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HOST PREFERENCE OF FRUIT FLY, BACTROCERA ZONATA TOWARDS DIFFERENT HOST FRUITS AT VARIOUS STAGES OF RIPENESS

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Abstract

Bactrocera zonata (Diptera: Tephritidae), the peach fruit fly, poses a major risks to tropical and subtropical fruit harvests. This study investigates *Bactrocera zonata's* preference for oviposition and the progeny's performance with respect to various fruit ripening stages, such as mango, guava, banana, and peach. Experiment was conducted to analyze the preference of fruit flies across different stages of ripeness. According to the results, mature and completely ripe stages are highly preferable because they attracted more adult flies than green or unripe stages of the fruit. Furthermore, ripe guava was a better host for *Bactrocera zonata* due to its superior biological parameters, which included high pupal recovery (128.00), percent adult emergence (85.2%), and longevity (38.6 days). Banana followed closely, showing optimal pupal weight (11.68 mg) and length (0.47 cm). Conversely, mango presented the least favorable conditions for fruit fly development. In order to effectively decrease *Bactrocera zonata* infestations, this study highlights how important it is to put early management techniques into effect that target susceptible ripeness stages. Strategies including baits, fruit fly traps, biological control, and the Sterile Insect Technique (SIT) are recommended for integrated pest management in fruit production.

Keywords: *Bactrocera zonata*, fruit fly, fruit ripening stages, host preference, biological control, Sterile Insect Technique (SIT).

1-Introduction

Fruit flies (Diptera: Tephritidae) are recognized to have significant negative effects on horticultural crops globally, severely damaging fruits and vegetables (Hasnain et al., 2023; Saeed et al., 2022; Ashfaq et al., 2020). These pests are polyphagous; they feed on a variety of crops, including bitter gourd, oranges, bananas, guavas, peaches, and mangoes. Fruit flies, which are mostly found in tropical and subtropical areas, have between 4,000 and 5,000 species known; only approximately 70–250 of these are thought to be commercially significant (Saeed et al., 2022).

About eleven fruit fly species have been identified in Pakistan; *Bactrocera zonata, Bactrocera dorsalis, Bactrocera cucurbitae, Carpomyia incompleta, Carpomyia vesuviana, Myiopardalis pardalina, Dacus ferrugincus,* and *Dacus diversus* are a few of the most well-known species (Gul et al., 2015). Of them, the genus *Bactrocera* is most notorious for its damaging effects on crops used in horticulture. This genus contains over 50 species that are well-known polyphagous pests (Vargas et al., 2015). Particularly well-known for significantly reducing Pakistan's fruit production are *Bactrocera zonata* (Saunders) and *Bactrocera dorsalis* (Hendel) (Ahmad et al., 2005; Clarke et al., 2005).

According to Shehata et al. (2008), one of the most destructive fruit pests is *Bactrocera zonata,* better known as the peach fruit fly. Infesting more than fifty different varieties of fruits, it has a large host range and is common throughout tropical and subtropical regions of the world (Chauhan et al., 2011). A variety of regions, including Pakistan's Punjab, Sindh, Khyber-Pakhtunkhwa, and Baluchistan, have experienced notable losses in fruit harvests due to this species, which is native to South and Southeast Asia (Khan & Naveed, 2017). The reason behind its invasive behavior is its exceptional flight abilities, which enable it to cover a minimum of 25 kilometers while searching for appropriate hosts. The existence of an appropriate host plant and a favorable environment has a significant impact on the incidence and geographic range of *Bactrocera zonata* (Zingore et al., 2020).

Bactrocera zonata is a global species that originated in tropical Asia. It is mostly found in Africa and the Arab World. The countries that contain it are Bangladesh, Egypt, India, Laos, Mauritius, Myanmar, Pakistan, Sri Lanka, Thailand, and Vietnam. *Bactrocera zonata* is primarily adapted

to tropical and subtropical temperatures, although it has also spread to areas with Mediterranean climates, including Northern Egypt (Alzubaidy et al., 2000).

