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Comparative efficacy of some insecticides against *Bactrocera zonata* (Saunders) under laboratory condition

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Abstract

The experiment was conducted to assess the efficacy of insecticides in the laboratory of NIA, Tandojam, during 2017 on mango fruit. Four insecticides (Laser, Trichlorfon, Lambda, and Malathion) were tested and also compared with each other as well as control. On pupal emergence, the impact of insecticides showed results that highest mean population was observed at different doses of Lambda were 34.25, 25.75, 12.25, 11 and 7.25 then of Malathion were 32.75, 23.25, 23.5, 18.75 and 15.75 and of Laser were 21.00, 20.00, 6.00, 6.5 and 3.75. In contrast, the lowest mean population was observed of Trichlorfon were 14.25, 15, 13.75, 10.5, and 8.25, respectively. On adult emergence, the highest mean population was found of Lambda were 30, 16.75, 7.75, 7 and 5.25, then Malathion was 15.25, 11, 10.5, 8 and 5, and Laser were 9.75, 10.25, 10.25, 9.5 and 5.75. Whereas lowest of Trichlorfon as 8.75, 8.75, 7.5, 6.5 and 4.5 respectively. While the impact on male and female survivorship ratio recorded on Trichlorfon, the male was 4.75, 5.5, 4.0, 3.5, and 2.25 and female was 3.75, 3.5, 3.25, 3.75, and 3. On Laser, the male was 3.75, 7.0, 5.25, 4.0 and 2.5, and female was 4.5, 5.75, 5, 3.75 and 2.5 but on Malathion, the male was 5.0, 6.0, 3.75, 4.5 and 3.5 and female was 4.5, 5.5, 4.5, 3.75 and 3.25. Where also on Lambda, the male was 6.5, 7, 5.25, 5.25, and 4.75 and female was 5.25, 6, 5.25, 4 and 4.25 respectively.

Keywords: *Bactrocera zonata* (Saunders), insecticides, laser, trichlorfon, lambda, malathion

Introduction

Mangifera indica is the most important fruit crop with huge export potential. Tephritid fruit flies represent one of the most economically most essential insects in different. Sub tropical and tropical parts of the world. Two well-known species of fruit flies in separate parts of Pakistan include mango fruit fly *Bactrocera zonata* (Saunders). Fruit flies are economically significant; their favorable hosts are mango, guava, peach as well as other fruits. Insect pests are a major responsible factor to affect the fruit production and quality adversely in Pakistan, and fruit flies among these insect pests cause enormous loss by infesting the fruits. *Bactrocera spp* is the fruit fly species that are mostly responsible for this [1,2]. Females of fruit fly always penetrate their eggs inside the skin of the fruit, and then hatching takes place in 36-48 hrs., and maggots feed in a concealed position.

The larval period is about 6 to 116 days may be depending on climatic conditions. Pupation takes place in the soil, and that period maybe 6-20 days. It is noticed that the emergence of adults takes place generally in the morning and very seldom during cold climatic conditions [3]. In Pakistan, two species of genus *Bactrocera* were found *Bactrocera zonata* (Saunders), which attack mango orchards during 2015. The highest attack of fruit flies was observed in Sindh on different mango varieties like Sindhri, Chunsa, and Sonara cultivators [4]. During 2013 the highest invasion of fruit flies was observed in Sindh in different mango varieties such as Sindhri, Chunsa, and Sonara Cultivators. The population of *Bactrocera zonata* (Saunders) increases when the temperature is below 31°C with 63-72 relative humidity [4].

In Pakistan, incidence, and abundance of *Bactrocera zonata* has been recorded in areas of Baluchistan and Sindh near the coastal and sub-coastal, as well as semi-arid regions and plains of northern Punjab [5]. Over 400 different fruits and vegetables, including mango, are laying eggs in female fruit flies and destroyed. It is generally noticed that Fruit flies are severely attacking guava and mango fruits, particularly in South East Asia. Common species of fruit flies are *Bactrocera zonata* (Saunders) and *B. correcta* (Bezzi) [6,7].

