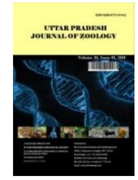
UTTAR PRADESH JOURNAL OF ZOOLOGY

41(2): 21-31, 2020
ISSN: 0256-971X (P)



CULTIVAR PREFERENCE PATTERN AND AMYLOLYTIC ENZYME ACTIVITY OF MANGO MEALY BUG (*Drosicha mangiferae* G.) FED ON DIFFERENT HOST PLANT CULTIVARS

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AUTHOR'S CONTRIBUTION

The sole author designed, analysed, interpreted and prepared the manuscript.

Received: 04 January 2020
Accepted: 10 March 2020
Published: 18 March 2020

Original Research Article

ABSTRACT

To elucidate whether there is a cultivar preference of mango mealy bug, (*Drosicha mangiferae* G.), the number of them were counted in 30 cm branch of panicle randomly from four different directions in Fazli, Guti, Lakhanbhog, Gopalbhog and Langra cultivars at orchards of Kaligram and Chanchal of Malda.Similarly number of mango mealy bug present in 10 cm^2 area of main trunk in those five cultivars were also noted. Oviposition preference, growth and weight gain pattern of mango mealy bug were also studied by feeding third instar nymphs of them with leaves of those different cultivars for two weeks. The number in the field and growth parameters of laboratory reared mango mealy bug have established the cultivar preference of mango as Fazli> Guti> Lakhanbhog> Gopal Bhog> Langra. The effect of food quality of different cultivars on the amylolytic enzyme activity was also carried out by measuring starch amount of different cultivars, quantifying protein and performing alpha-amylase assay of mango mealy bug fed on those cultivars. Starch amount differed significantly in different cultivars. Fazli had highest amount of starch followed by Guti, Lakhanbhog, Gopalbhog and Langra. Availability of lesser starch in Langra or Gopalbhog caused down regulation of alpha-amylase in these less preferred cultivars. So, alpha-amylase and protein amount enzyme activity of mango mealy bug was found to be low in mealy bugs fed in Langra (0.017 U/ml ± 0.007) and Gopalbhog (0.019 U/ ml ± 0.0007) cultivars compared to highly preferred Fazli or moderately preferred Guti and Lakhanbhog. Fazli reared pest showed highest (0.047 U/ml ± 0.003) amylolytic activity followed by Guti (0.44 U/ml ± 0.0005) and Lakhanbhog (0.038 U/ml ± 0.001). This current study is very much helpful to choose the suitable cultivar for propagation. Moreover, the effect of nutrient on digestive physiology of insect can also be understood.

Keywords: Mango mealy bug; cultivar preference; oviposition preference; starch amount; protein content; digestive-physiology; alpha-amylase assay.

1. INTRODUCTION

Mango is a popular fruit worldwide for its rich aroma and taste [1]. India produces a huge quantity of mango with a share of 11% of the total world production [2]. West Bengal is one of the important state of mango production and covers 44% of the total food crop cultivation area [3]. Malda district tops the list among all the districts with massive production of about 196 metric tons [4]. This mango crop is attacked by several insect pests and reduces mango production [5]. Huge amount of fruit loss is incurred by Mango mealy bug, *Drosicha mangiferae*, which is a major pest of mango [6]. Mango mealy bug can cause fruit

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loss up to 50% [7]. The unremitting sap sucking ability by mango mealy bug from the twigs is the root cause of the fruit drop and also develops sooty mould for honey dew secretion thus making fruit inconsumable [8].

The mango mealy bug is not controlled easily by pesticides [9,10]; however, to achieve effective control of this pest, chemical pesticide is preferred [11,12]. Moreover load of pesticide by repeated use leads to pest resistance and increases cost of production. Therefore, it becomes very imperative to search for an effective alternative. Planting and propagating less preferred cultivar can be one such alternative to reduce pest incidence. Similarly, learning insects' digestive enzyme physiology can become one important tool in integrated pest management programme [13]. It is well established that amount and quality of food diet can affect the activity of insects' digestive enzyme [14]. The digestion of food macromolecules are brought about by enzymes such as proteases, amylases and lipases [15]. Furthermore, amylase is responsible for hydrolysis of starch and other carbohydrates, and activity of this enzyme is influenced by food diet [16].

Over 30 cultivars of mango are commercially cultivated in India [17]. These cultivars differ from one another in morphological forms, aroma and taste [18,19]. So, it is expected that the intensity of mealy bug infestation will vary among cultivars. It was also hypothesized that mango mealy bug would accumulate more biomass and grow larger when fed on some mango cultivars than others and nymphs reared on cultivars with lower starch content would have lower alpha-amylase activity resulting in low efficiency of ingested food into body matter as reported in other studies [14,16].

Therefore, this current study was undertaken to count the number, screen biological parameters and perform morphometry of mango mealy bug in five different commercial mango cultivars of Malda district of West Bengal both in field and laboratory conditions. Finally, a series of physiological assays were performed to explore the activity of mango mealybug amylase reared on those five cultivars The main objective of this current study was to find the most suitable cultivar in terms of resistance to mango mealy bug so that it can be used as one of the components for Integrated Pest Management in future for pest control.

