Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

J E Z S Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2015; 3(4): 307-311

Received: 08-06-2015
Accepted: 10-07-2015

Swapan Kumar Chowdhury
Dept. of Botany, Sreegopal Banerjee College, Bagati, Mogra, Hooghly-712148, West Bengal, India.

Correspondence:
Swapan Kumar Chowdhury
Dept. of Botany, Sreegopal Banerjee College, Bagati, Mogra, Hooghly-712148, West Bengal, India.

Diversity and nature of damage of mango insect pests at Kaliachak-II Block of Malda, West Bengal, India

Swapan Kumar Chowdhury

Abstract
The aim of this present study is to focus yield loss of mango fruit by different mango insect pests and their effect on economic condition of mada peoples as well as national and international trading system. This study is totally field based which was conducted during 2013-2014 in many public mango gardens of Kaliachak-II Block of Malda district to assess the fruit loss in different genotypes of mango due to mango insect pests. The principle insect pests of mango are hopper, mealy bug, inflorescence midge, fruit fly, scale, shoot borer, leaf Webber and stone weevil. Information about damage and fruit loss of mango was collected from farmers using questionnaire and group discussion and cross checked by aged People. The observation from field report revealed that yield loss and damages of mango affected by organ specific pests irrespective of mango genotypes.

Keywords: Diversity, Mango, pests, damage, Kaliachak, Malda.

1. Introduction
Mango (*Mangifera indica* L.) is one of the choicest fruit crops of tropical and sub-tropical regions of the world. Its popularity and importance can easily be realized by the fact that it is often referred to as 'King of Fruits' in the tropical world. India is the largest producer of mango in the world, contributing 40.48% of the total world mango production (Anonymous, 2013) [1]. Mango has been under cultivation in India since 4000 years and over 1200 varieties are said to exist in the country. The cultivated mango varieties in India, exhibit an unusual diversity of fruit forms, flavours and tastes (Mukherjee, 1948) [2]. At present, 20–30 land races are cultivated commercially, the majority of which are area-specific. Northern, eastern, western and southern regions of India are recognized as distinct mango growing regions, though some cultivars are grown over wider areas (Yadav and Rajan, 1993) [3].
Photosynthesis is the basis for growth, development and yield in plants, but perennial trees like mango have a very low orchard efficiency (Chacko and Randhawa, 1971) [4]. Earlier studies on different mango genotypes showed significant variation in gas exchange parameters, production and translocation of photosynthesis which are important in meeting the urgent requirement of sink (Singh and Rajan, 2009) [5]. Leaf morphological characters are important to support photosynthesis and both can influence the plant growth strategies of different tree species (Takayoshi *et al.*, 2001) [6]. In mango, Kalyan *et al.* (2012) [7] observed a variation in foliage density, shape of lamina, leaf nature, leaf apex, the colour of new and matured leaves and arrangement of major veins which can be helpful in differentiation among cultivars. The photosynthetic potential of leaves is reported to be inherited (Ojima *et al.*, 1969) [8]. It is also reported that, photosynthesis, has a strong association with chlorophyll content, photosynthetic production, total sugar concentration and specific leaf weight (SLW) in mango and other crops (Saini and Joshi, 1989; Nii *et al.*, 1995; Guru *et al.*, 1999; Singh and Rajan, 2009) [9-11, 5]. At the same time, leaf epicuticular wax is one of the important factors, which influence the energy balance of leaves by preventing the overheating of leaves and thereby affect photosynthesis (Armando *et al.*, 2012) [12]. The amount of epicuticular wax is positively correlated with tolerance to a variety of abiotic stresses due to its role in regulating gas exchange, leaf temperature and light reflectance properties (David and James, 1978; Mansour *et al.*, 2007) [13, 14].
There are about 176 insect pests on mango trees and fruits (Nair *et al.*, 1976) [15]. Mango stem borers, weevils, fruit flies, jassids, webworms, mealy bugs and scale insects are very destructive pests of mango. Out of which, weevils, fruit flies, mealy bugs and scales

are associated with fruits and cause severe damage at storage, there by affecting quality and marketability of the fruits. Weevil in particular is very bad pest of mango at storage due to which Indian mango export is banned in some western countries.