The total period of preoviposition is about influenced on temperature, and that ranges from 7 to 15 days [7, 8, 9, 10]. Food hunt for the larval host plant is needless. Bird feces, honeydews, floral nectaries and 3 and bacterial colonies are obtained from feed on fruit surfaces. Food nuts are obtained from bird feces. It is generally noticed that feeding takes place in the early hours of the day, but some feeding may take occur at other times as well [6, 14, 15].

It is generally observed during different research studies that various climatic factors are influencing the population dynamics of fruit flies as well as their survivorship, oviposition, development rates, and fecundity [5]. The percent mortality within the generation can reach up to 90% due to adverse conditions of climatic conditions. These factors can combine with increasing liberal global trade. Biotic factors include, among others, heavy fruit fly infestations, which is a great threat to fruit crops as well as vegetable crops in over all the world [13, 18, 11]. In the tropics, the problem is further aggravated by the prevailing warm weather conditions which interfere with the fruiting patterns, resulting in overlapping fruit fly generations 4 and fruit infestation all the year-round [11, 13]. Fruit flies in Sudan are the most serious mango insect pests, which cause severe losses and significant export effects. Fruit flies were added to Sudan's list of national pests in 2007, but their management is not recommended. The immature phases of tephritides can be formed within a temperature range of between 10-30 ° C. A 45 ° C temperature is the highest for many hours in all flying phases [4]. So, keeping in view these aspects, the study on Comparative 6 efficacy of different insecticides against *Bactrocera zonata* was planned in the laboratory of NIA Tandojam.

Materials and Methods

The experiment on Comparative efficacy of some insecticides against *Bactrocera zonata* (Saunders) under laboratory condition was conducted in the laboratory of Nuclear Institute of Agriculture, Tandojam. The experiment was started on 15th of July 2017. Four insecticides such as Laser, Trichlorfon, Lambda, and Malathion were tested with different dozes such as higher, optimum, and lower dozes were compared with each other as well as control. During experiment, 1000 numbers of pupae of *Batrocera zonata* were placed in a cage, and then the development of adults takes place in 6 to 8 days. Adult fruit flies were placed in different cages containing artificial diets of 10% sugar solution and protein hydrolysate for feeding and oviposition. Five pairs (male & female) were placed in a separate cage for oviposition on natural hosts (mango fruits). In this experiment each treatment was replicated five times. Four insecticides were applied with different doses and compared with control. Adult fruit flies were reared in cages containing artificial diet of 10% sugar solution. From the reared adult *Batrocera zonata* five pairs were kept in each cage. Natural hosts like mango fruit were placed in each cage for oviposition. The pesticides were tested with different doses such as higher, optimum, and lower dozes were compared to each other as well as control. Each pesticide was mixed with 1 liter of water at the dosage of 0.2, 0.4, 0.8, 1.6, 3.2ml. The doses of all the pesticides were calculated with the help of an injection. The respective doses were formulated on all treatments equal weight of mangoes was dipped for 5-7 seconds. The dipped mangoes were kept in cages for 24 hours and this second and kept in plastic jars for pupation. Emerged pupae were counted and recorded for the compilation of data. Then these pupae

were placed for adult emergence on the room temperature during the entire experiment period, and adults were kept for their emergence, then the mortality ratio was also examined. The statistical analysis was done with the help of statistix 8.1 software.