2. MATERIALS AND METHODS

2.1 Field Screening for Cultivar Preference

The cultivar preference of mango mealy bug was studied in the field was for two years consecutively by noting the mango mealy bug population in inflorescence/panicle and trunk of five popular commercial cultivars. During the study period the mango orchards were kept free from all kinds of pesticide sprays.

Three mango orchards with an average of 15-20 years old tree and with a history of mango mealy bug infestation were selected. These orchards were located at Kaligram (25.38° N-88.04° E) and Chanchal (25.38°N-88.01°E) in the district of Malda and were 3-4 km apart. At least two trees of each popular commercial cultivars (Fazli, Guti, Lakhanbhog, Gopalbhog and Langra) were selected and tagged for counting mango mealy bug. In order to decipher about cultivar preference both nymphs and adult numbers of mealy bug were taken into account as in inflorescence mixed population of mealy bug nymphs and adults are found. Trees of different cultivars were selected on the basis of having similar layered-crown type canopy, similar age and location at the same agro climatic zone. Ten inflorescence of each trees from the four directions were tagged randomly by binding colored rope, and the mealy bugs were counted from 30 cm branch of each panicle at weekly interval in the year 2018 and 2019 during the pest infestation period. Therefore, total 20 inflorescence of each cultivar were taken into account and each inflorescence is considered as a replicate.

Similarly, the population of mango mealy bug nymphs or adults was also counted by using a metal square piece in the 10 cm^2 area of the main trunk situated approximately one meter above ground level.

Peak infestation time was noted carefully by considering mealy bug number/inflorescence and trunk throughout the pest infestation period in both years of study. The numbers were compiled through complete randomized block design using Sigma Plot software. The data on mealy bug nymphal population were subjected to analysis of variance (ANOVA) and means were compared using Duncan's Multiple Range Test (DMRT) at 0.05 level of significance.

2.2 Study of Biological Parameters of Mango Mealy Bug Feeding on Different Mango Cultivars

Five third instar nymphs having more or less similar size were collected from these selected cultivars from the field. These nymphs of each variety were placed separately in a 100 ml beaker and then covered with cotton cloth. The leaves of the cultivars were plucked fresh from the orchards and then supplied as food after wrapping the petioles with water soaked cotton. This was done to keep moisture intact for a considerable amount of time.Each female grown in different cultivars were considered as replicate. Egg laying behavior was noticed which started after13-14 days of rearing as by that time gravid female were formed from third instar. The adults were identified by carefully monitoring shedding of exuviae by the third instar. Then the egg sacs of the female were dissected with the help of tweezers and the number of eggs laid on each cultivar was counted. Oviposition preference was estimated by counting the mean number of eggs/female fed on different cultivars. After this two weeks of rearing, these females from each cultivar were weighed and their length and width were measured with a centimeter scale. Other biological parameters like weight, length and width of adult female mango mealy bug feeding on different cultivars were also measured. ANOVA of mean fecundity (the number of eggs/female), weight, length and width was carried out using Sigma Plot software. Means were compared by DMRT using the same software.

2.3 Starch Assay in Different Cultivars

The starch concentration in various cultivars was measured following Benfield's method [20] Standard starch solutions were prepared by diluting 10 mg/ml stock solution. After pipetting out starch in each test tube volume of each test tube was made up to 10ml.Then one drop of iodine solution (0.01 M solution of iodine in potassium iodide) was added in each test tube and thoroughly mixed and absorbance was read at orange wavelength (610 nm). Similarly, for measuring cultivar starch concentration 0.2 g panicle and leaf extract of each cultivar was homogenized in 35 ml distilled water, heated to boiling point and filtered. Ten ml of this filtrate was poured into a test tube and to it one drop of iodine solution was added, mixed thoroughly and Optical Density [O.D.] was measured in the same wavelength. Three replicates of each cultivar were taken.

2.3.1 Enzyme sample preparation

Enzyme sample of mango mealy bugs fed on the leaves of different cultivars for two weeks and adults were raised and hen enzyme sample was prepared after Cohen's method [21] with slight modifications. Adult insects were killed by keeping them in refrigerator and then weighed in balance. One gram of insects were taken from each variety and then ground in a homogenizer in 1ml ice cold saline buffer (0.006M Nacl). Then homogenate was centrifuged at 10,000 r.p.m for 5 minutes. The obtained supernatant was used as enzyme solution and the remaining was stored for protein quantity analysis.

2.3.2 Assay

0.2 M sodium phosphate buffer (0.5 ml), 1% starch 0.5 ml and 0.2 ml (200 µl) of enzyme solution of each cultivar were incubated at 37°C for 30 minutes. The liberated maltose sugars were estimated using DNSA solution. 1 ml of DNSA was added to liberated maltose in each test tube reaction mixture of different cultivars. Thereafter, these mixtures were heated in boiling water bath for 10 minutes and absorbance was read at 540 nm after cooling for 5 minutes. A standard curve of absorbance against amount of maltose released during α-amylase assays was generated. For making the standard curve 0.5 ml of sodium phosphate buffer, 0.7 ml of maltose solutions of various concentrations were mixed and then to each of them 1 ml of DNSA were added. One blank was with distilled water instead of sample was used to set the spectrophotometer.

