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A case study of the life cycle of the *Pectinophora gossypiella* Saunders (Lepidoptera:Gelechiidae) of a cotton worm on the vegetable plant *Abelmoschus esculentus* of Ramgarh, Jharkhand, India

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Abstract:- The pest *Pectinophora gossypiella* Saunders is a serious pest of cotton plant, it damage the stem, buds flowers and the cotton bolls. Its life cycle was completed on cotton plant *Gossypium hirsutum*. It damage 75% of cotton bolls, plants and cotton seeds. Some times on serious infestation the damage reach up to 100 %. The quality and the quantity of the cotton balls and cotton seeds decline. The present paper deals with the life cycle of *Pectinophora gossypiella* Saunders on a new vegetable plant *Abelmoschus esculentus* in Ramgarh, Jharkhand. The life cycle was studied during the year 2018-2020 at Ramgarh. During the study it was found that the life cycle of pest was very complicated generally it completed 4 to 5 overlapping generations between July to November of a year. Some of the larvae hibernate in extreme cold and larval period prolong up to two years. Some of the moths emerge out from the cocoon present in the soil. The larvae enters the fruits of vegetable and protect them self from the birds and predators as well as eating the plant and pluck the bore by excreta cause as damage the vegetables. The lady's finger is a healthy and tastier vegetable, rich in carbohydrate, minerals and fibres. The pest damage the cultivated vegetable plants and loss not only the quality, quantity, and taste of the vegetables and also the profit of the farmers. Ramgarh is a district town, the rural area is known for gross vegetable production, the climatic condition is moderate and suitable for vegetable production. The experimental pest is very difficult to control. Pest should be controlled by mechanical and by spraying carbaryl 1 0.1%, endosulphan 0.05%, endrin 0.04%.

Key words: pest, minerals, quality, vegetables, fibres.

INTRODUCTION

Pectinophora gossypiella Saunders is a serious pest of cotton plant. This species is common in the cotton yielding warm region of Asia, America, Africa and Australia. The life cycle of this cotton pest needs dry and warm climate. Ramgarh is a district town located at

Lat.23.38° N and Long.85.34 °E., situated very near to Ranchi the capital of Jharkhand ,about 40 km. south-east. The temperature is moderate with more humidity. This climate is favourable for vegetable cultivation. Cabbage, Brinjal, Cauliflowers, Lady's fingers are the main vegetable crops of Ramgarh.

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Considerable works have been done by workers on the life cycle of cotton pest on cotton plant, but none of the scientist studied the life cycle of *Pectinophora*

gossypiella Saunders on lady's finger plant in Ramgarh. The present author deals with the life cycle of *Pectinophora gossypiella* Saunders on plant *Abelmoschus esculentus* Moench, the lady's finger plant in Ramgarh. Lady's finger (bhindi) is a delicious vegetable available throughout the year. It is full of carbohydrate, minerals and fibres. The larvae cut the buds and enters the fruit eating the fruit and come out through the bore and pluck the bore by excreta, and the fruit remained was full of excreta. The pest not only decline the quality, quantity and taste of the vegetable but also the financial condition of the farmers. The pest completed 4 to 6 overlapping generation during the month July to November of a year.

Some of the larvae hibernate in extreme cold weather and it prolong up to two years. Some of the moths emerged out from silicon cocoon present inside the soil and continue their lifecycle. Various instars of larvae can be seen at a time on the plant. Prevention is very difficult of this pest, pluck the infected plant and fruits manually and destroy. Carbaryl 0.1 % or endosulfan 0.05 % or endrin 0.04% spray is also advised to farmers.

MATERIALS AND METHODS

Standard methodology was applied for the study of life cycle of *Pectinophora gossypiella* Saunders. Life cycle and the nature of damage of the experimental pest were studied in the crop field as well as in the laboratory. The life cycle was studied during the year 2018-2020. Ten healthy selected plants of *Abelmoschus esculentus* Moench (Bhindi) were completely and carefully covered by a small mesh mosquito net separately. One pair (one male and one female) of experimental pest were introduced on the plant covered by mosquito net and make observation daily. One pair (one male and one female) of the experimental pest were kept in the cage of 20 cm x 20 cm x 30 cm and provided them fresh leaves of host plant for egg laying and hatching, the observation were recorded for further study. Methods of prevention of crop and control of pests were collected and recorded. The records of the private agencies and the scientists of Birsa Agriculture University, Ranchi, were also kept in mind for accurate result.

OBSERVATION

High temperature and average rain fall is suitable for cotton cultivation. One of the serious cotton pests is

Pectinophora gossypiella Saunders. It damage 60% to 90% some times 100% cotton crops. Now the present author deals the life cycle of the pest on vegetable *Abelmoschus esculentus* Moench. It is a common vegetable of Ramgarh (Jharkhand) cultivated throughout the year.

Morphology of the pest: The experimental moth was a small grey brown active pest. The wings span of the pest was 8 to 10 mm. The fore wings having blackish spots on grey brown colours. The margins of the hind wings are deeply fringed. The antennae are filiform.

Morphology of larva: The newly hatched larva is pale yellow coloured with a dark head and greyish prothoracic shield. It grows to the length of about 10 to 12mm. The full grown larva was pink body, brown head, two lateral grey strips on the body.