Bactrocera zonata's development and life cycle are significantly influenced by temperature. The pupal stage is influenced by soil temperature, whereas the egg, larval, and adult stages are affected by air temperature. The ideal temperature range for development is 25˚ to 30˚C, with 25˚C offering the highest rates of survival for eggs, larvae, and pupae. All life stages are fatally affected by temperatures below 12.6˚C (Zingore et al., 2020). According to Mir et al. (2014), female flies have a preference for depositing their eggs on the soft parts of fruits, where the larvae develop inside the pulp and leave visible brown spots on the fruit's surface. After emerging from the fruit, the larvae pupate in the soil until they emerge as adults. *Bactrocera zonata* has a significant negative economic impact, especially throughout the summer (Ghanim, 2009). According to Imran et al. (2013), this pest is expected to cause losses of USD 200 million per year in Pakistan and impacts farmers as well. Awad et al. (2014) state that infection rates can be alarming, impacting up to 50% of summer guavas and resulting in miniature, damaged, and decomposing fruits. Fruit fly infestations have the potential to cause shipments to be refused due to quarantine regulations, posing a major risk to both domestic and international trade (Saeed et al., 2022).

One important behavioral feature of *Bactrocera zonata* is host preference, which is controlled by the nutritional value and maturity of the fruit. In order to improve the performance of their offspring, females are thought to select oviposition sites depending on host stability and suitability (Joachim-Bravo et al., 2001). Studies show that fruits with more nutrients and soft, juicy skins are better for the growth of *Bactrocera* species (Rattanapun et al., 2009). On the other hand, some fruits' poisons and resins can harm a larva's ability to develop (Farooq et al., 2020).

Understanding the host preference of *Bactrocera* species based on fruit maturity stages is crucial for creating targeted and environmentally friendly pest management techniques, especially considering their widespread distribution and economic importance. Examining how different fruits interact with *Bactrocera zonata* at different phases of ripening might yield important information on efficient management strategies, which will ultimately lower the financial losses brought on by this pest.

2-Methadology

Study on the response of the peach fruit fly *Bactrocera zonata,* to various hosts at different ripeness stages were conducted at the Nuclear Institute for Food Agriculture (NIFA), Peshawar. The flies were reared under controlled conditions (27 ± 1ºC, 60 ± 5% relative humidity) on natural hosts in the Plant Protection Division's fruit fly laboratory.

Rearing *Bactrocera zonata* Fruit Flies Adult fruit flies were maintained in cages containing naturally occurring host fruits, such as guava, banana, mango, and peach, for 48 hours to allow for infestation and oviposition. The infected fruits were then moved to pupal chambers to allow the larvae to finish developing and pupate in sawdust or sand.

Figure 1. Adult fruit fly Rearing cages

Pupae handling: Every three to four days, pupae were removed from the sawdust and placed in Petri plates until they emerged as adults. The adult flies were then reared in 35 × 30 × 35 cm rearing cages with water, sugar, and protein hydrolysate. Host fruits were available for oviposition and were changed on a regular basis.

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Figure 2. Banana with larvae infestation

Figure 3. Fruit fly pupae

Fruit Hosts and Setup for Experiments Four locally grown fruits were used, varying in ripeness stages (unripe, ripe, and fully ripe): mango, peach, banana, and guava. The fruits were guaranteed to be free of wild infestations when they were purchased from nearby marketplaces.

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Experiment with Free Choice Ten sets of adult flies, aged 13 days, were kept in tiny cages of 30×30 ×30 centimeters, and filled with water, sugar, and protein hydrolysate. Every fruit was available at three different states of ripeness at the same time. The number of visits to each fruit stage was recorded hourly from 8:00 am to 4:00 pm for two days. After the infestation, fruits were placed in sawdust to pupate, the pupae were collected, and their emergence as adults was observed. Sex ratio, length, developmental stage, adult emergence, and pupal weight were among the biological parameters that were recorded.

Figure 4. Infested fruits

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Figure 5. Measuring pupae weight

Figure 6. Dead Fruit flies

Statistical Analysis Statistical analysis was performed using Statistix 8.1 software. A one-way ANOVA assessed the variations among parameters, followed by the Least Significant Difference (LSD) test for specific comparisons, with a significance level set at 0.05. This study provides insights into the host preferences and biological parameters of *Bactrocera zonata*, offering valuable information for pest management strategies.