One unit of α-amylase activity was denoted as the amount of enzyme required to produce 1 mg of maltose in 30 minutes at 37°C or mg of maltose released by the enzyme in 1 minute time/ml.

2.4 Total Protein Estimations

The amount of protein present in mealy bugs reared on each mango cultivar was measured from the remaining supernatent after enzyme quantification following standard method [22] using bovine serum albumin as the standard and measuring O.D at 750 nm.

2.5 Correlation Analysis

Pair wise correlation between the amount of starch and population of mango mealy bug in panicle was estimated. Similarly correlation of starch amount and fecundity, weight gain, length of gravid females and amylase quantity of mealy bugs reared on different cultivars were also worked out.

3. RESULTS

3.1 Population of Mango Mealy Bug on Different Mango Cultivars

Population dynamics of mango mealy bug clearly revealed that the population peaked up at 13 SMW i.e. first week of April in 2018 and 2019 (Figs. 1 and 2). Number of pest also varied significantly in different cultivars (Table 1). Highest numbers of mango mealy bug/ 30 cm of panicle was seen in Fazli variety in both years of study (83/panicle and 183/panicle) in 2018 and 2019 whereas minimum numbers was noted in Langra (11/panicle and 29.5/panicle). When cumulative average number of mealy bugs in the two years were considered, Fazli was found to be the most preferred with an average number of 132.57 mealy bugs and Langra was non-preferred having a mean number of 26.67 mealy bugs. The cumulative numbers of the mealy bugs for the two years showed that Gopalbhog and Langra were not significantly different ($p \leq 0.05$) (Table 1).

Therefore, the order of infestation in inflorescence due to the preference of mealy bug was Fazli> Guti> Lakhanbhog> Gopal Bhog> Langra.

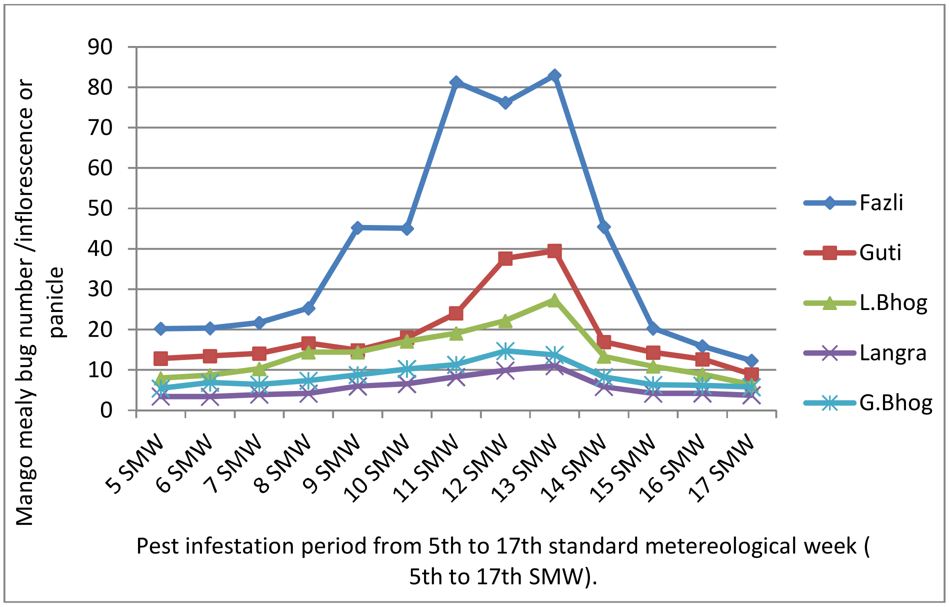

Fig. 1. Population trend of mealy bug on different mango cultivars in 2018
where L. Bhog = Lakhanbhog and G. Bhog = Gopalbhog

