



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; 6(5): 1548-1550
Received: 03-07-2017
Accepted: 04-08-2017

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Varietal preference of Mango Red Banded Caterpillar on the basis of total free amino acid content of pulp and seed at different stages of fruit development of mango cultivars in New Alluvial zones of West Bengal

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Abstract

Mango red banded caterpillar is a very recently emerged pest of mango which was once a minor pest but it gained a major pest status very recently due to injudicious application of broad spectrum pesticides and global climatic changes. The research study on this pest was carried in the Regional Research Station, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal to record the incidence pattern of this pest at different stages of fruit development. Eight cultivars were selected to observe the varietal preference of this borer pest on the basis of total free amino acid content of the pulp and seed at different stages of fruit development of mango cultivars. It was observed that the highest percentage of infestation was seen in Himsagar (10.45%) where the total free amino acid content in the pulp and seed at the egg stage were 0.045 mg/kg and 0.167 mg/kg respectively. Also amino acid content in the pulp at marble stage was 0.187 mg/kg. While at the maturity stage the total free amino acid content in the pulp and seed were 0.030 mg/kg and 0.093 mg/kg respectively. The least percent infestation of the borer pest was seen in Mallika (2.29%) where the total free amino acid content in the pulp at the marble stage was 1.032 mg/kg. However, the amino acid content of the pulp and seed at egg stage were 0.450 mg/kg and 0.123 mg/kg respectively and that in the maturity stage were 0.133 mg/kg and 0.50 mg/kg respectively. The correlation study of the fruit borer infestation with free amino acid content of pulp and seed at all three stages were non significant and negatively correlated at different stages of development.

Keywords: Amino acid, correlation study, Himsagar, Mallika, pulp, seed.

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. This pest was once regarded as the minor pest in mango orchards had recently gained the major pest status due to injudicious application of broad spectrum insecticides in the mango orchards. The first pest brood was seen in the 1st fortnight of March and continued till June. Pest attack had been found to be maximum from the West direction. The larvae bored into the fruits both at the young marble stage to more mature ones producing a 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 a network of tunnels to reach the seed. The later instar larvae fed on the seed filling up the inner content by their excreta.

Materials and Methods

Studies on the varietal preference and incidence pattern of mango fruit borer on Eight cultivars of mango were done in the orchard. For ascertaining damage intensity in different cultivars, numbers of freshly bored fruits were counted out of 100 randomly selected fruits. This was found out to differential level of preference. RBD with Duncan multiple range test (DMRT) had been performed for calculation. To study the incidence pattern of mango fruit borer during 2008-2009 and 2009-2010 fruiting season Eight different cultivars were selected. Two replications of each from the selected cultivars were taken for the study and those plants were tagged during the month of February to March, i.e. flowering stage of the plant. The infestation of fruit borer was noticed at the pea to marble stage of the fruit when the kernels were yet to harden i.e. during the last week of March to 1st week of April. Data were taken at ten days interval on the tagged shoots. The plants under observations were kept free from any pesticide application. The attack mango fruit borer was recorded by recording the number of damaged fruits out of 100 randomly selected shoots. This randomly selected shoots were taken from each direction (East, West, North and South).

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Estimation of amino acid is done by the powerful oxidizing agent called Ninhydrin (Triketohydrindene hydrate) at pH= 4 to 8 produce oxidative decarboxylation of amino acid to produce CO₂, ammonia and aldehyde. Reduced Ninhydrin then reacted with the liberated ammonia to produce blue or purple coloured complex called Ruhemann's purple compound measured calorimetrically at 570 nm. The estimation of free amino acid was done in the laboratory of Department of Plant Physiology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal.

Reagents

80% Ethanol, 0.2 M Citrate buffer (pH=5), Ninhydrin reagent. Dilute solvent :Equal volumes of water and n-propanol stock standard leucine solution(50 gms leucine/50 mL water working standard leucine solution were mixed. 10 mL of stock leucine was diluted with 100 mL of water.

Estimation

- 1) 10 mL volume of 10% ethanol was added to 0.1 gm dry powdered sample taken in a test tube.
- 2) Centrifugation of the prepared sample was done at 4800

rpm for 20 minutes.

- 3) Dried samples were collected after evaporation of the ethanol from the materials by the help of hot water bath.
- 4) After dissolving the residue in 5 mL of the distilled water, 0.1 ml were pipette out into a test tube and 0.1 mL of prepared ninhydrin solution was added.
- 5) Volume make up was done with 2 mL distilled water.
- 6) By measurement of the absorbance value of the coloured solution at 570 nm wavelength by spectrophotometer the total free amino acid content were determined.
- 7) Then comparing the absorbance value with standard curve of the total free amino acid was done.