Results

It was observed that the effect of Trichlorfon, Laser, Malathion, lambda against *Bactrocera zonata*(Saunders) on mango fruits. Such experiment was carried out at fruit fly laboratory at NIA (Nuclear Institute of Agriculture)Tandojam. The impact of different insecticides on pupal emergence of *Bactrocera zonata* The efficacy of each insecticide was compared with different doses. The results showed that Trichlorfon was more effective than others; these results are the agreements of [18]. Mango crop is a major fruit crop of Pakistan with its high economic value as well as more potential for exports. Tephritid fruit flies represent one of the most economically important insects in the Tropical and Sub-Tropical regions. Fruit flies are financially important. Their favorable hosts are mango, guava, peach as well as other fruits. Insect pests are a major responsible factor to affect the fruit production and quality adversely in Pakistan, and fruit flies among these insect pests cause enormous loss by infesting the fruits. *Bactrocera spp.* are the fruit fly species that are mostly responsible for this [1,2]. In such cases, the measurement of *Bactrocera* region was performed with the values 0.02 ppm, 0.13 ppm, 0.22 ppm, 0.28 and 0.51 ppm in males and 0.07 ppm, 0.16 ppm, 0.55 ppm and 0.62 ppm in females, such as malathion, lufenuron, Lambda and Methoxyfenozide in LC50. LC50 levels in infected adult females have been shown to be higher in 24 h, 48 h and 72 h following surgery than in infected adult males. This indicates that adult men were more vulnerable to the insecticides studied than adult females [18]. The application of various pesticides on pupa of *Bactrocera zonata* comparative efficacy of some insecticides against *Batrocerazonata* (Saunders) mango fruit under laboratory conditions experiment was carried out about pupal emergence of *Bactrocera zonata*, were as results showed that Trichlorfon was more active then followed by Laser, Malathion, and Lambda respectively at room temperature. Insecticidal control is the more effective and quicker method generally used by our farming community. While [19] applied Trichlorfon at room temperature at laboratory conditions, then results of the mean population showed that 14.25, 15, 13.75, 10.5, and 8.25 respectively was supported study is trichlorfon was observed as highly effective against *Bactrocera zonata*. While ever comparison of these insecticides on sex ratio results of male (*Bactrocera zonata*) than the impact of Trichlorfon was better than others, i.e., 4.75, 5.5, 4, 3.5 followed by Laser, Malathion, and Lambda. For this experiment, four insecticides such as Trichlorfon, Laser, Malathion, and Lambda were applied at room temperature on the fresh fruit of mango at different doses. Mean of these pesticides 4 doses of each insecticide were dose calculate. The pupal emergency response was relatively mild, negative, and highly important also showed in figure 1. Results of different insecticides showed that the application of different doses such as,

Trichlorfon

Different dose concentrations, e.g. at room temperature and conditions of lab, were 0.2, 0.4, 0.8, 1.6 and 3.2 ml/L of trichlorphone. At 14.25, 15, 13.75, 10.5, and 8.25, the mean

population respective aments were observed. Simultaneously, in response to the global average population of 8.25 m / l was observed.

Laser:

Different dosages were applied, i.e. 0.2, 0.4, 0.8, 1.6, and Laser 3.2 ml/L at room temperature and in laboratory conditions. The total population was 21.00, 20.00, 6.00, 6.5 and 3.75, each. In comparison, a dose of 3.2 ml/L was observed at the overall mean population of 3.75.

Malathion

Applications were made for 0.2, 0.4, 0.8, 1.6 and 3.2 ml/L in room and in working conditions. There were 32.75, 23.25, 23.5, 18.75 and 15.75 of the adult population. On the other hand, the average daily dose of population was 3.2 ml/L, at 15.75.

Lambda

A few concentrations, i.e. at room temperature and conditions in laboratory, were employees of 0.2, 0.4, 0.8, 1.6 and 3.2 ml/L of lambda. The mean population was 34.25, 25.75, 12.25, 11 and 7.25. Instead, the maximum average dose of dose of 3.2 ml/L was observed at 7.25.

In laboratory conditions, the effect of various insecticides on *Batrocera zonata* adult development was performed to test adult *Batrocera zonata* emergency, using different pesticides, such as Trichlorfon, Laser, Malathion and Lambda, for room temperature respectively. Five doses each have been added to measure the average of these pesticides. The emergency response of adults was relatively mild, negative and extremely necessary also expressed in Figure 2.

Trichlorfon

Different doses were applied, i.e., at room temperature and in laboratory circumstances of 0.2, 0.4, 0.8, 1.6 and 3.2 ml/L Trichlorfon. 8.75, 8.75, 7.5, 6.5 and 4.5, respectively were contained in the mean population. The overall average population of 4.5 was simultaneously observed at 3.2 ml/L.

Laser

Different dosages were applied, i.e. 0.2, 0.4, 0.8, 1.6, and Laser 3.2 ml/L at room temperature and in laboratory conditions. The mean population was 9.75, 10.25, 10.25, 9.5 and 5.75. The overall average dose of 5.75 per dose of 3.2 ml/L was also observed.