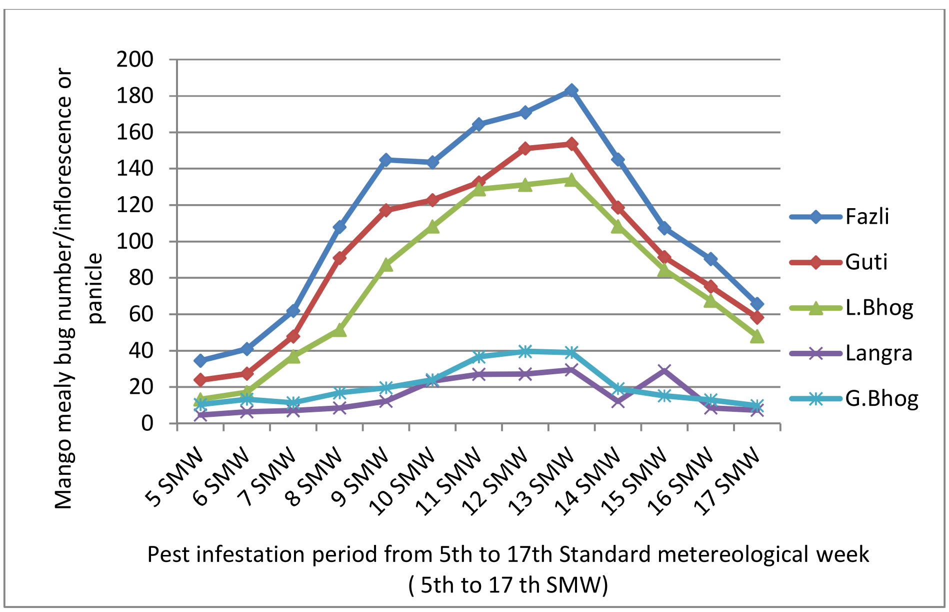

Fig. 2. Population trend of mealy bug on different mango cultivars in 2019
where L. Bhog = Lakhanbhog and G. Bhog = Gopalbhog

Table 1. Mean population of mango mealy bug on different cultivars of mango per 30-cm branch of panicle during peak time (13 SMW) of 2018 and 2019

Cultivars	2018 *	2019*	Cumulative average number of mealy bug of two years.*
Fazli	83 a	183.15 a	132.575a
Guti	39.5 b	153.7 b	96.6b
Lakhan bhog	30.05 b	134 b	82.025c
Langra	11 c	29.55 c	20.275d
Gopalbhog	13.75 c	39.5 d	26.675d

-Numbers with the same alphabet in the column are not not significantly different (DMRT; p<0.05)

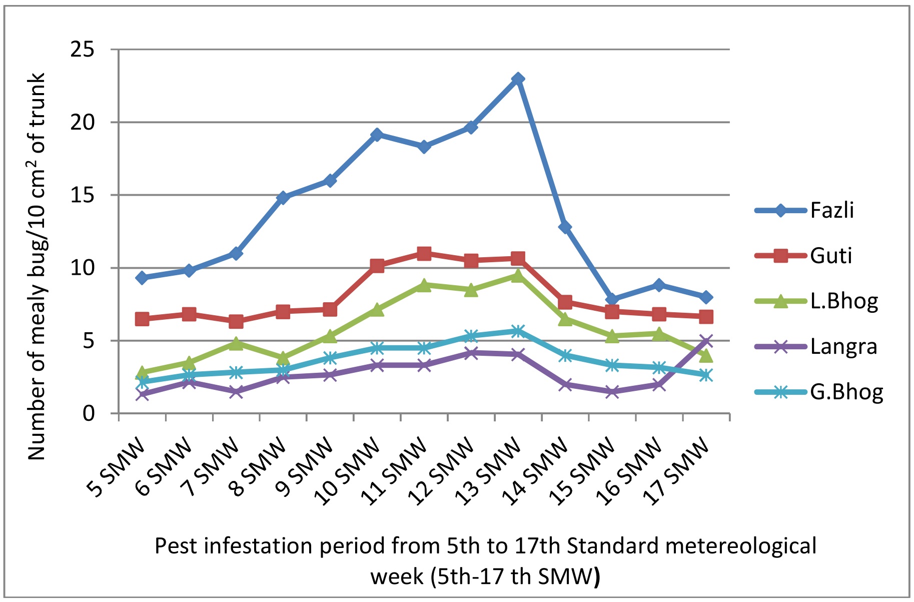

Fig. 3. Population trend of mango mealy bug at 10 cm^2 of trunk during pest infestation) in 2018
where L. Bhog = Lakhanbhog and G. Bhog = Gopalbhog

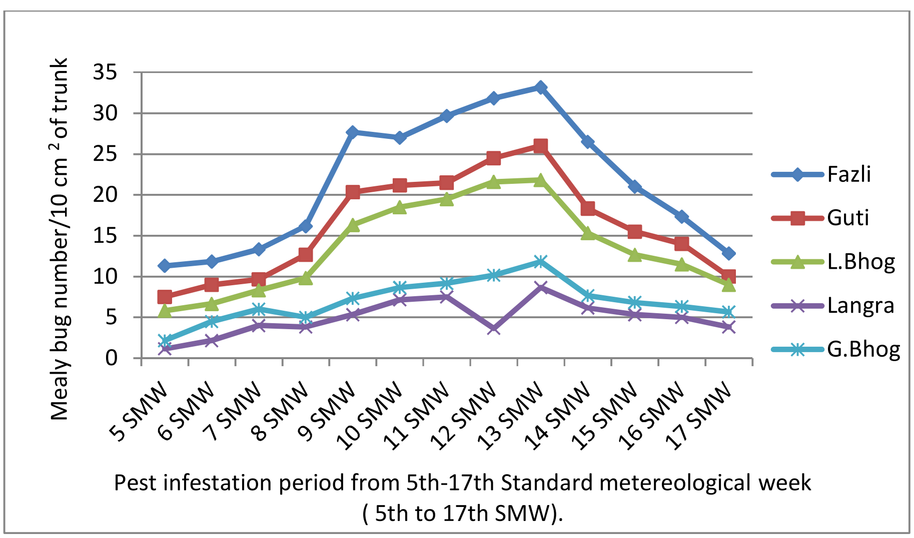

Fig. 4. Population trend of mango mealy bug at 10 cm^2 of trunk during pest infestation) in 2019
where L. Bhog = Lakhanbhog and G. Bhog = Gopalbhog