Mango *Mangifera indica*, the king of fruits was suffered from various insect pests and rodents at storage. There by affected the marketability of the fruits both in India and abroad. Therefore, the paper deals with the biology, damage and control measures of pests of mango at storage. From insect category weevils, fruit flies, scales, mealy bugs, dermestids, eye flies and drosophila were prominent pests and from rodents, Rattus rattus and *Bandicota indica* were the prominent pests found feeding on stored fruits (Sathe T. V., Bhoje P. M. and Desai A. S. 2014) [16].

The major reason for its low productivity is the threat of insect pests, out of which insects belonging to order Hemiptera damaged mostly the plants. Species diversity analyzed through consistent survey and sampling conducted in various districts of Jammu region from March 2013 to Feb. 2014 indicated that the mango plantations are damaged mostly by insects belonging to order Hemiptera (J.S Tara, M. Gupta, P. Shrikhandia, A. Bala, N. Zaffar and S. Sharma -2014) [17].

Fruit flies (Diptera: Tephritidae) are amongst the world's worst pests of fruits that cause enormous losses in orchards. The percentage of fly infestation for mango fruit was examined by randomly analyzing a total of 100 fruits and observing number of fruits showing fruit fly oviposition or injury marks. The results showed that tephritid fruit fly *Bactrocera zonata* (Saunders) was the predominant species (more frequent and constant) at experimental site. Surveillance of fruit fly populations in mango orchard revealed that peak population of *B. zonata* (40-30 per trap per week) and fruit infestation (9.05-7.45%) were recorded in June, July and August (M. Sarwar, M. Hamed, M. Yousaf, M. Hussain-2014) [18].

In West Bengal it was first recorded in Malda during although survey of mango orchards in Malda and Murshidabad by Jha *et al-1991*.[19.] 10-52% damage of fruits from pin head stage is noticed in West Bengal, particularly in Malda, Murshidabad, Nadia and Hooghly (Sahoo *et al.* 2009, JS. Tara *et al.* 2014) [20, 21].

2. Materials and Methods

The field studies for recording the pest diversity on mango plants were conducted Kaliachak-II Block of Malda district during the period from March, 2013 - February, 2014 to record the distribution of mango as well as insect pests associated with the plant along with their mode of damage. Data were taken at ten day interval on the tagged leaves, shoots, fruits, inflorescence of mango plants. The plants under observation were kept free from any pesticide application. The attack of different parts of mango were recorded by recording the number of damaged parts randomly from each direction (i.e. East, West, North, and South). The insects along with their immature and mature stages were collected by traditional methods of hand picking. The adults and nymphs were collected and preserved in 75% alcohol in vials for later identification in Laboratory. All the collected insect samples were identified by Dr. Manish Kanti Biswas, Department of Zoology, Sreegopal Banerjee College, Hooghly.

3. Results

During the period of observation, a total of 18 insect pests belonging to different families were recorded from the Malda region of W.B. state. Detailed report on pests and their effects were given bellow.

Table 1: List of pests and their period of damage

Name of the pests	Effected parts	Stage of Damage	Period of damage					
			Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
1.Leaf Hopper	Leaf	Nymphs and Adults	++	++	++	+	-	-
2.Mealy Bugs	All parts	Nymphs and Adults	++	++	++	++	++	++
3.Leaf Webber	Old crowded parts	Adults	-	++	++	+	++	++
4.Thrips	Leaf, Fruits	Nymphs and Adults	+	++	++	+	+	-
5.Stem Borer	Young Shoot	Grubs	++	++	++	++	++	++
6.Shoot borer	Seedling, young tree	Larvae	+	+	++	++	++	+
7.Leaf miner	Leaf	Adults	+	+	+	+	++	+
8.Scales	Leaf, Fruit, Inflorescence	Nymphs and Adults	++	++	+	+	++	++
9.Red ant	Leaf	Nymphs and Adults	++	++	+	+	-	++
10.Termites	Root, Stem	Nymphs and Adults	++	++	+	+	-	++
11.Fruitfly	Fruit	Larvae and Adults	-	-	++	++	+	-
12.Nut Weevil	Ripening fruit	Grubs	-	+	++	+	-	-
13.Leafgall midge	Leaf	Adults	+	+	+	+		+
14.Inflorescence midge	Inflorescence	Larvae	++	+	-	-	++	-
15.Bark borer	Stem	Nymphs and Adults	++	++	++	++	++	++
16.Shootgall psylla	Shoot	Adults	-	-	-	++		-