Malathion

Different doses were applied at room-temperature and in laboratory conditions, i.e. 0.2, 0.4, 0.8, 1.6 and 3.2 ml/L Malathion were applied. The total population was 15.25, 11, 10.5, 8 and 5. The average maximum population of 5 per dose of 3.2 ml/L was observed.

Lambda

A range of doses, i.e. at room temperature and in laboratories, including 0.2, 0.4, 0.8, 1.6, and 3.2 ml/L of lambda were used. The total population was 30; 16.75, 7.75, 7 and 5.25. In contrast, in the dose of 3.2 ml/L, the overall average population was 5.25.

The effect of various insecticides on the *Batrocera zonata* combination ratio: In laboratory conditions experiments were carried out with the results, respectively at ambient

temperature, of certain insecticides against *Batrocera zonata* (Saunders) at the corresponding ratio by various pesticides, e.g., Trichlorfon, Laser and Malathion, and Lambda. Five doses of each pesticide were added to measure the mean of these pesticides. The relationship between matting was relatively mild, harmful, and extremely critical.

Trichlorfon: The result is present in figure 3, which shows that:

Male: Different doses were applied for *Batrocera zonata* male, i.e. 0.2, 0.4, 0.8, 1.6, 3.2 ml/L trichlorfon at room and laboratory conditions. The average male population was 4.75, 5.5, 4, 3.5 and 2.25, respectively. Simultaneously, an average maximum dose of 2.25 mL/L was reported.

Female: The female of the *Batrocera zonata* was treated with different dose, i.e. 0.2, 0.4, 0.8, 1.6 and 3.2 ml/L trichlorfon under normal and laboratory conditions. The total number of women was 3.75, 3.5, 3.25, 3.75 and 3. At the same time, three of the total maximum population was found below the 3.2 ml/L level.

Laser: In figure 4, it is clear that:

Male: Different doses of Laser, i.e. 0.2, 0.4, 0.8, 1.6 and 3.2 ml/L, were applied to the *Batrocera zonata* male under room temperature and in laboratory conditions. The average population of males was 3.75, 7, 5.25, 4 and 2.5. Mean population of 2.5 under a dose of 3.2 ml/L was observed simultaneously.

Female: The female of the *zonata* of *Batrocera* was given various doses, i.e. 0.2, 0.4, 0.8, 1.6, and laser 3.2 ml/L in room temperature and in laboratory conditions. The total female population was 4.5, 5.75, 5, 3.75 and 2.5, respectively. At the same time, a dosage of 2.5 ml/L was observed for the full average population.

Malathion: Figure 5 express that: **Male:** Different doses of malathion, i.e. 0.2, 0.4, 0.8, 1.6, and malathion 3.2 ml/L were added to the male *Batrocera zonata* at room temperature and laboratory conditions. The overall male population was 5, 6, 3.75, 4.5 and 3.5, respectively. Simultaneously, a 3.5 dose lower average population of 3.2 ml/L was observed.

Female: Various doses of malathione were added to female *batrocera zonate* (i.e. 0.2, 0.4, 0.8, 1.6 and 3.2 ml/L at room temperature and under lab conditions). The total gender was 4.5, 5.5, 4.5, 3.75 and 3.25 for the female population. Compared to the estimated limit of 3.25 ml/L, the dosage was calculated.

Lambda: The results shows in Figure 6, explained as:

Male: Different doses, i.e. 0.2, 0.4, 0.8, 1.6 and 3.2 ml/L Lambda, were administered to *Batrocera zonata* males at room temperature and in laboratory conditions. The total population of males was 6.5, 7, 5.25, 5.25, and 4.75. In comparison, the average daily dosage of population was 4.75 ml/L.

Female: Various doses of Lambda, 0.2, 0.4, 0.8, 1.6, and 3.2 ml/L were used for *Batrocera zonata* at room temperature and in laboratory conditions. In females, the total population was 5.25, 6, 5.25, 4, and 4.25. In combination with this, the mean average dosage of 1.6 ml/L was calculated to be 4.25.

