to that in the control (Anonymous, 2003). Extracts from neem has proved good repellents against many insect pests. Neem extracts showed strong repellent activities against insect pests (Sharma and Ansari, 1994; Khattak *et al.*, 2001). It was observed from the data of (heap and fallen) fruits that maximum percent infestation was observed on November it indicated an alarming period for ber fruits, it is in conformity with Bagle (1992) according his findings that pest attack started in October was their pack in November.

After application of plant extracts the data revealed that neem powder was more affective against fruit flies as followed by tobacco extract. These findings can be compared with those of Singh (2000). He demonstrated that neem extracts can be effectively used as an excellent alternative to synthetic insecticides. Regarding the existence of the species of fruit flies, it was found from the data that three species of fruit fly infested the jujube fruits were *Bactrocera zonata* which occurred in large numbers. In the rest of two species *Bactrocera dorsalis* and *Corpomyia vasuviana* were found fewer numbers.

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