++ indicated maximum observed population
+ indicated lowest population observed
– indicated no population observed

3.1. Mango (leaf) hoppers (*Amritodus Atkinsoni, Idioscopusniveo sparsus, I. clypealis)*.

The population of hopper occurs from January to April on flowering flush. Also noticed during June-August on vegetative flush. Old, neglected and closely planted orchards that are shady and with high humid conditions favour their multiplication. Piercing and sap sucking of tender parts by nymph's and adults causing reduction of vigor that leads to shedding of flower buds, flowers and young fruits. Development of sooty mould due to honey dew secretion on leaves gives blackish appearance. Hoppers hibernate in the crevices of the barks on the tree. During higher infestation periods, characteristic clicking sounds of leaf hoppers can be heard. Warm, humid and cloudy climate is most congenial.

Figure -1 showing many Mango (leaf) hoppers on leaf surfaces.

3.2. Mealy bugs (*Drosicha mangiferae*),

The female adult crawls down the tree in the month of April-May and enter in the cracks in the soil for laying eggs. Pinkish nymphs and adult mealy bugs are present on leaves, inflorescence, branches, fruits and fruits talk. The nymphs of this pest suck sap from leaves and inflorescence causing dryness leading to flower drop and negligible fruit set. They also secrete honey dew which gives rise to sooty mold attack.

Figure -2-4 showing Mealy bugs on leaves, fruits and inflorescences.

3.3. Leaf Webber (*Orthagaexvinacea, O. euadrusalis, O. thyrisalis)*

Pest infestation begins from the month of April and continues up to December. It is a pest that is attaining serious proportions mainly in Malda, India especially in old, crowded orchards where there is excessive shade. Infestations of leaf Webber may begin as early as seedling stage and persist even during flowering and fruiting. Webbing of terminal leaves and tender shoots with several caterpillars found inside. Caterpillars initially scrap and feed on the terminal leaves within the web and give burnt appearance to leaves.

Figure 5, 6 showing Leaf Webber on leaves.

3.4. Thrips (*Scirtothrips dorsalis*): Thrips are showing all season of a year except November and December. Thrips are polyphagous in nature and are widely distributed around mango growing regions of Malda. Laceration of leaf tissues as a result of sucking of the cell sap by nymphs and adults. Silvery sheen on affected leaves bearing small spots of faecal matter. *C. indicus* and *R. cruentatus* feed on leaves and causes stippling on leaves *S. dorsalis* mainly feed on inflorescence and fruits which show discoloured tissues that subsequently turn brown.

Figure 7 showing many Thrips on leaf surfaces.

3.5. Stem borer (*Batocera rufomaculata)*

Grubs feed inside the stem boring upward making irregular tunnels which results in interruption of nutrient and water transport in the tissue. Drying of terminal shoot in early stages and severe symptoms causes wilting of branches or entire tree.

Figure 8 showing Stem borer on infested stem.

3.6. Shoot borer (*Chlumetia transversa)*

This pest can be found throughout India and is serious in seedlings and young trees.

Tunneling from top-down wards of the tender terminal shoots. Stunting of seedlings with terminal bunchy appearance. Larvae of this moth bore into the young shoot resulting in dropping of leaves and wilting. Similar symptoms also noticed on panicles.

Figure 9 showing Shoot borer on young shoot.

