



Ovipositional Preference of *Bactrocera zonata* on Jujube Varieties under Laboratory Conditions

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BKS writ up & supervised the experiment, MHH maintained samples under laboratory condition, SAM help in statistical analysis, GMB corrected the manuscript and KKK helps in collection of data.

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B. zonata, Jujube, Preference, Varieties, Population, Sex ratio.

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ABSTRACT

This particular study was conducted on Ovipositional preference of *Bactrocera zonata* on jujube varieties under laboratory condition during 2015-2016. The research was carried out on the host preference, maximum adults' emergence, and sex ratio and to observe the impact of different jujube varieties. The results showed that the highest adults emergence percentage (56.74%), was recorded on late gola while lowest (41.96%), on Kherol Mukhri, respectively. The data further described that the maximum pupal period 7.85 ± 0.07 days was observed on white gola, while minimum on sufiimran 6.20 ± 0.06 , under free choice. However, the highest sex ratio of male and female 1.36:1 was noted on Kherol Mukhri, whereas lowest was 1.13:1, on late gola. This experiment also indicated that female sex ratio was higher compared to male adults in all varieties. Such as, the highest pupal weight was recorded (0.0118 ± 0.003) on late gola, and lowest was (0.0075 ± 0.001), on Kherol Mukhri, respectively. The further results determined under no choice, the highest males and females emergence (79.02%), was recorded on Kherol Mukhri while lowest (54.35%), on white gola, respectively. The data further revealed that the maximum pupal period 7.85 ± 0.07 days was observed on white gola, while minimum on sufiimran 6.20 ± 0.06 . On the other hand, the maximum emergence of female adult (132.54 ± 29.20) was recorded on Kherol Mukhri, this experiment also described that pupal weight is different on all varieties and population of *B. zonata* highest on under no choice as compared to under free choice. Such as, the better adults' emergence percentage as well as sex ratio was occurred Kherol Mukhri as compared to other varieties.

1. INTRODUCTION

Tephritidae flies belong to the order Diptera and most economically important in all over the world. The fruit flies are largest group distributed concerning 4600 species offered in different regions [1]. More about 800 species are recorded from orientated regions, as well as jointly with 400 species from South Asia and south east [2]. In South East Asia the *B. zonata* was notorious as one of the most important agriculture pests, some fruits Guava, Mango, Jujube, Sputa, are the most important hosts

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of fruit flies and also vegetables pest in India and Pakistan. The Ber, *Zizyphus* (jujube) is grown in the warm regions and it's belong to family Rhamnaceae this fruit recorded most of Sindh and Punjab [3]. This is very delicious fruits and mostly used in making candies as well as in cooking this is grown in 3018 area hectares, having 16745 tons regular yield in Pakistan [4]. The Ber fruits are the main source of vitamin A, calcium, protein, fat, carbohydrates and also phosphorus. In most of the area Sindh a graft native jujube varieties are grown, the area of farming ber fruits from Middle East counties under the jujube increasing due to exported, and jujube trees are very responsible to a wide variety of phytophagous insect

pests those attack a wide varieties, and destroy which including ber fruits fly such as *C. vasuviana costa* and *B. zonata* [5]. The different type of jujube varieties was damaged by fruit flies species From Pakistan it reported 67 to 73 percent. On the other hand, *Carpomia vesuvana* 3.75 to 19.5 percent damage occurred by jujube fruit fly whereas there is infestation of flies founded the damage could be even higher, keeping the more importance of ber fruit fly, it was decided that on managing of fly species on different jujube to carry the experiment [6]. The peach fruit fly, *B. zonata* was noted one of the most critical fruit pests which increased in more than a few regions of the world. It is also recorded in several governorates in Egypt where it caused great problems to many fruits. In Pakistan, this pest caused from 25 to 50% losses in guava fruits [7]. The Selection of the egg laying site by the fruit fly depends upon host quality. Female fruit flies decisions about fruit and vegetable to oviposition their eggs based on aptness regarding the performance of the off-springs Fruits and vegetables may vary with respect to the quality and quantity of nutrients available that can influence the larval and pupal size, weight, developmental time, adult eclosion rate, maturity time of adult bee and their fecundity as well [8]. Fruit fly females use visual and contact cues like shape, size, smell and color of fruits and as well as olfaction to locate the suitable larval host [9]. The little work on inhabitant's dynamics of fruit flies and their parasitoids species in terms of identification on different varieties of ber have been carried out so far. The output of the present survey will be exploited for managing the population densities of fruit flies integrated pest management program for fruit flies in Ber orchard. Hopefully, these findings will be helpful in managing the population densities of fruit flies and their Integrated Pest Management (IPM) programmes in different orchards [5]. The main objective of Present study was to observe the ovipositional preference, and biology of *B. zonata*.

