



Pests of Mango *Mangifera Indica* Linn. at Storage And Their Control

KEYWORDS

Mango, storage fruits, damage, insect pests, rodents, control

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ABSTRACT *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. The insect pests were controlled by adopting preventive control measures and spraying storage shade and around area with 0.02% phosphamidon and treating fruits with 0.03% Azadirachtin or keeping fruits in hot water 50 to 52°C for 2 to 3 hours while, rodents were controlled by keeping poison baits in their nesting and visiting places.

INTRODUCTION

In India mango *Mangifera indica*, a king of fruits is cultivated in about 7, 50,000 hectares of land. It is widely cultivated in the states Uttar Pradesh, Andhra Pradesh, Bihar, Maharashtra, West Bengal and Kerala. Maharashtra is leading states in mango cultivation in India, wherein it is cultivated from coastal, Ratnagiri and also plain regions. Hapus, hybrid and indigenous varieties have economic importance in horticultural business. There are about 176 insect pests on mango trees and fruits (Nair et al, 1976). 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, mealybugs 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. At storage rodents also cause considerable damage. Keeping in view all above facts the present work was carried out from Kolhapur region of Maharashtra. In past Ayyar (1924), Fotidar and Kapur (1941), Rehman and Latif (1944), Singh (1960), Ellerman (1963), Deoras (1964), Bhutani (1974), Sathe (1998, 2010, 2014) etc. worked on pests of mango.

MATERIALS AND METHODS

Survey of pest insects was made during the years 2012-2014 by visiting various mango orchards and storage houses of mango in western Maharashtra, India by one week interval by one man one hour search method. Ripening fruits on the trees and field storages of mango were also surveyed weekly and observation on life cycle nature of damage and important pest features studied by consulting literature cited in references. Egg deposition, incubation, larval/pupal and adult emergence duration, were the components of life cycle studies. For chemical control 0.02% Phosphamidon or 0.03% Azadirachtin have been used. Similarly, observations on rodents and their damage to storage mango have also been made. For rodents control, poison baits have been used.

RESULTS

Results recorded in table 1 and figs 1- 4 indicated that 10 species of insects were found damaging storage mango fruits. The most abundant and more destructive insects were

Dacus dorsalis, *Aspidoitus destructor*, *Sternochetus mangiferae*, *Drosicha mangiferae*, dermestid beetles, *Drosophila* and *Siphunculina funicola*. The fruits of ripening stage were found seriously affected by disfiguring, forming brownish reddish circular spots and making the fruits insipid by *A. destructor* and *D. mangiferae* while, *D. dorsalis* larvae fed on pulpy contain of fruits and they formed numerous exits on fruits for escaping and for pupation in soil. Such fruits invited secondary pathogenic infestations and fruits found rotten. *S. mangiferae* was probably the worst enemy of mango industry for which western countries banned mango import from India. The grubs of *S. mangiferae* were associated with pulpy content of the fruits and also found in stone feeding on embryo. Many times weevils have been observed coming out of the mango stone when the mango fruit was eaten by man. The weevils were also found emerged from the mango stone and pulpy content before it was consumed by man. This behavior of the pest has seriously affected the export of mango from India. Dermestid beetles, eye flies and drosophila were specially associated with damaged fruits.

At the time of harvestation of fruits field infested fruits by scales and mealy bugs were isolated and brushed or kept in water 50-52°C for half an hour. This water treatment removed all scales and mealy bugs attached to mango fruits. Hot water (50-52°C) treatment to mango solved the problems of weevil and fruit fly control.

The control of stored fruit insects was possible by preventive and curative control measures.

Preventive measures:

1. Disposal of damaged fruits and fruit residues from storage house and around area. Similarly, field infested, damaged fruits be collected and destroyed along with pest stages.
2. After consumption of the fruits, stones be collected and burned/destroyed, along with weevil stages.
3. Earthling of soil below the trees for exposing pupae of fruit flies and weevils to natural mortality factors has solved the pest problem up to certain extent.
4. For avoiding damage, fruit harvesting be made at appropriate time (as early as possible) and not delayed.