Results and Discussions

The colourless ionic compounds forming the basic units and building blocks of proteins are the amino acids. Free amino acids are the one which exist in the free form in many tissues apart from being bound as protein. They are mostly water soluble in nature, During diseased condition in plants the free amino acid composition exhibit a change and hence the clear idea of the total free amino acids give the physiological and health status of the plant.

Table 1: Correlation values of the fruit borer infestation with the total free amino acid content of pulp and seed at different stages of fruit development.

| Cultivars | Amino acid content (mg/kg) | | | | | % Infestation |
|-----------|----------------------------|-----------|--------|----------------|--------|---------------|
| | Marble stage | Egg stage | | Maturity stage | | |
| | Pulp | Pulp | Seed | Pulp | Seed | |
| Neelgoa | 1.044 | 0.436 | 0.134 | 0.126 | 0.058 | 3.53 |
| Neelshan | 1.131 | 0.329 | 0.070 | 0.290 | 0.033 | 4.05 |
| Mallika | 1.032 | 0.450 | 0.123 | 0.133 | 0.500 | 2.29 |
| Amrapali | 0.150 | 0.043 | 0.620 | 0.030 | 0.557 | 3.67 |
| Bangalora | 0.519 | 0.260 | 0.110 | 0.107 | 0.053 | 3.29 |
| Langra | 0.537 | 0.091 | 0.143 | 0.070 | 0.053 | 5.73 |
| Himsagar | 0.187 | 0.045 | 0.167 | 0.030 | 0.093 | 10.45 |
| Neeluddin | 0.544 | 0.108 | 0.273 | 0.073 | 0.250 | 3.29 |
| r value | -0.522 | -0.562 | -0.094 | -0.369 | -0.373 | |

From Table(1) It was observed that the highest percentage of infestation was seen in Himsagar (10.45%) where the total free amino acid content in the pulp and seed at the egg stage were 0.045 mg/kg and 0.167 mg/kg respectively. Also amino acid content in the pulp at marble stage was 0.187 mg/kg. While at the maturity stage the total free amino acid content in the pulp and seed were 0.030 mg/kg and 0.093 mg/kg respectively. The least percent infestation of the borer pest was seen in Mallika (2.29%) where the total free amino acid content in the pulp at the marble stage was 1.032 mg/kg. However, the amino acid content of the pulp and seed at egg stage were 0.450 mg/kg and 0.123 mg/kg respectively and that in the maturity stage were 0.133 mg/kg and 0.50 mg/kg respectively. The correlation study of the fruit borer infestation with free amino acid content of pulp and seed at all three stages were non significant and negatively correlated at different stages of development. The correlation study of the percent of fruit borer infestation with the total free amino acid in pulp at the marble stage was -0.522, while that with the pulp and seed amino acid content at egg stage was -0.562 and -0.094 respectively. However, correlation studies of percent of fruit borer infestation with the pulp and seed total free amino acid content at maturity stage showed negative correlation of -0.369 and -0.373 respectively. Nevertheless, it could be seen that the total free amino acid content of the pulp at the marble stage ranged from 0.150 mg/kg in Amrapali to 1.131 mg/kg in Neelshan. At the egg stage of the fruit the total free amino acid content in the pulp ranged from 0.043

mg/kg in Amrapali to 0.436 mg/kg in Neelgoa and the seed amino acid content ranged from 0.070 mg/kg in Neelshan to 0.620 mg/kg in Amrapali respectively. However, at maturity stage of the fruit, the total free amino acid in pulp showed in the range of 0.030 mg/kg in Amrapali to 0.290 mg/kg in Neelshan. while in the seed the total free amino acid showed in the range of 0.033 mg/kg in Neelshan to 0.557 mg/kg in Amrapali.

Conclusion

In West Bengal the red banded caterpillar attacked the mango fruits at two different stages. Caterpillar from hatched eggs bored into the tissues and made multiple tunnels into the seed. This produced the typical small hole at the distal end of the fruit. The hole gradually enlarged and faecal matter was accumulated. The fruit collapsed and infested fruits become unfit for human consumption. The bored hole in the fruit called upon secondary infestation of the fruits by several microorganisms like fungi and bacteria which caused necrosis of fruit.

Acknowledgement

I would like to convey my thanks to my parents and Teachers. Special thanks to Department of Agricultural Entomology and Department of Plant Physiology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal.

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