3-RESULTS

Number of visits made by *Bactrocera zonata* to various ripening stages of guava fruit.

The highest mean visits by Bactrocera zonata were to firmly ripe guava (2.85±0.32/hour/10 minutes), similar to fully ripe guava (1.9±0.21/hour/10 minutes). The lowest visits were to unripe guava (0.59±0.09/hour/10 minutes), significantly different (F = 14, P = 0.005).

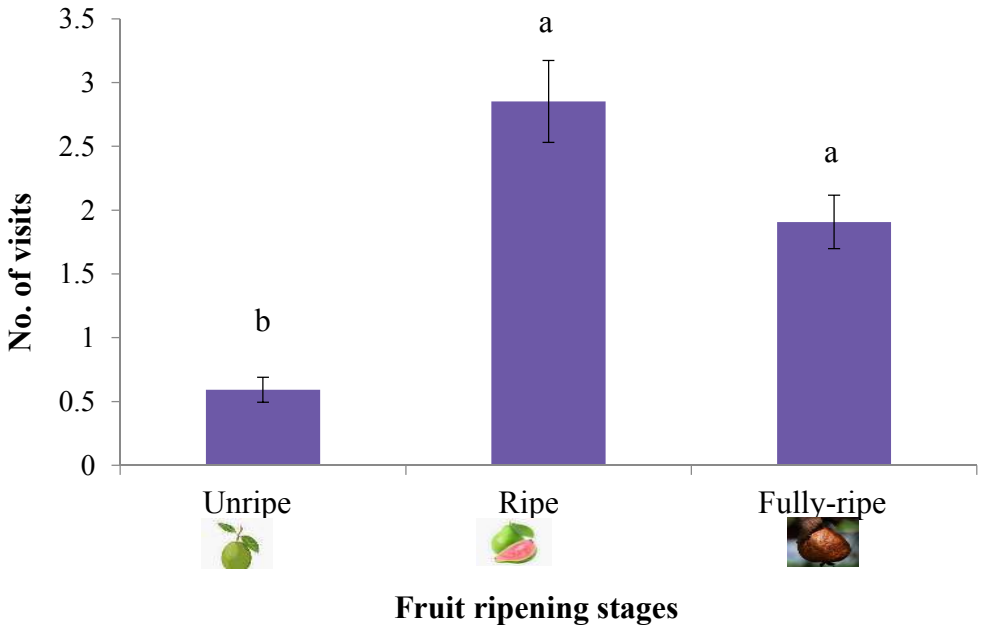

Figure 1: Mean+S.E. number of visits by *Bactrocera zonata* adults to various ripening stages of guava fruit ($P \leq 0.05$)

Effect of various ripening stages of guava fruit on biological parameters of *Bactrocera zonata.*

Table 1 shows the effects of guava ripening stages on *Bactrocera zonata*. Firmly ripe guava had the highest pupal recovery (112.33±5.32), with fully ripe guava slightly lower (102.67±3.65), and unripe guava the lowest (27.33±2.33). Pupal weight was highest in ripe guava (11.65±0.04 mg) and lowest in unripe (11.01±0.04 mg). Ripe guava produced the longest pupae (0.46±0.02 cm), while unripe had the shortest (0.353±0.014 cm). Adult emergence was highest in ripe (94±4.33) and fully ripe (85.33±3.59) guava, but lowest in unripe (19.66±1.45). Adult longevity followed a similar trend, with the longest in ripe (45.66±2.54) and shortest in unripe guava (34.33±1.34). The highest female progeny was in ripe guava (52.827 ± 1.45%), similar to fully ripe guava (51.917 ± 1.65%). The lowest percent females were in unripe guava (44.001 ± 2.33%) (F = 39.9, P = 0.0003). This trend was also observed in the percent males.

