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Varietal Preference of Mango fruit Borer *Autocharis albizonalis* Hampson in Regard to the Phenol Content of the Fruit

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Abstract

Varietal preference of mango fruit borer (*Autocharis albizonalis* Hampson) was determined in regard to the Phenol content of the fruit in Department of Plant Physiology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal. Total estimation of Phenol was carried out with the Folin-Ciocalteu reagent. It was determined that pulp phenol level of the fruits of the mango cultivars ranged from 5.707 mg kg⁻¹ to 23.57 mg kg⁻¹ at marble stage, 2.537 mg kg⁻¹ to 13.493 mg kg⁻¹ at egg stage and from 1.023 mg kg⁻¹ to 11.023 mg kg⁻¹ at maturity stage of the fruit. The variations in pulp phenol level of mango cultivars under study were significant at all three stages indicating inherent differences in this respect among the cultivars. Himasagar at marble stage had phenol content 21.060 mg kg⁻¹ in the pulp. Gradually, the phenol content declined to 11.023 mg kg⁻¹ in the pulp at maturity when infestation of the pest on the variety reached its highest. The correlation study of fruit borer infestation revealed that its infestation was strongly associated with pulp phenol level of fruit maturity ($r=0.78$) and egg stage ($r=0.73$) where as it did not have any association with pulp phenol level at marble stage ($r=0.44$).

Keywords: Egg stage, Folin-ciocalteu reagent, himsagar, mango fruit borer, phenol

1. Introduction

The study on the incidence pattern of mango fruit borer (*Autocharis albizonalis* Hampson) was carried out along with the different aspects of infestation and their varietal preference. The fruit borer infestation occurred from pea to marble sized stage of the fruit and continued till maturity stage. The first pest brood was seen in the first fortnight of March and continued till June. Study of the incidence pattern and the varietal preference of mango fruit borer during 2008 to 2009 and 2009 to 2010 showed that in the year 2009 to 2010 the infestation of the pest started from the first week of April when fruits were in the pea to marble size, infestation reached maximum during 2nd fortnight of April (i.e. 2.29 %) when temperature, relative humidity and rainfall regime were in the range 29.04 and 42.48 °C. The relative humidity range 14 & 100% and rainfall regime 0 mm respectively. Later the population was found to decline. Lowest infestation was found at the end of May when temperature, relative humidity and rainfall were in the range of 25.3-36.2 °C, the humidity ranged between 63 & 97% and rainfall being 5.7 mm respectively.

In the next year early appearance of the pest was noticed at the pea stage of the fruit. Peak damage (i.e. 3.81%) was observed during last week of March in the year 2010 when

temperature, relative humidity and rainfall regime were in the range of 36.6 and 16.9 °C, 31 and 98% and 0 mm respectively. The infestation of the mango fruit borer was lowest during second week of May when the temperature, relative humidity and rainfall varied from 38.4 and 22.8 °C, 51.6 and 93% and 27.1 mm respectively. The fruit borer bored into the fruits both at the young marble stage to more mature ones producing tiny pin head size small circular hole at the point of entry encircled by a dark brown ring. Larvae feeding on the fruit pulp formed network of tunnels to reach the seed, the later instar larvae fed on the seed, filling up the inner content of the fruits with excreta.

2. Materials and Methods

Biochemical analysis of the fruit in regard to the phenol content of different stages and parts of mango samples were conducted in Plant Physiology laboratory of Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal to evaluate the effect of phenol through correlation studies of these chemicals with percentage damage of the fruits by borers. For the experiment in laboratory, mango fruits of different stages were collected from the orchard of Regional Research Station, Gayeshpur, Nadia, West Bengal. The fruits were cut into pieces to separate the pulp and the seed i.e.



cotyledon part which were dried in a drier for 4 to 7 days and the full dried mango pulp and seed were then ground in the grinder machine thoroughly to get parts of the fruits in dust form and then the analyses were conducted.

Phenols are best described as the aromatic compounds with hydroxyl groups which are widely distributed in the plant kingdom occurring in all parts of the plants. Disease and pest resistance in plants are attributed due to phenol content. Total estimation were carried out with the Folin-Ciocalteu reagent where under alkaline condition phenol reacted with an oxidizing agent phosphomolybdate resulting in the formation of a blue coloured complex, the molybdenum blue which was measured at 650 nm calorimetrically (Bray and Thorpe, 1954)

The Folin-Ciocalteu reagents comprise of the following: 80% Ethanol, 20% Na_2CO_3 standard, 100 mg catechol in 100 ml of water diluted 10 times for a working standard. 10 ml of 80% ethanol was added to the 0.5 g of sample taken in a test tube. The mixture was centrifuged at 4800 rpm for 20 minutes and later the mixture were kept over a hot air oven to evaporate the ethanol and the dried supernatant were collected. The residue was dissolved in 5 ml distilled water, 0.2 ml pipette out into a test tube and the volume was made up with 3 ml of water. Furthermore to it 0.5 ml of Folin-Ciocalteu reagent was added. 3 minutes later, 20 ml Na_2CO_3 solution was added to it mixed thoroughly. The prepared solution was then placed in boiling water for a minute when the materials turn deep blue. The phenol content of the sample was evaluated by the absorbance value of the coloured solution at the 650 nm wavelength in the spectrophotometer and the absorbance value was compared with the standard phenol curve thus prepared by various catechol concentration.