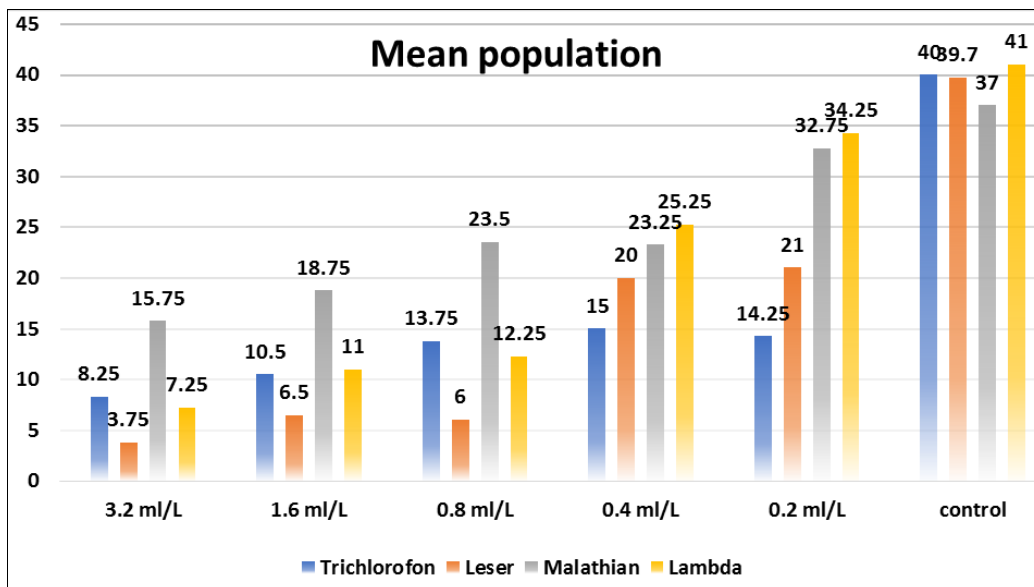


Fig 1: Impact of different doses of insecticides on pupal emergence of *Bactrocera zonata* (Saunders)

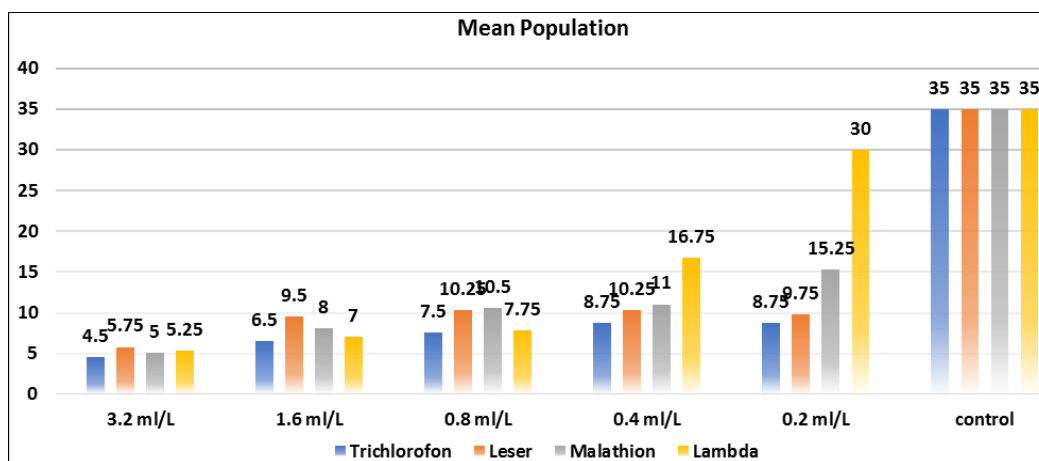


Fig 2: Impact of different doses of insecticides on adult emergence of *Bactrocera zonata* (Saunders)