Table 1: Effect of various ripening stages of guava fruit on biological parameters of *Bactrocera zonata*

Parameters	Unripe	Ripe	Fully ripe	LSD
Pupal recovery	27.33±2.33 [b]	112.33±5.32 [a]	102.67±3.65[a]	15.816
Pupal weight(mg)	11.01±0.04[b]	11.65±0.04[a]	11.58±0.02[a]	0.113
Pupal Length(cm)	0.353±0.0[c]	0.46±0.02[a]	0.41±0.013[a]	0.0298
Adult emergence	19.66±1.45[b]	94±4.33[a]	85.33±3.59[a]	17.096
Adult emergence %	72.66±2.34[b]	83.63±1.62[a]	83.27±3.54[a]	10.135
Longevity(day)	34.33±1.34[b]	45.66±2.54[a]	43.33±3.12[a]	5.8816
Male ratio	55.99±2.33 [a]	48.08±1.45 [a]	47.17±1.65[a]	7.8516
Female ratio	44.001±2.11[b]	52.82±2.14[b]	51.91±2.35[b]	9.4885

Means within the same row are significantly different at 5% level of significance (P≤0.05**).**

Figure 7. healthy guavas before infestation

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Figure 8. Infested guava

Number of visits made by *Bactrocera zonata* to various ripening stages of banana fruit.

In Figure 3, *Bactrocera zonata* showed the highest visitation rate (2.22 ± 0.21/hour/10 minutes) to fully ripe banana fruit, significantly more than visits to firmly ripe banana fruit (1.2963 ± 0.32/hour/10 minutes). Unripe banana fruit had the lowest visitation rate (0.4815 ± 0.098/hour/10 minutes) ($F = 55.8$, $P = 0.0001$).

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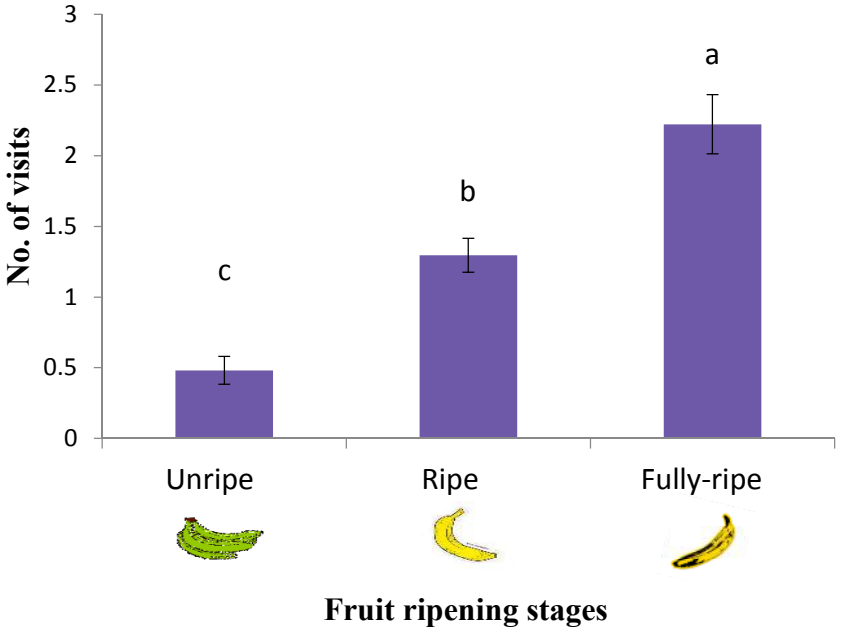

Figure 2: mean+ S.E. numbers of visits by *Bactrocera zonata* adults to various ripening stages of banana fruit ($P \leq 0.05$)

Effect of various ripening stages of banana fruit on biological parameters of *Bactrocera zonata*