Curative measures:

1. Hot water (50-52°C) treatment be given to fruits for 2-3 hours for killing weevil stages in stone of mango.
2. Dipping the fruits in emulsion of ethylene di-bromide at 50-52°C for 2 hours can kill the weevil stages in mango fruit.
3. Treating fruits with 0.03% Azadirachtin spray. Spraying the storage shade and around area with 0.02% Phosphamidon.
4. Rodents can be controlled by keeping poison baits near the nesting and their frequent visiting places. Poison bait be prepared with Zinc phosphide 1 part and 40 parts of ground nut cracked. Balls be prepared with poison bait and used.

DISCUSSION:

S. mangiferae was widely distributed in the tropics and was more common in South India (Atwal, 1963). The present work indicates that *S. mangiferae* was quite abundant in western Maharashtra. According to Singh (1960) freshly formed grubs bored through the pulp, fed on seed coat and later damaged the cotyledons. Pupation took place inside the stone. Later, the adults came out of the ripe fruits. On cutting open the fruits, the pulp adjacent to the affected stone was seen discolored due to excretion of the grub. In the present study, adults as well as grubs were found coming out from ripen fruits. Therefore, Indian mango is banned in certain European countries and U.S.A.

According to Narayanan and Batra (1960) the fruit flies were strong fliers and active throughout the year in South India. However, it hibernated in winter in pupal stage. In active period the maggots fed on pulpy content of the fruits. A brown patch was developed around the oviposition spot later, the fruits rotted. In the present study, *D. dorsalis* completed its life cycle within 14-15 days. According to Bees and Haramoto (1977) temperature above 21°C was necessary for the flies to attain sexual maturity and avoiding pre oviposition period. In the present study, the field temperature range was 32-40°C, hence one generation was completed within a very short period, 14-15 days and female oviposited on the fruits shortly and completed many generations in a single season and became serious pest on mango in western Maharashtra.

Although several species of scale insects were associated with mango, *A. destructor* was the only species which attained status of major pest of mango at storage and field condition (Sathe et al., 2014). The sucking pests *D. mangiferae* and *A. destructor* were active in summer season and destroyed much amount of the fruits. The presence of an impervious coating or shield over the bodies of these insects makes it difficult to control them effectively by use of insecticides. However, in the present study insecticides 0.03% Azadirachtin and 0.02% Phosphamidon proved to be satisfactory. Azadirachtin acts as antifeedant against insect pest. It is not only effective against mealy bugs and scales but also against aphids, jassids, thrips and necked caterpillars. It was safer to biocontrol agents and humans. In fact, it is dermal disease curative in humans (Sathe et al., 2014).

Mc Bride and Mason (1934) studied the effect of sub freezing temperature on mango seeds containing grubs and pupae of weevil *S. mangiferae* and observed that exposure of the stones for 48 hours at 120°C killed all grubs and pupae and also 77.7% adults. Five days exposure gave cent per cent mortality of adults. David and Sundara Babu (1962) found spraying with 0.01% Fenthion to be effective. For control of mango weevils, Cheema et al (1954) suggested destruction of affected fruits and digging of soil to expose the hibernating weevils.

In storage or in open condition, the rodents not only destroy the fruits but also invites additional pests like Dermestid beetles, eye flies and *Drosophila* and also pathogens which cause fruit rotting. In the present study rodents were

controlled by poison baits prepared with Zinc phosphide and cracked ground nut. The same strategy was suggested by Atwal (1963). Mango insect pests were widely attempted in the fields. However, very little attention is paid on stored mango pests and their control. Therefore, this work will add great relevance in solving the pest control problems at storage.