3. Results and Discussion

Results of the biochemical analysis of phenol against mango fruit borer showed the level of its phenol content of pulp and seed at different stages of fruit development of the mango cultivar. It could be noticed that pulp phenol level of the fruits of the mango cultivars ranged from 5.707 mg kg^{-1} to 23.57 mg kg^{-1} at marble stage, 2.537 mg kg^{-1} to 13.493 mg kg^{-1} at egg stage and from 1.023 mg kg^{-1} to 11.023 mg kg^{-1} at maturity stage of the fruit. The variations in the pulp content level of mango cultivars under study were significant at all three stages indicating inherent differences in this respect among the cultivars. The pulp phenol content level of all the cultivars was recorded to be highest at marble stage, gradually decline with the development and found to be lowest at the maturity stage. Whereas the seed phenol level of the cultivars at egg stage ranged from 17.520 mg kg^{-1} to 25.090 mg kg^{-1} . The variation in seed phenol level of the cultivars was highly significant indicating significant difference among the cultivars in this respect. At maturity stage, the seed phenol level of the cultivars ranged from 23.543 mg kg^{-1} to 4.983 mg kg^{-1} . The variation in seed phenol level at the fruit maturity of the cultivars was also significant indicating inherent difference

among the cultivars in this respect.

From Table 1 it is clear that Himasagar at marble stage had phenol content 21.060 mg kg^{-1} in the pulp. Infestation of the fruit borer was seen in the Himsagar. Gradually the phenol content declined to 11.023 mg kg^{-1} in the pulp at maturity when infestation of the pest on the variety grew to reach its

Table 1: Total Phenol content of pulp and seed at different stages of fruit development of the mango cultivars

Variety	Marble stage (mg kg^{-1})	Egg stage (mg kg^{-1})		Maturity stage	
	Pulp	Pulp	Seed	Pulp	Seed
Neelgoa	17.721	10.892	10.598	4.985	4.983
Neelshan	12.543	6.040	20.077	2.550	18.547
Prabha Shankar	13.473	3.517	25.070	1.033	13.537
Ratna	7.067	3.567	25.060	0	0
Mallika	12.553	3.567	25.090	1.060	17.533
Amrapali	18.550	2.543	25.047	1.040	23.543
Kesar	7.557	3.530	21.060	1.057	17.520
Zardallu	10.113	5.067	20.060	2.573	17.557
Fazli	9.110	3.567	25.090	1.060	17.533
Bangalora	10.093	5.063	25.037	1.023	23.520
Langra	23.570	12.527	17.520	7.487	15.033
Arka Anmol	22.557	3.520	25.063	1.537	20.053
Neeluddin	5.707	2.537	23.533	1.557	22.537
Himsagar	21.060	13.493	22.507	11.023	18.523

highest. From Table 2 Himsagar showed mean percentage damaged fruits by the borer of 2.59% and 2.415% in 2009 and 2010 respectively. Prabha shankar showed first attack along with Himsagar when phenol content in the pulp at marble stage was 13.473 mg kg^{-1} , thereafter the infestation grew up at maturity when the pulp phenol content declined to 1.033 mg kg^{-1} . Arka Anmol showed uniformly high level of phenol content from marble to maturity stage and thus showed tolerance to the pest.

It is revealed from Table 3 that the correlation study of the fruit borer infestation with phenol content of pulp and seed at different stages of the fruit development showed infestation strongly associated with the pulp phenol level of fruit maturity ($r=0.78$) and egg stage ($r=0.73$) where as it did not have any remarkable association with pulp phenol level at marble stage ($r=0.44$). However, the correlation study of the borer infestation with phenol level revealed that seed phenol level neither at egg stage nor at maturity stage were associated with the fruit borer infestation.



Table 2: Varietal preference of mango fruit borer in terms of percent damaged fruits in 2009 & 2010

Variety	Mean percent damaged fruits by the borer		Mean percent damage by borer in two years
	2009	2010	
Neelgoa	0.38	0.43	0.405
Neelshan	0.29	0.495	0.392
Prabha Shankar	0.51	1.165	0.837
Ratna	0.37	0	0.185
Mallika	0.45	0.165	0.307
Amrapali	1.51	0.25	0.880
Kesar	1.93	0.165	1.047
Zardallu	0.35	0.33	0.340
Fazli	0.83	0	0.415
Bangalora	0.38	0.332	0.356
Langra	0.76	0.495	0.627
Arka Anmol	0.71	0	0.355
Neeluddin	0	0.665	0.332
Himsagar	2.59	2.415	2.502

Table 3: Correlation values of fruit borer infestation with phenol content at different stages of fruit development

Phenol content (mg kg ⁻¹)	Correlation values (r)	
Marble stage	Pulp	0.44
Egg stage	Pulp	0.73
	Seed	-0.36
Maturity Stage	Pulp	0.78
	Seed	-0.42

4. Conclusion

The result of the present experiment was at variance with such previous information. The most interesting part of the findings of the present experiment was that the preference of the borer that reside within the seeds and feed on its cotyledon had no bearing with seed phenol level. Whereas its infestation

appeared to have strong and positive association with the pulp phenol level of the fruit at egg and maturity stage.

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