Table 2 summarizes *Bactrocera zonata* responses to banana fruit ripening stages. Fully ripe bananas had the highest pupal recovery (102.67 ± 2.9059), significantly more than firmly ripe (69.00 ± 3.2146) and ripe bananas (63.50 ± 3.5047). Unripe bananas had the lowest pupal recovery (28.00 ± 3.7859) ($F = 265$, $P = 0.0000$). Pupal weight was highest in fully ripe bananas (11.867 ± 0.0133 mg), followed by ripe bananas (11.640 ± 0.0693 mg), and lowest in unripe bananas (11.120 ± 0.0611 mg) ($F = 50.5$, $P = 0.0002$). Pupal length was longest in fully ripe bananas (0.4700 ± 0.0057 cm), followed by ripe bananas (0.4333 ± 0.0176 cm), and shortest in unripe bananas (0.4000 ± 0.0115 cm) ($F = 7.70$, $P = 0.0221$). Adult emergence was significantly higher in fully ripe (85.832 ± 0.5774) and ripe bananas (83.637 ± 1.6212) compared to unripe bananas (74.045 ± 2.6034) ($F = 265$, $P = 0.0000$). Adult emergence percentage was highest in fully ripe (85.832 ± 2.1498) and ripe bananas (83.637 ± 1.6212), and lowest in unripe bananas (74.045 ± 1.1202) ($F = 13.9$, $P = 0.0056$). Adult longevity was longest in fully ripe bananas (43.000 ± 0.5774 days), followed by ripe bananas (38.000 ± 1.5275 days), and shortest in unripe bananas (29.667 ± 1.2019 days) ($F = 33.1$, $P = 0.0006$). Fully ripe bananas had the highest percentage of females (53.775 ± 2.35%), not significantly different from ripe bananas (49.759 ±

2.14%). Unripe bananas had the lowest percentage of females (39.611 ± 2.11%) (F = 7.81, P = 0.0214). The sex ratio for males followed a similar pattern across the ripening stages.

Table 2: Effect of various ripening stages of banana fruit on biological parameters of *Bactrocera zonata*

Parameters	Unripe	Ripe	Fully ripe	LSD
Pupal recovery	28.00 ± 3.78^{c}	69.00± 3.21^{b}	102.67± 2.90^{a}	11.496
Pupal weight(mg)	11.12 ± 0.06^{c}	11.64± 0.06^{b}	11.86±0.01^{a}	0.1865
Pupal Length(cm)	0.40 ± 0.01^{b}	0.433± 0.01^{ab}	0.470±0.05^{a}	0.0437
Adult emergence	74.04 ±2.60^{c}	83.63±2.40^{b}	85.83± 0.57^{a}	7.1727
Adult emergence %	74.04 ± 1.12^{b}	83.63±1.62^{a}	85.83±2.14^{a}	5.8265
Longevity(day)	29.66± 1.20^{c}	38.00±1.52^{b}	43.00± 0.57^{a}	4.0509
Male ratio	60.389 ±2.13^{a}	50.241±1.49^{b}	46.225± 1.65^{b}	4.1053
Female ratio	39.611±2.11^{b}	49.759±2.13^{a}	53.775±2.45^{a}	9.0380

Means within the same row are significantly different at 5% ss level of significance ($P \leq 0.05$).

Figure 9. Healthy banana before infestation

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Figure 10. Infested banana

Number of visits made by *Bactrocera zonata* to various ripening stages of peach fruit.

In Figure 5, *B. zonata* showed the highest visitation rate (2.9444 ± 0.20/hour/10 minutes) at the fully ripe stage of peach fruit, significantly higher than at the firmly ripe stage (2.1296 ± 0.32/hour/10 minutes). The lowest visitation rate (0.8148 ± 0.089/hour/10 minutes) was recorded at the unripe stage (F = 28.9, P = 0.0008).