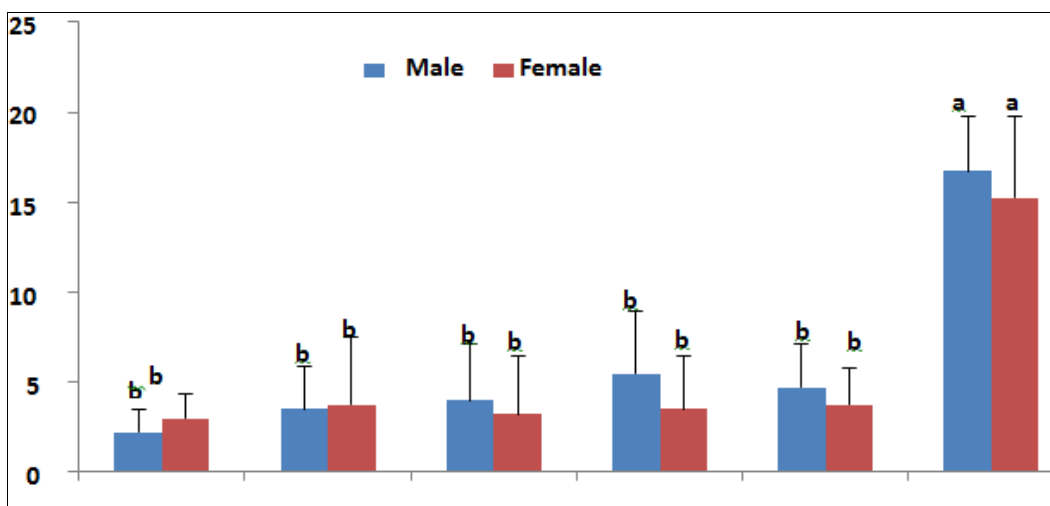


Fig 3: Impact of differences doses Trichlorofon on the mating ratio of *Bactrocera zonata*(Saunders)

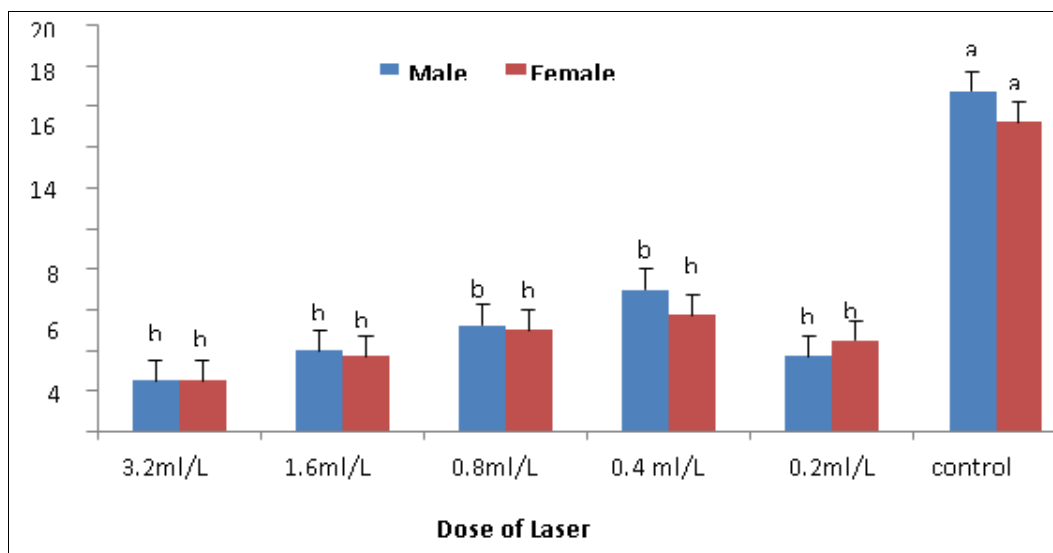


Fig 4: Impact of differences doses Laser on the mating ratio of *Bactrocera zonata*(Saunders)