Table 2. Mean population of mango mealy bug on different cultivars of mango per 10 cm^2 of trunk during peak time of infestation (13 SMW) in 2018 and 2019

Cultivars	2018 *	2019 *	Cumulative average number of mealy bug of two years*
Fazli	23 a	33.16a	28.05a
Guti	10.66 b	26a	18.33b
Lakhan bhog	9.5 b	21.83a	15.66b
Langra	4.06c	8.66b	6.36c
Gopalbhog	5.66c	11.83c	8.74c

Numbers with the same alphabet in the column are not significantly different (DMRT; p<0.05)

Table 3. Biological parameters of gravid female mango mealy bug grown on different mango cultivars

Cultivar	Number of eggs / female*	Gravid female weight(g)*	Female length (cm)*	Female width (cm) *
Fazli	109.4 a ± 21.03	0.256 a± 00011	0.234 a ± 0.0054	0.174 a ±0.0054
Guti	84.6 b ± 5.45	0.242 b ± 0.0083	0.220 a ± 0.01	0.164 a ±0.0054
Lakhanbhog	76.4 b ± 11.45	0.222 c ± 0.0083	0.228 a ± 0.0049	0.162a ±0.0083
Langra	42.2 c ± 6.90	0.18 d ± 0.0070	0.142 b ± 0.0044	0.106 b ± 0.0054
Gopalbhog	62.4 d ± 6.98	0.20 d ± 0.0083	0.178 c ± 0.0083	0.126 c ±0.0054

-Means with the same alphabets in the column are not significantly different (DMR, p value= 0.05)

3.2 Population of Mango Mealy Bugs in Trunk of Different Cultivars of Mango

The population trend of mango mealy bug in trunk revealed that in case of trunk also the number gradually peaked at 13 SMW just like the panicle (Figs. 3 and 4). The results of number of mango mealy bug/10 cm^2 was showing significant difference in various cultivars (Table 2). At the peak of infestation in 2018, Fazli cultivar had the maximum number of 23 mealy bugs/unit area whereas minimum number was noted in Langra with 4.06 mealy bugs/unit area. Guti, Lakhanbhog and Gopalbhog had 10.66, 9.5 and 5.66 mealy bugs/unit area. Similar trends were also noticed in 2019 (Table 2).

3.3 Oviposition Preference and Morphometry of Mango Mealy Bug on Different Mango Cultivars

The various biological parameters and fecundity of a female reared on different mango cultivars is presented in Table 3. This study revealed clearly that mango mealy bug growing on various cultivars differed significantly in length, width and weight. Gravid female mealy bug gained the highest weight in Fazli cultivar (0.256 g) whereas mealy bugs grown in Langra had the minimum weight (0.18 g). In other cultivars like Guti, Lakhanbhog and Gopalbhog the weight were 0.24, 0.22 and 0.20 g respectively. Females grew upto 0.234 cm in Fazli, on the contrary it achieved only 0.142 cm in Langra. Similarly maximum width of mealy bug was found in Fazli (0.174 cm) whereas lowest width was noticed in Langra (0.106 cm). In Guti and Lakhanbhog the growth pattern was more or less similar. In both of these cultivars mealy bug achieved 0.164 and 0.162 cm width. Moreover, mean number of eggs laid by gravid female also differed significantly. It was observed that mean number of eggs laid /female was more in Fazli (109.4) compared to all the other cultivars. The mean number of eggs/laid by female gradually diminished from Fazli (109.4) followed by Guti (84.6), Lakhanbhog (76.4), Gopalbhog (62.2) and Langra (42.2).

3.4 Starch Amount of Panicle and Leaves in Various Cultivars

F Significant variation was noticed in the estimated amount of starch in different cultivars (Fcal.> F-tab, df = 2,14). The panicle of the most preferred Fazli variety had the highest amount of starch (59.36 mg/g ± 0.550) followed by Guti (57.16 mg/g ± 0.30) and Lakhanbhog (42.2 mg/g ± 0.75) which are considered to be moderately preferred whereas relatively non-preferred cultivar Gopalbhog had much less amount of starch (26.5±0.8 mg/g). The lowest amount of starch was found in the least preferred Langra variety (22.33±0.40 mg/g) (Fig. 5).