3.7. Leaf miner (*Acrocercops syngramma)*

Light brown caterpillars mine the dorsal epidermis of tender leaves and feed within. Mining results in greyish- white blisters on leaves**.**

Figure 10 showing many Leaf miner on leaf.

3.8. Scale insect: (*Aspidiotus destructor*)

The vigour of the plants is reduced as both nymphs and adult scales suck the sap of the leaves and other tender parts. Secretes honeydew which encourages the development of sooty mould on leaves and other tender parts of the mango plant. Flower spikes and fruits may also be infested.

Severe scale infestation tends to adversely affect the growth and fruit bearing capacity of the tree.

Figure 11 showing many Scale insects on leaves.

3.9. Red ant *(Oecophyllas maragdina)*

Red ant Webbed of leaves with ants forming nests of all season of a year. Reddish Ant, queen – olive green in colour.

Figure 12 showing Red ant on leaves.

3.10. Termites *(Odontotermes* sp.)

Termites are cover with soil on stem, root and protect sunlight. Termites are white in colour, prefer darkness and remain underground. They feed on root or move upward making the tunnels with the construction of mud galleries on tree.

Figure 13 showing Termites on stem.

3.11. Shoot gall psylla (*Apsylla cistellata*)

The pest is active from August onwards with the nymphs emerging from eggs during August- September and crawling to the adjacent buds to suck cell sap. As a result of feeding, the buds develop into hard conical green galls which are usually seen during September-October. Terminal shoots affected. Formation of green conical galls in leaf axis in response to egg-laying by adult insects or feeding by nymphs. Development of the green galls results in no flowering and fruit setting. Figure 14 showing Shoot gall psylla on growing shoot.

3.12. Fruit fly (*Daccus dorsalis; D. zonatus and D. correctus*)

The oriental fruit fly is one of the most serious pests of mango in the country, which has created problem in the export of fresh fruits. The female punctures the outer wall of the mature fruits with the help of its pointed ovipositor and insert eggs in small clusters inside the mesocarp of mature fruits. After hatching, the larva feeds on the pulp of fruit which appears normal from outside, but drops down finally. The mature maggots fall down into the soil for pupation. The emergence of fruit fly starts from April onwards and the maximum population is recorded during May -July, which coincides with fruit maturity. The population declines slowly from August to September after that it is non-existent up to March. Figure 15 and 16 showing Adult and maggots' fruit fly on ripening mango fruit.

3.13. Mango nut weevil (*Sternochetus Mangiferae)*

Grub makes zigzag tunnels in pulp, Eats unripe tissue and bore into cotyledons. Fruit dropping at marble stage. Oviposit ion injuries on marble sized fruits. Tunnelled cotyledons in mature fruit by grubs**.**

Figure 17 showing Mango nut weevil in mango fruit nut.

3.14. Midge

There are four species of midges prevalent in India with three species attacking blossoms

While one attacks the leaf. The inflorescence midge is becoming serious in some pockets of

Uttar Pradesh, as well as Maharashtra.

A] Leaf gall Midge (*Procontarinia matteiana*)

Wart-like galls produced on leaves that reduce photosynthetic activity leading to leaf drop and lowered fruit production. Infested plant material and wind currents are responsible for its spread. Figure 18 showing Leaf gall Midge on leaves.

B] Inflorescence midge (*Erosomyia indica*)

Attacks at flower bud burst stage and fruit set stage during January and May. The midge infests and damages the crop in three different stages. The first attack is at the floral bud burst stage. The eggs are laid on newly emerging inflorescence; the larvae tunnel the axis and thus destroy the inflorescence completely. The mature larvae make small exit holes in the axis of the inflorescence and slip down into the soil for pupation. When the tender fruits are attacked they slowly turn yellow and finally drop. The third attack is on tender new leaves encircling the inflorescence. The most damaging one is the first attack in which the entire inflorescence is destroyed even before flowering and fruiting. The inflorescence shows stunted growth and its axis bends at the entrance point of the larvae. Figure 19 showing Inflorescence midge on Inflorescence.