2. MATERIALS AND METHODS

The experiment was conducted at Dipterian Research Laboratory, Department of Entomology, Faculty of Crop Protection, and Sindh Agriculture University Tandojam during 2015-2016. Ovipositional preference of *B. zonata* on different jujube varieties under laboratory condition was observed at temperature of 27°C with relative humidity of 67±5.

2.1 Experimental design

The five jujube varieties i.e T1= Sufi Imran T2= White gola, T3= Late gola, T4= Kherol Mukhri and T5= Sufi gilli, were placed in one Cage for free

choice and five different cages were used for no choice ovipositional preference for 2 hours, with release 200 pairs of fruit flies in the cage. After 24 hours the jujube varieties were separated in five different cages containing fine saw dust at the bottom for pupation. The experiment was laid up in Complete Randomized Design (CRD) with three replications. The observation was recorded based on parameters, as mentioned below Adult emergence, pupal weight, pupal period and Sex ratio (male and female).

2.2 Adult diet

B. zonata were reared on artificial diet making solution of 30% honey and 70% water.

2.3 Saw dust

It was purchased from saw machine and placed inside the cages. The infested fruits were shifted in the saw dust cage, after few days' larvae pop out and drop into the saw dust after pupation. The saw dust was sieved to separate the pupae of fruit flies.

2.4 Statistical analysis

The collected data were subjected to statistical analysis of variance to know the significance differences and least significant difference (LSD) tested was applied to compare different treatments.

3. RESULTS

3.1 Ovipositional preference under free choice

The results in Table 1 show that the highest males and females adult emergence percentage i-e (56.74%) was recorded on late gola while lowest (41.96%), on Kherol Mukhri, respectively. The data further described that the maximum pupal period 7.85±0.07 days was observed on white gola, while minimum on sufiimran 6.20±0.06. On the other hand, maximum preference of *B. zonata* female adult (92.45±28.74) was recorded on white gola, followed by late gola (90.45±34.88), sufiimran (82.00±30.46), sufigilli (80.20±27.59), whereas the minimum was recorded on Kherol Mukhri (72.70±38.91), under free choice. However, the highest sex ratio of male and female 1.36:1 was noted on Kherol Mukhri, followed by 1.31:1, 1.30:1, 1.30:1, whereas lowest was 1.13:1, on late gola. This experiment also indicated that female sex ratio was higher compared to male adults in all varieties. The results further revealed that maximum No of male 79.79±26.05 was noted on late gola whereas the minimum 53.20±23.19, on Kherol Mukhri, respectively. During the research work it was observed that sex ratio of *B. zonata* comparatively higher on white gola variety than other varieties. Such as, the highest pupal weight was

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recorded (0.0118±0.003) on late gola, and lowest was (0.0075±0.001), on Kherol Mukhri, respectively. The fruit fly infests most of the *Ziziphus* species grown in

the world and cause severe yield loss up to 80% or even more.

Table 1. Rearing of *B. zonata* under free choice on different jujube varieties

Treatments	Total No. of pupae	Pupal weight (g)	Pupal period (days)	Total No. of Male	Total No. of Female	Total Adult emergence	Sex Ratio Male & Female
T ₁ Kherol Mukhri	3954	0.0075±0.001a	7.15±0.07a	53.20±23.19c	72.70±38.97b	41.96%	1.36:1
T ₂ Late Gola	6086	0.0118±0.003b	7.36±0.08b	79.79±26.05a	90.45±34.88ab	56.74%	1.13:1
T ₃ Sufi Gilli	4551	0.0095±0.001b	6.85±0.07b	61.37±21.33bc	80.20±27.59ab	47.19%	1.30:1
T ₄ Sufi Imran	4668	0.0105±0.001c	6.20±0.06c	62.95±23.84bc	82.00±0.46ab	48.31%	1.30:1
T ₅ White Gola	5255	0.0127±0.006c	7.85±0.07c	70.45±21.56ab	92.45±28.74a	54.3%	1.31:1