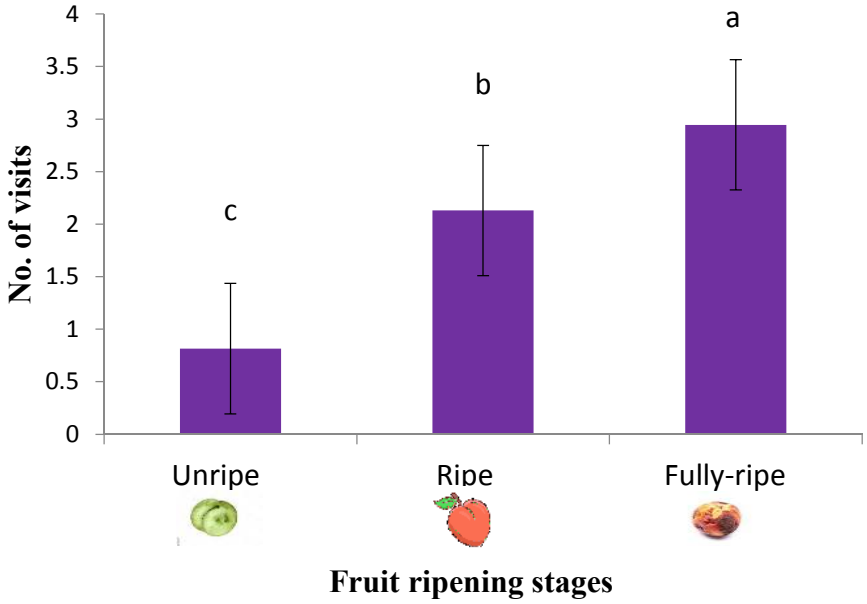

Figure 3: Mean+S.E. number of visits by *Bactrocera zonata* adults to various ripening stages of peach fruit ($P \leq 0.05$)

Effect of various ripening stages of peach fruit on biological parameters of *Bactrocera zonata*

Results on the effect of various ripening stages of peach fruit on the biological parameters of *Bactrocera zonata* are presented in Table 3. The results revealed that there was significant interaction among various stages of ripeness. The highest mean pupal recovery (73.333±2.9059) was recorded from the fully ripe stage of peach fruit followed by the firmly ripe stage (44.667±2.6034). However, mean pupal recovery from ripe and fully ripe peach was found significantly different from each other. Unripe peach showed significantly the lowest pupal recovery of 16.00±1.7321 (F = 135, P =0.0000). The pupal weight of *Bactrocera zonata* was the largest in fully ripe peach (11.267± 0.1702mg) followed by ripe peach (10.967±0.0636). Unripe fruit showed the lowest pupal weight of 10.813±0.1988 (F =2.20, P =0.1921) non-significantly. Similarly, the non-significantly longest pupae were recorded from fully ripe peach with a mean length of 0.4467± 0.01760cm. It was followed by the pupal length of 0.4133 ± 0.0066cm from the ripe peach. The shortest pupae were recorded from unripe peach fruit with a mean length of 0.3533± 0.0133cm significantly (F =12.6, P =0.0071). Overall mean adult emergence was found to be significantly different between ripe and fully ripe peaches (37.000± 2.0817 and 63.667±1.8559 respectively). The same was found significantly the lowest (11.333±1.2019) in unripe peaches (F = 223, P =0.0000). The same trend was also observed for adult emergence percentage where the highest was observed in fully ripe peach (86.919±1.8140A) followed by ripe peach non-significantly (82.859±0.8313). Percent adult emergence in unripe peaches was significantly the lowest i.e. 70.884 ±2.0713 of *Bactrocera zonata* (F =25.2, P =0.0012). Adult longevity (days) was also higher in fully ripe peaches followed by ripe peaches (32.667± 0.98 and 29.000±1.01 respectively). Unripe peach fruit showed the shortest longevity 17.667 ±0.8819 of *B. zonata* (F =35.1, P =0.0005). The highest percentage of females was recorded in fully ripe peach (48.221±2.45 %) which was found non-significantly different from the percent females recovered from ripe peach (53.134±2.24%). Non-Significantly the lowest percent of females (50.284±2.01%) were recorded from unripe peach (F =, P =0.0214). The same trend was also true for the percentage of males who recovered from various ripening stages of peach fruit

Table 3: Effect of various ripening stages of peach fruit on biological parameters of Bactrocera *zonata*.

Treatment	Unripe	Ripe	Fully ripe	LSD
pupal recovery	16.00±1.73^{c}	44.66±2.60^{b}	73.33±2.90^{a}	8.5285
pupal weight(mg)	10.81±0.19^{a}	10.96± 0.06^{a}	11.26±0.17^{a}	0.5381
length(cm)	0.35±0.01^{b}	0.41±6700^{a}	0.44±0.017^{a}	0.0461
adult emergence	11.33±1.20^{c}	37.00±2.08^{b}	63.66±1.85^{a}	6.0672
adult emergence %	70.88 ±2.07^{b}	82.85±0.83^{a}	86.91±1.81^{a}	5.7461
longevity(day)	17.66±0.88^{b}	29.00±1.01^{a}	32.66±0.98^{a}	4.5656
male ratio	53.134±2.16 ^{a}	50.284±1.43^{a}	48.221±1.55 ^{a}	3.7673
female ratio	46.866±2.01 ^{a}	49.716±2.24 ^{a}	51.779±2.45 ^{a}	3.7673

Means followed by different letters within the same row are significantly different ((P≤0.05)

Figure 11. Peach before infestation

Figure 12. Peach after infestation

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Number of visits made by *Bactrocera zonata* to various ripening stages of mango fruit.