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Table- 1: Life cycles and damage of mango pests

Sr. No.	Species	Damage	Life cycle and features
1.	Weevil <i>Sternochaetus mangiferae</i> Fabricus (Coleoptera: Curculionidae)	Larvae feed on pulp and seed content in stone	Adults dark brown with snout, short and stoutly builded. Life cycle completed within 45 days.
2.	Fruit fly <i>Dacus dorsalis</i> Hendel (Diptera: Tephritidae)	Larvae feed on pulpy content, make holes to fruit, fruit rot.	Adults brownish with yellow legs, transparent wings, dark rust red and black stripes on thorax. About 12-16 mm long, larva leg less, yellowish opaque. Life cycle completed in 12-15 days.
3.	Mealy bug <i>Drosicha mangiferae</i> Green (Hemiptera: Coccidae)	Nymphs and adult female suck cell sap from fruits, make fruits insipid and disfigured.	Adult males winged and females wingless. Nymphs and females flat bodied, mahogany red with white waxy component on their bodies. Life cycle completed in 3 months.
4.	Scale <i>Aspidiotus destructor</i> Signort (Hemiptera: Coccidae)	Nymphs and adult females suck cell sap from fruits, makes fruit insipid and disfigured.	Adult males winged; females and nymphs wingless, rounded white, circular flat scale like, remained attached to fruits. Life cycle completed within one month.
5.	Dermestid beetle (Coleoptera: Dermestidae)	Adults and grubs feed on pulpy content of fruit.	Adults 2.5 – 3mm long and brownish.
6.	Dermestid beetle (Coleoptera: Dermestidae)	Adults feed on pulpy content of fruit. Mostly liked wounded fruits for feeding.	Adults 3- 4 mm long, brownish red, typically taper posteriorly and broader thoracically and again narrowed anteriorly.
7.	<i>Drosophila</i> (Diptera: Drosophilidae)	Adult and larvae feed and develop on pulpy content of the fruit.	Adults 2-3 mm long with orange head and transparent wings, thorax and abdomen light orange with white longitudinal stripes.
8.	Eye fly <i>Siphunculina funicola</i> (Diptera: Chloropidae)	Adults feed on juice from damaged fruits.	Adults black; 2 mm long, aggregates on hanging threads, wires etc. Life cycle completed in 12-14 days.

9.	Rat <i>Rattus rattus</i> (Rhodentia: Murinae)	Rats feed on stored fruits and damaged them and invited other insects like dermestids, drosophila, etc for causing more damage by developing upon them.	Adults grey brown to black, about 12 -14 cm length, breed throughout the year.
10.	<i>Bandicota indica</i> (Rodentia: Murinae)	Rats feed on stored fruits and damaged them and invited other insects like dermestids, drosophila, etc for causing more damage by developing upon them	Adults black, large sized about 20-25cm, about 300-500 gm in weight, breed throughout the year.



Fig 3 Scales *Aspidoitus destructor* on mango fruits



Fig. 4 *Drosophila* flies on damaged mango fruit

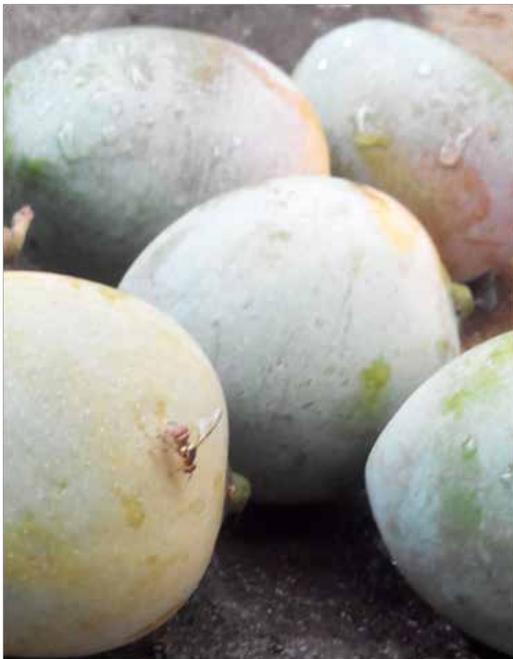


Fig.1 *Dacus dorsalis* on Mango fruit



Fig.2 Mango damage (exits) by *Dacus dorsalis*

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