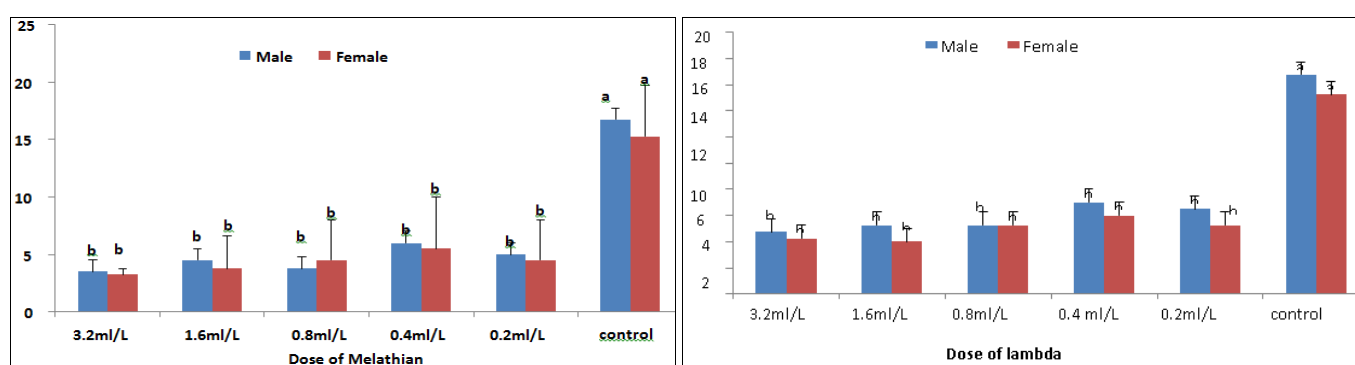


Fig 6: Impact of differences doses Lambda on the mating ratio of *Bactrocera zonata* (Saunders)

Discussion

The efficacy of each insecticide was compared with different doses. The results showed that Trichlorfon was more effective than others. These results are the agreements of [18]. Mango crop is a major fruit crop of Pakistan with its high economic value as well as more potential for exports. Tephritid fruit flies represent one of the most economically important insects in the Tropical and Sub-Tropical regions. Fruit flies are financially important. Their favorable hosts are mango, guava, peach as well as other fruits. Insect pests are a major responsible factor to affect the fruit production and quality adversely in Pakistan, and fruit flies among these insect pests cause enormous loss by infesting the fruits. *Bactrocera* spp. are the fruit fly species that are mostly responsible for this [2,1]. In such cases, the measurement of *Bactrocera* region was performed with the values 0.02 ppm, 0.13 ppm, 0.22 ppm, 0.28 and 0.51 ppm in males and 0.07 ppm, 0.16 ppm, 0.55 ppm and 0.62 ppm in females, such as malathion, lufenuron, Lambda and Methoxyfenozide in LC50. LC50 levels in infected adult females have been shown to be higher in 24 h, 48 h and 72 h following surgery than in infected adult males. This indicates that adult males were more vulnerable to the insecticides studied than adult females [18]. The application of various pesticides on pupa of *Bactrocera zonata* Comparative efficacy of some insecticides against *Bactrocera zonata* (Saunders) mango fruit under laboratory conditions experiment was carried out about pupal emergence of *Bactrocera zonata*, were as results showed that Trichlorfon was more active then followed by Laser, Malathion, and Lambda respectively at room temperature. Insecticidal control

is the more effective and quicker method generally used by our farming community. While [19] applied Trichlorfon at room temperature at laboratory conditions, then results of the mean population showed that 14.25, 15, 13.75, 10.5, and 8.25 respectively was supported study is trichlorfon was observed as highly effective against *Bactrocera zonata*. While ever comparison of these insecticides on sex ratio results of male (*Bactrocera zonata*) than the impact of Trichlorfon was better than others, i.e., 4.75, 5.5, 4, 3.5 followed by Laser, Malathion, and Lambda.

Conclusion

The pesticide was tested with different dozes such as higher, optimum, and lower doses were compared to each other as well as control. In this research experiment, four insecticides were applied, such as Trichlorfon, Laser, Malathion, and Lambda and tested at room temperature in the laboratory on pupal, adult emergence, as well as sex ratio, were also determined. Five doses, such as 0.2, 0.4, 0.8, 1.6, and 3.2 ml/L of each insecticide, were applied to check their effectiveness. During the entire research study, it is concluded that Trichlorfon insecticide was comparatively better than Laser, Malathion, Lambda, and Malathion. In thi sex periment, different dozes of each pesticide were applied, such as 0.2, 0.4, 0.8, 1.6, and 3.2 ml/L of water, but 0.8 ml/liter was noticed better for comparison with the economic injury level.

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