The mean number of visits made by fruit fly *Bactrocera zonata* to various ripening stages of mango fruit is presented in Figure 7. The results revealed that *B. zonata* made the highest mean number of visits (2.0185±0.44/hour/10 minutes) to fully ripe stage of mango fruit, which was found non-significantly different with the number of visit paid to fully ripe stage of mango fruit (1.3333±0.24/hour/10 minutes). Significantly the lowest mean number of visits (0.9630±0.091/hour/10 minutes) was recorded on unripe stage of mango fruit (F = 7.91, P=0.0208).

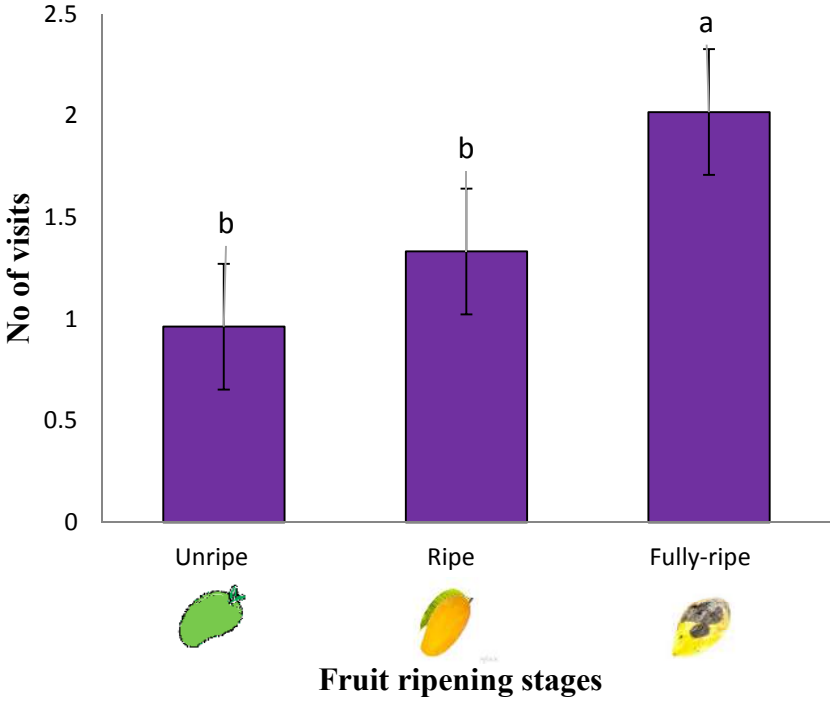

Figure 4: Mean+S.E. Number of visits by *Bactrocera zonata* adults to various ripening stages of mango fruit (P≤0.05)

Effect of various ripening stages of mango fruit on biological parameters of Bactrocera *zonata*.

Table 4 reveals significant interactions among mango ripening stages for *Bactrocera zonata*. Fully ripe mango showed the highest pupal recovery (33.000 ± 4.9329) and pupal weight (11.267 ± 0.1702 mg), with the longest pupal length (0.4267 ± 0.006 cm). Ripe mango exhibited similar parameters, whereas unripe mango recorded significantly lower values across all biological parameters, including adult emergence and longevity (F = 67.7, P = 0.0001).Fully ripe mango

showed the highest female percentage (53.396±2.45%), similar to ripe mango (52.333±2.24%), and significantly different from unripe mango (44.444±2.01%) (F = 0.93, P = 0.4447)

Table 4. Effect of various ripening stages of mango fruit on biological parameters of *Bactrocera zonata*