3.15. Bark borer: (*Indarbela tetraonis)*

Young trees may succumb to the attack. Caterpillars bore into the trunk or junction of branches Caterpillars remain hidden in the tunnel during day time and come out at night, feed on the bark. Presence of gallery made out of silk. Larva - Stout and dirty brown in colour. Adult-Stout yellowish –brown moth with brown wavy markings on the forewings Hind wings is white colour. Males are smaller than the females. Figure 20 showing Bark borer on stem.

Fig:1 Mango (leaf) hoppers

Fig:2 Mealybugs on leaf

Fig:3 Mealybugs On fruit

Fig:4 Mealybugs on inflorescence

Fig:5 Webbing of terminal leaves due to leaf webber

Fig6: Larvae ofleaf webber

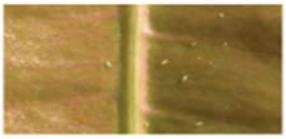

Fig:7 Thrips on leaf

Fig:8 Stem borer infested trunk

Fig: 9 Larva of shoot borer

Fig:10 Leaf miner

Fig:11 Scale insect

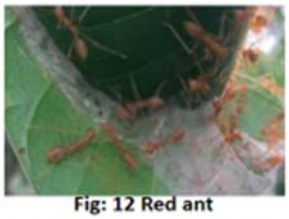

Fig: 12 Red ant

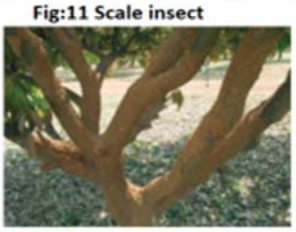

Fig: 13 Termites

Fig:14 Shoot gall psylla

Fig:15 Adult

Fig:16 Maggots of fruit fly on mango fruit

Fig: 17 Mango nut weevil

Fig:18 Leaf gall Midge

Fig:19 Inflorescence midge

Fig:20 Bark borer

4. Discussion

In the present work, different types of pest exclusive for mango were studied over a period of one year in Langra, Fajli, Ashina, Himsagar and Lakshmanbhog varieties which were common to the Malda district of West Bengal, India. It was observed that mainly 16 pests were common to all mango varieties. These pests were plant part specific and affects all types of mango plants i.e. irrespective of mango genotypes. They lowers the yield of mango mainly by affecting photosynthesis and phytochemical metabolisms (by damaging leaves and pericarp of immature fruits), water and food transportation (by stem damage). Pest directly lowers the fruit yield by damaging flowering twig, immature fruits and during ripening.

5. Conclusion

Studies undertaken on the incidence of mango insect pests during 2013 and 2014 revealed that the peak damage took place during the last week of March to first week of April and infestation decline gradually reaching the lowest during mid-May. Investigation on the incidence of this insect pest in the orchard during 2013-2014 showed that maximum damage of different parts of mango plants started from the last part of March to the first week of May when fruits were in the pea to marble size with a first peak recorded during the last week of March and continuing up to first week to mid-May after which the population began to decrease. Among the varieties studied, Himsagar followed by Fazli, Lakshmanbhog, Asiana, Nagra were highly susceptible to the mango insect pests. The work represented here would be very helpful for controlling mango pests in different seasons to yield better quality and quantities of mango in Malda and allied areas.

6. Acknowledgement

The author is grateful to Dr. Manis kanti Biswas (Entomology), Zoology Department of Sreegopal Banerjee College for his constant advice and suggestion of this study.