Similarly, there was significant variation in amount of starch recorded in the leaves of different varieties of mango (Fcal> F-tab df = 14). Starch was found to be highest in most preferred Fazli (43.63± 0.60 mg/g) and lowest in the least preferred Langra (20.8± 0.35 mg/g). Moderately preferred Guti and Lakahanbhog cultivars had 42.4±1.15 and 31.5±0.36 mg/g of starch which is also comparatively higher than Gopalbhog

(22.6±0.36), is also a less preferred cultivar like Langra (Fig. 6).

3.5 Effect of Mango Cultivars on Protein Content of Mango Mealy Bug

Fig. 7 shows the effect of host plant cultivar on the protein content of mango mealy bug. Higher amount of protein was found in the most preferred Fazli (14.55 mg/g ± 0.11 mg/g) compared to the rest of the cultivars. Least amount of protein was estimated in the least preferred Langra cultivar (11.03 mg/g ± 0.045). Moderately preferred Guti (13.37 mg/g ± 0.06) and Lakhanbhog (13.11 mg/g ± 0.13) also showed higher protein content than the least preferred Gopalbhog (11.53 ± 0.13).

Df=2,14. Fcal value 2372.76 > F critical value= 3.47. P value < 0.05

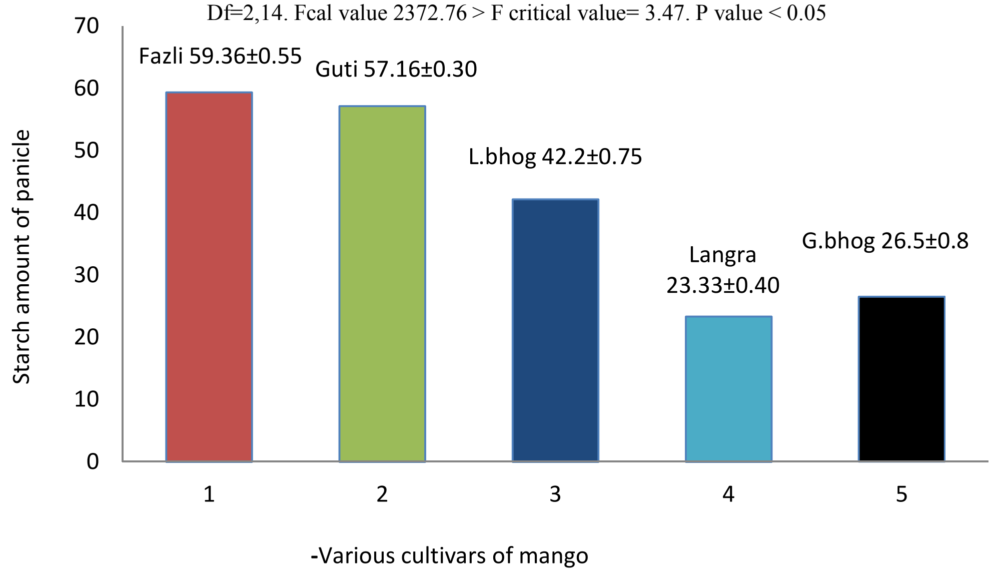

Fig. 5. Amount of Starch of panicle (mg /g) in different cultivars
where L. Bhog = Lakhanbhog and G. Bhog = Gopalbhog

df.=2,14. F value 824.54 > F critical value 3.47, p <0.05.

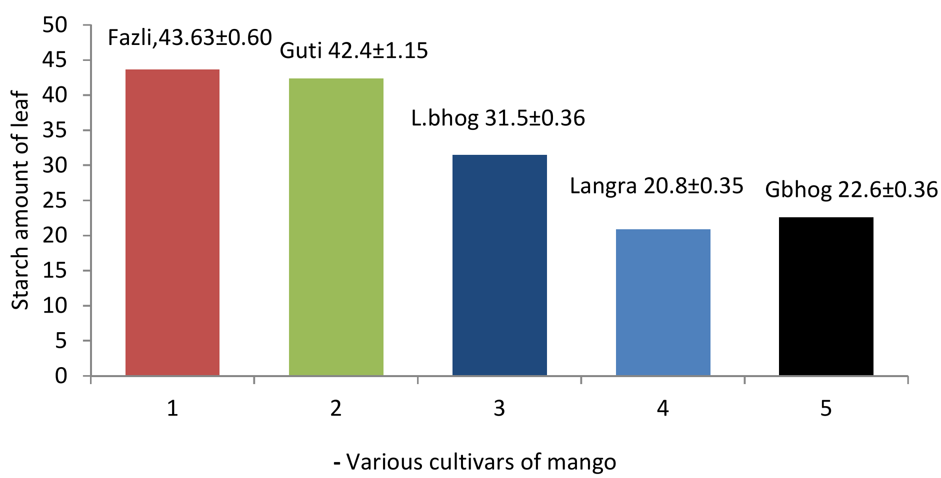

Fig. 6. Amount of Starch of leaves (mg /g) in different cultivars
where L. Bhog = Lakhanbhog and G. Bhog = Gopalbhog

3.6 Effect of Mango Cultivars on Amylolytic Enzyme Activity of Mango Mealy Bug

In Fig. 8, the alpha-amylase activity of mango mealy bug differed significantly when reared on different cultivars (df=2,14, F value=194.31 > F critical value 3.47) (Fig. 8). The highest amylase activity was recorded in mango mealy bug reared in most preferred Fazli cultivar (0.047 U/ml ± 0.003) whereas those feeding on least preferred Langra exhibited lowest amount of protein (0.017 U/ml ± 0.007). Similarly, amylase activities of mango mealy bug reared in moderately preferred mango cultivars like Guti and Lakhanbhog were 0.44 U/ml ± 0.0005 and 0.038 U/ml ± 0.001, respectively. This was also comparatively higher than the amount of enzyme of mango mealy bug reared in less preferred Gopalbhog (0.019U/ ml ± 0.0007).