3.2 Ovipositional preference under no choice

The results of Table 2 determined that the highest males and females adult emergence percentage (79.02%) was recorded on Kherol Mukhri while lowest (54.35%), on white gola, respectively. The data further revealed that the maximum pupal period 7.85±0.07 days was observed on white gola, while minimum on sufiimran 6.20±0.06. On the other hand, the maximum emergence of female adult (132.54±29.20) was recorded on Kherol Mukhri, followed by (118.38±29.21, 105.21±28.99, 103.29±31.56, 91.33±30.37), such as late gola, sufigilli, sufiimran and white gola. The fruit fly larvae mostly feed inside the fruit, destroying the pulp and allowing to the entry of secondary bacteria and fungi that rot the fruit and humiliate the

excellence of the host., However the highest sex ratio of male and female 1.29:1 was noted on late gola, followed by 1.28:1, 1.27:1, 1.25:1, whereas lowest was 1.26:1, on sufiimran. The results further revealed that maximum no of male adult 104.54±26.19 was noted on Kherol Mukhri, whereas the minimum 71.25±22.00, on white gola, respectively. This table also described that pupal weight is different noted on all varieties and population of *B. zonata* highest recorded on under no choice as compared to under free choice. Such as, the highest pupal weight was recorded (0.0119±0.005) on late gola, and lowest was (0.0095±0.002), on sufiimran, respectively. The better adults' emergence percentage as well as sex ratio (males and females) was occurred Kherol Mukhri as compared to other varieties.

Table 2. Rearing of *B. zonata* under no choice on different jujube varieties

Treatments	Total No of pupae	Pupal weight (g)	Pupal period (days)	Total No of Male	Total No of Female	Total Adult emergence	Sex Ratio Male & Female
T ₁ Kherol Mukhri	5284	0.0111±0.002a	7.15±0.07a	104.54±26.19a	132.54±29.20a	79.02%	1.26:1
T ₂ Late Gola	7538	0.0119±0.005b	7.36±0.08b	91.25±22.86ab	118.38±29.21ab	69.87%	1.29:1
T ₃ Sufi Gilli	5979	0.0105±0.002ab	6.85±0.07ab	80.83±22.58bc	105.21±28.99bc	62.01%	1.27:1
T ₄ Sufi Imran	5952	0.0095±0.002bc	6.20±0.06bc	79.20±24.63bc	103.29±31.56bc	60.83%	1.25:1
T ₅ White Gola	6663	0.0125±0.007c	7.85±0.07c	71.25±22.00c	91.33±30.37c	54.35%	1.28:1

4. Discussion

The fruit flies are principal group distributed concerning 4600 species offered in different regions [1]. During this study highest males and females adult emergence percentage was recorded on late gola while lowest on Kherol Mukhri same observation was also noticed by Imtiaz *et al.*, [10] who recorded that the jujube, *mauritiana* L. is the king most of the arid zone fruits area, and the highest

emergence % age was obtained on late gola as compared to Kherol Mukhri, and Golden gola respectively. Another investigation noted by Muhammad *et al.*, [11] stated that fruit flies are the destructive polyphagous insect which transmits pests; the effect of *B. zonata* fly preference was considered on jujube, peach fruits in field conditions. The jujube fruit was noted as more preferring host followed by apple, the highest number of pupae was recorded

(175.17), pupae weight (6.50 mg) observed and emergence percentage of adult male and female was founded (85.55%). In the present study results showed that the pupal period was high on white gola, while minimum on sufiimran 6.20 ± 0.06 gm. On the other hand, maximum emergence of female adult was recorded on Kherol Mukhri. Our results are co-related with Mari et al., [12] who studied that organic management in jujube the host recorded for fruit fly species in the ecosystem. The highest was recorded 8.15, 20.8 and 55.72 % infestation on sufiimran and sufi during treated fruits used by Neem powder, tobacco extract and control, however on 22st November. The infestation percentage also decreased and it was reached on 0.72, 3.15 and 10.70 % correspondingly. However the results of Table 1 revealed that highest sex ratio of male and female was noted on late gola, followed by whereas lowest was on sufiimran. The results further revealed that maximum number of male adult was noted on Kherol Mukhri, whereas the minimum on white gola, respectively. Nehal, *et al.*, [13] reported that the population fruit fly and their parasitoids on the different type varieties of Jujube were determined ten methyl euganol baited traps were installed for 24 hours in the orchard of ber, that weekly and after these experiment were bring back to the laboratory conditions for the identification and demo fruit flies. The collected fruit was observed that 90 % of infestation is inflicted the slowly by the *B. zonata* which followed by the *C. vesuviana* and also *B. dorsalis* recorded two species were duplicated from infested fruits. In present study population of *B. zonata* highest was recorded on under no choice as compared to under free choice.

5. Conclusions

It is concluded the highest sex ratio of (males and females) was recorded on Kherol Mukhri and late gola under free and no choice, the females adult were higher emerged on all varieties as compared to males. It is suggested that the white gola, late gola and Kherol Mukhri are more suitable for *B. zonata* mass rearing in public and private sector and bio-control laboratories for mass production. It is also suggested that these both varieties should be grown in Guava orchards to control the fruit flies.

6. CONFLICTS OF INTERESTS

The authors declare that there are no conflicts of interests regarding the publication of this article.

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