7. References

1. Anonymous, Retrieved 04.10.13 http://agriexchange.apeda. Gov.in/Market%20 Profile/one/MANGO.aspx
2. Mukherjee SK. The varieties of mango (Mangifera indica L.) and their classification. Bull. Bot. Soc. Bengal 1948; 2:101-133.
3. Yadav IS, Rajan S. Genetic resources of Mangifera. In: Chadha, K.L., Pareek, O.P. (Eds.), Advances in Horticulture, Fruit Crops, Part 1. Malhotra Publishing House, New Delhi, India, 1993; 1:77-93.
4. Chacko EK, Randhawa GS. Towards an understanding of the factors affecting flowering in mango (Mangifera indica L.). Andhra Agric. J 1971; 18:226-236.
5. Singh VK, Rajan S. Changes in photosynthetic rate, specific leaf weight and sugar contents in mango (Mangifera indica L.). Open Hortic. J 2009; 2:40-43.
6. Takayoshi K, Mitsutoshi K, Yutaka A, Shigeta M, Thomas TL. Leaf morphology and photosynthetic adjustments among deciduous broad-leaved trees within the vertical canopy profile. Tree Physiol 2001; 21:951-958.
7. Kalyan C, Tuhinsri S, Arvind KC, Samir KS. Leaf characters and measurements of mango cultivars in Gangetic plains of West Bengal. In: International Seminar on Multidisciplinary Approaches in Angiosperm Systematics, 12 September Kalyani, WB, 2012, 762-768.
8. Ojima M, Kawashima R, Mikoshiba K. Studies on the seed production of Soybean. VII. The ability of photosynthesis in F1 and F2 generation. Crop Sci. Soc. Jpn. Proc 1969; 38:693-699.
9. Saini JP, Joshi HC. Diurnal variation in SLW and total sugar in the leaves of ragi. Himal. Res. Develop 1989; 6:23-24.
10. Nii N, Watanabe T, Yamaguchi K, Nishimura M. Changes of anatomical features, photosynthesis and ribulose bisphosphate carboxylase – oxigenase content in mango leaves. Ann. Bot 1995; 76:649-659.
11. Guru SK, Jain V, Pal M, Abrol YP, Relationship between specific leaf weight and photosynthetic rate in two wheat genotypes. Indian J Plant Physiol. 1999; 4:117-120.
12. Armando G, Wilmer T, Elizabeth R, Ana H. Eco physiological responses to drought and salinity in the cosmopolitan invader Nicotiana glauca. Braz Braz. J Plant Physiol. 2012; 24(3):213-222.
13. David AR, James WH. Physiological effect of surface waxes. Plant Physiol 1978; 62:101-104.
14. Mansour AM, Jennifer RW, Robert SH. The impact of epicuticular wax on Gas-exchange and photoinhibition in Leucadendron lanigerum, Proteaceae. Acta Oecol 2007; 31:93-101.
15. Nair KK, Ananthkrishnan TN, David BV. General and applied entomology, Tata Mc Graw-Hill publishing co. Ltd, New Delhi, 1976, 589.
16. Sathe TV, Bhoje PM, Desai AS. Pests of Mango Mangifera Indica Linn. At Storage and Their Control, Indian Journal of Applied Research. 2014; 4(7).
17. Sathe TV, Bhoje PM, Desai AS. Harmful Scale Insects (Coccidae: Hemiptera) of Mango and Their Control. Global Journal for Research Analysis, 2014; 3(6), 10-12. |
18. Sarwar M, Hamed M, Yousaf M, Hussain M. Surveillance on Population Dynamics and Fruits Infestation of Tephritid Fruit Flies (Diptera: Tephritidae) in Mango (Mangifera indica L.) Orchards of Faisalabad, Pakistan, International Journal of Scientific Research in Environmental Sciences. 2014; 2(4):113-119.
19. Jha S, Sarkar A. Mango in Malda, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, W.B., 1991, 13.
20. Sahoo Sk, Jha S. Bioecology of Mango Fruit borer, Autocharis (=Noorda) albizonalis Hampson (Pyralidae, Lepidoptera)-A Recent Threat to Mango Growers in West Bengal, India. (ed,: S.A. Oosthuyse, Proc. VIII Int. Mango Symposium Acta Hort.820,ISHS 2009) Acta Horticulture, 2009; 820:1345-1425.
21. Tara JS, Gupta M, Shrikhandia P, Bala A, Zaffar N, Sharma S. Record of Some Hemipteran Insect Pests of Mango (Mangifera indica) From Jammu Region of Jammu and Kashmir State, International Journal of Interdisciplinary and Multidisciplinary Studies (IJIMS). 2014; 1(8):19-29.