3.7 Correlation Analysis

The correlation coefficients of starch amount with population of mango mealy bug, biological parameters and alpha- amylase quantity is shown in Table 4. The results of correlation analysis revealed that there was a strong positive correlation between the amount of starch and the population of mango mealy bug/panicle at peak time of infestation (r= + 0.969). The correlation between the amount of starch and fecundity, length of the adult female and weight attained by gravid females reared on different cultivars were also positive (r= + 0.924, 0.882 and 0.955). Similarly the amount of starch and alpha amylase also exhibited strong positive correlation (r= 0.982).

4. DISCUSSION

The result of the numbers of mealy bug at peak time of infestation (13 SMW) clearly revealed that there was a cultivar preference of mango mealy bug for different cultivars. Cultivar like Fazli was highly preferred whereas Langra was least preferred. Similarly, Guti and Lakhanbhog can be considered as moderately preferred and Gopalbhog as less preferred based on their number count in paicle or trunk. Furthermore, the results also indicated that gravid females laid more eggs, gained more weight, and also attained greater size when reared on the most preferred Fazli variety compared to the other less preferred varieties, thus, emphasizing cultivar preference pattern. The current study agrees with other studies where similar cultivar resistance or susceptibility were established by denoting population pattern on panicle and trunk [23] and biological parameters difference when reared on different cultivars [24].

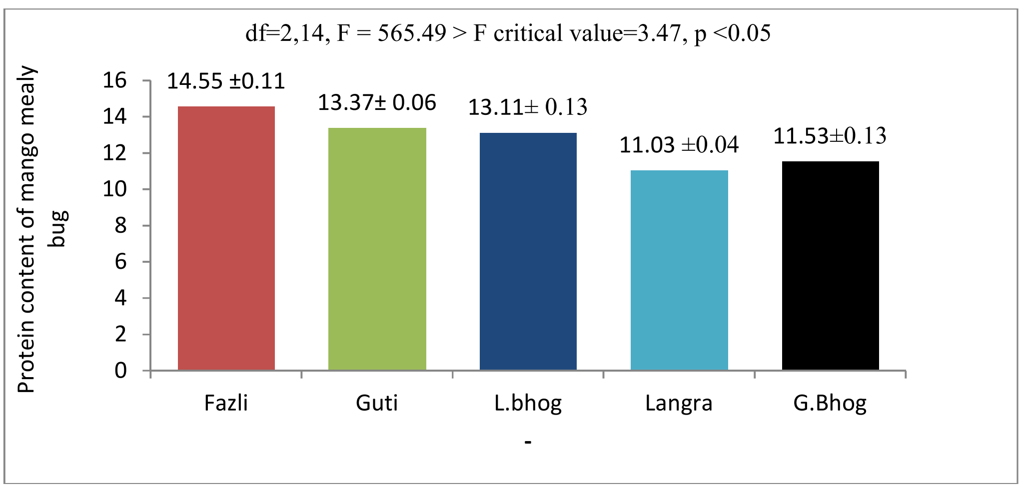

Fig. 7. Protein content of mango mealy bug (mg/g) reared on different mango cultivars

Table 4. Simple correlation (r) between starch amount and other parameters of host preference

Parameter	* Correlation coefficient (r).
Population of mango mealy bug/panicle	+ 0.969*
Fecundity (eggs laid/female)	+ 0.924*
Length of the gravid female	+0.882*
Weight of the gravid female	+0.955*
Alpha-amylase quantity	+ 0.982*

**Significant at p value = 0.05*

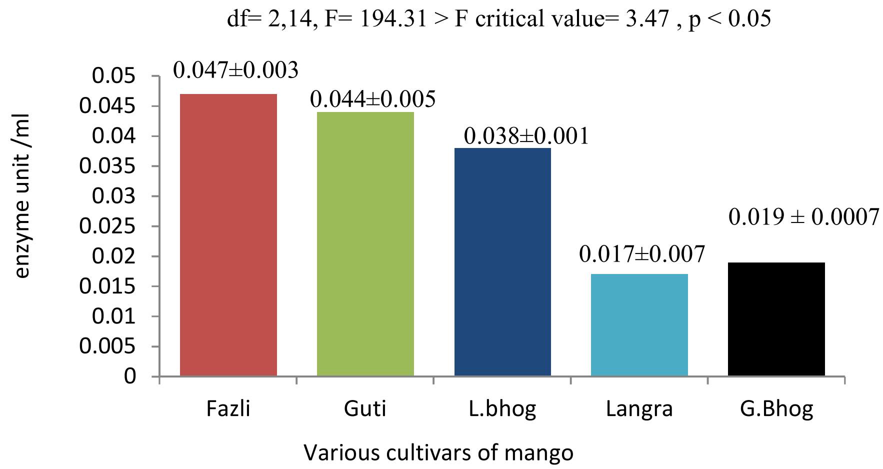

Fig. 8. Alpha-amylase enzyme amount (Unit/ml) of mango mealy bug reared in different cultivars