Treatment	Unripe	Ripe	Fully ripe	LSD
pupal recovery	13.66±2.33[b]	27.33±2.02[a]	33.00±4.93[a]	11.631
pupal weight	10.53±0.07[b]	11.17±0.08[a]	11.26±0.17[a]	0.4055
Length	0.350±0.00[b]	0.426±0.00[a]	0.426±0.00[a]	0.0221
adult emergence	9.66 ±1.20[b]	22.33±1.45[a]	27.00±4.93[a]	10.551
Adult emergence%	71.96±1.20[a]	81.14±3.41[a]	81.82±1.45[a]	10.759
Longevity	15.33±1.45[b]	25.00±1.52[a]	26.00±2.64[a]	6.7588
Male ratio	55.556±2.16[a]	47.667±1.43[a]	46.604±1.55[a]	3.6476
Female ratio	44.444±2.01[a]	52.333±2.24[a]	53.396±2.45[a]	3.7673

Means within the same row are significantly different at 5% level of significance (P ≤ 0.05)

Figure 13 Mango before infestation

Figure 14. Mango after infestation

4-Discussion

The study demonstrates that *Bactrocera zonata* prefers ripe and fully ripe fruits over unripe ones in a variety of hosts, including guava, banana, peach, and mango. This information is critical for the development of targeted pest control strategies. *Bactrocera zonata*, the peach fruit fly, is a significant pest in horticulture, causing substantial economic losses.

When it came to oviposition, fully ripe bananas and ripe guavas were substantially preferred over immature fruits, with higher visit frequency. On the other hand, guavas and bananas were more visually appealing than mature and fully ripe peaches and mangoes, even though they were equally preferred. This conduct is consistent with earlier research showing that fruit hardness is a constraint on oviposition (Balagawi et al., 2005). According to Aluja et al. (2014), ripe and completely ripe fruits allow simpler oviposition since they are softer.

The results indicate that mature fruits provide a more favorable environment for the development and survival of *Bactrocera zonata* populations, echoing the observations of Rattanapun et al. (2009). Important biological parameters like pupal recovery, weight, length, adult emergence percentage, and adult longevity were noticeably improved in ripe and fully ripe fruits.

Fruit flies prefer ripe and fully ripe fruits because of their attractive qualities, such as bright color and stronger volatile emission, which act as cues for identifying suitable hosts (Cornelius et al., 2000; Lalel et al., 2003; Jayanthi et al., 2012). Jaleel et al. (2021) discovered that aromatic compounds released from ripe fruits are more appealing to Bactrocera fruit flies than those emitted by unripe fruits. This preference is strategic because many tephritid species prefer softer spots or pre-existing wounds in fruit for egg deposition (Papaj & Alonso-Pimentel, 1997).

According to Piñero et al. (2006) and Jaleel et al. (2021) differences in fruit features like color, shape, size, and olfactory signals are responsible for the different fly populations found in guava and banana as opposed to peach and mango in free choice tests conducted separately for each fruit type at different ripening stages.

At the same ripeness stage, *Bactrocera zonata* was more attracted to guava and banana than to peach and mango; the preferences were statistically significant, and the order of preference was guava > banana > peach > mango. These results are consistent with those of Murtaza et al. (2021) and Ren et al. (2008), who found that guava was the most preferred host fruit, closely followed by banana.

On the other hand, some research has revealed contrasting preferences. For example, Jang et al. (1991) reported that *Bactrocera dorsalis* preferred green papaya with a tougher skin. In contrast, Nor et al. (2018) discovered that in a free-choice experiment involving *Bactrocera dorsalis*, guava was the most favored fruit over mango and papaya.

Female fruit flies use numerous sensory signals such as appearance, odor, and texture to pick acceptable larval hosts. Factors like color, size, shape, firmness, and fragrance strongly influence a female fruit fly's response to possible hosts (Prokopy & Vargas, 1996; Cornelius et al., 1999). *Bactrocera zonata* finds bananas more appealing than other fruits due to volatiles that give them their distinct scent (Li-Li et al., 2008). Bactrocera species favor fruits with soft, juicy skins, such as guava and bananas; since these qualities help the larvae survive and develop (Rattanapun et al., 2009).

In conclusion, because of their favorable physical and chemical characteristics, *Bactrocera zonata* shows a strong preference for ripe and fully ripe fruits, especially bananas and guavas. This information can be used to inform targeted pest management strategies, improving the efficacy of control measures in horticultural practices.

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