Low nutritive value of host diet can offer resistance against insect herbivores [25,26]. So, the most probable reason for discriminatory results of population trend of Fazli and other lesser preferred cultivars could be due to the availability of sufficient food required for growth and survival and in Fazli. It has been noticed in this study that the quantity of starch is found to be high in most preferred Fazli cultivar similar to the finding of Karar et al. [23] who have reported presence similar higher quantity of carbohydrate in the most susceptible Chaunsa cultivar than other lesser susceptible cultivars. This finding indicates that carbohydrate like starch may play great role to influence mealy bug preference. The present study also illustrated that the amount of starch in the cultivars were positively correlated with oviposition preference, length achieved by female or weight gained by female fed on different cultivars. This suggests that these factors play decisive roles to control the behaviour and well-being of the insect. This positive correlation of insect growth and primary nutrient input is well documented in many studies [25,26].

The suitability of a cultivar or plant to host a phytophagous insect depends on physical and chemical factors of the plant as well as physiology of insect [27]. Food consumption and utilization had direct effect on synthesis and secretion of digestive enzymes [14,28,29]. In this study it was revealed clearly that host plant cultivar's nutritional quality varied significantly and as such digestive enzyme physiology was influenced accordingly. The highest amylolytic activity in 3rd instar nymph of *D. mangiferae* was observed when they were reared on most field preferred Fazli whereas lowest activity was exhibited when reared in least preferred Langra. Even when mango mealy bug was reared in moderately preferred Guti and Lakhanbhog, the amylase was much more upregulated than mealy bugs fed on less preferred cultivars like Gopalbhog and Langra. The amylase activity was almost three fold higher in Fazli compared to least preferred Langra variety. The result of this report is very much in line with other studies [30,31] where proportional relationship of the amount of starch and host cultivar preference had been demonstrated in *Helicoverpa armigera* and *Spodoptera exigua* of cotton and sugar beet. It is very much established phenomenon that primary nutrients (starch and protein) and secondary biochemicals of host plants play pivotal role to control digestive enzyme activity [31,32]. So, high proportion of primary nutrient (starch) in this study may be a causal factor for such higher presence of digestive enzyme in more preferred cultivars. Based on relationship between amylase activity and starch amount of five cultivars it can be clearly pointed out that insect has an accurate system for detecting, quantifying the food content as well as regulating the level of these necessary digestive enzymes [33].

This study also revealed that protein content as well as enzyme activity were found to be higher in most preferred Fazli and moderately preferred Guti or Lakhanbhog compared to Gopalbhog and Langra. This indicates that larvae collected from the more preferred cultivars had higher energy derived from host plant thus leading to the formation of higher body mass. The current finding on the amount of protein in predisposing mango cultivars to mealy bug preference is similar to other reports [31] where similar increase of protein content was reported to confer susceptibility on beet cultivar.

It is well established that digestive enzyme played pivotal role in the conversion of digested food into larval body mass [34]. So, it is very much possible that not only lesser amount of primary nutrients but enzyme inhibiting components decrease the conversion rate of food in *D. mangifearae* nymphs reared on less preferred Gopalbhog or Langra cultivars and as such growth rate was lesser in those cultivars compared to others.

Therefore, based on nutrient availability and digestive enzyme activity observed in *D. mangiferae* reared on five different commercial cultivars it can be said that Langra is least preferred and Fazli is most preferred cultivar. The basis of this host cultivar preference may be higher level of primary nutrients like starch and accordingly higher amount of alpha amylase which is a biomass forming digestive enzyme or lesser amount of secondary metabolite acting as antibiotic agents.

5. CONCLUSION

Population trend of Mango mealy bug in panicle and trunk, oviposition preference and morphometry pattern have established that Langra and Gopalbhog varieties are less preferred, Lakhanbhog and Guti are moderately preferred whereas Fazli is the most preferred cultivar of Malda. One important factor contributing to this preference is the high amount of primary nutrient like starch in most preferred cultivars resulting into hyper production of alpha-amylase associated with digestion of starch and conversion of same into body mass. In this context, less preferred cultivars have a potential to decrease the use of insecticides and implement other control measures such as biological control in a better way. Moreover, by working out the relationship of local cultivar of mango with digestive enzymes will help us to understand plant-herbivore interaction. Further incorporation of some resistant genes in the commercially sound strains can also make susceptible strain resistant.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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