Life cycle of pest: The pests were active in rainy season and took part in reproduction. The adult moth flies around after dusk and hides during the day light. A large number of moth appeared in the month of July to September, few moths were also observe in the month of March and October, November. The female moth lays 250 to 300 eggs, singly or in clusters of 2 to 10, on the hairs of the back of the leaves, soft stem, on the buds and on the fruits of the vegetable plant. The female died after egg laying. The hairy structure of the plant was suitable for egg laying. The freshly laid eggs were translucent white flattened elongated and later turns yellowish brown and then turns deep brown in colour before hatching. After the incubation of 3 to 4 days in March, 5 to 7 days in July to September (rainy) and 12 to 18 days in October, November the larvae hatched in to pale yellow colour tiny caterpillars with dark head and greyish prothoracic shield. The caterpillars started to eating and bore to tender shoots, buds and latter to the flowers and fruits. The tiny caterpillar entered the fruits through the bud and exit through the bore and attack new fruit, the bore was plucked by excreta. The caterpillar passes through 6 instars and rich to a full grown larval stage. The full grown larvae were about 10 to 12 mm long. The larvae attain full grown stage at an age of 04 to 30 days, except in cold days. The full grown larvae were pink coloured body, brown head and two lateral grey strips over the body. The full grown larvae moved from fruits and pupate in a tough silken cocoon of grey colour attached to the stem or fallen leaves on the ground. The moth emerges out from the cocoon in 05 to 07 days in

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the month of March, July, August and September and 40 to 80 days in winter. In extreme cold winter the larvae and pupae hibernate, sometimes the hibernation prolong up to two years and become active when temperature become favourable. After emergence the moth mate in next night and laying eggs from second to fourth night. The lifecycle of the pest completes in three weeks to one month in

summer. There are 04 to 06 over lapping generations are observe in a year. The attack of the pest is maximum in rainy season and minimum in winter. There was peculiar types of lifecycle observe in this moth. The short life cycle which was completed in 03 to 08 weeks, while the long lifecycle which was completed in 04 to 10 months.

Table 1. Representation of lifecycle of pest *Pectinophora gossypiella* Saunders, on host plant *Abelmoschus esculentus* Moench.

Sl. no.	Name of months	No. of eggs laid	Incubation period of eggs in days	No. of days of hatching	No. of days of pupation
1.	March-April	250-300	03-04	04-05	05-07
2.	July-September	250-300	05-07	07-10	10-12
3.	October-November	250-300	12-18	15-30	40-90
4.	December-February	250-300	20 days-up to 2 year	40-80	40-90

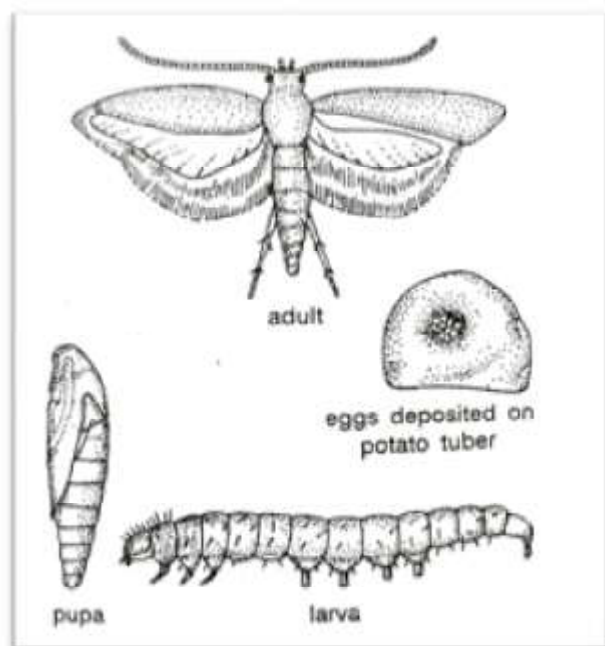


Fig.1. Life cycle of *Pectinophora gossypiella* Saunders.



Fig.2. Host plant *Abelmoschus esculentus* Moench.

Suggestion for control of pests:

1. Infected parts of the plant should be collected and destroyed.
2. After the crop is over the plant should not be remain there on the field.
3. The infested area should be flooded or irrigated and ploughed which destroys the hibernating caterpillars in the fields.
4. The seed should be kept under “sun heat treatment” to kill hibernating larvae.
5. Resistant variety only should be grown.
6. Pest population can be controlled by spray of carbaryl 0.1%, endosulphan 0.05% or endrin 0.04% at the interval of 15 days.

DISCUSSION

Ramgarh is a beautiful district town of Jharkhand state. The climatic condition of Ramgarh is moderate and suitable for the vegetable cultivation. Vegetables are the main and cheap dietary components of starch, carbohydrate and minerals to produce energy for the all vital activities of the poor population (Upadhyay *et.al.* 2012, Upadhyay & Bakshi 2019)^{1,2}. The production of *Abelmoschus esculentus* (bhindi) vegetables is abundant, easy to transport make the Ramgarh good and prime market for vegetable sale (Upadhyay & Bakshi 2020)³. The experimental pest *Pectinophora gossypiella* Saunders is a serious pest of cotton plant *Glossypium hirsutum*. The present paper deals the life cycle of the pest on *Abelmoschus esculenta*, it is a common yielding crop of Ramgarh throughout the year. The pest is very much adapted on this plant. It lays eggs on the hairs, the tiny larvae feed and enters the buds, flowers and fruits of the crop sometimes the tender stem also, the bore was plucked by the excreta. Six instars of larvae were observe on the plant in hidden position and protect them self from birds.

A peculiar lifecycle was observed in this moth the short life cycle completed in 3to 8 weeks while the long lifecycle was completed in 04 to 10 months. This can be observe by table.

In March to April the life cycle completed in 03 to 08 weeks but in winter it take more months, the larvae and pupa hibernates during extreme cold seasons, sometimes up to 2 years. All the metabolic activities directly affected by the temperature, humidity, pH etc. (Upadhyay & Verma 2004, 2005, Upadhyay 2009)^{4,5,6}.

Prevention and control of the pest is a very difficult phenomenon. The larva inside the plant does not die by pesticide. The spray of carbary 1 0.1% S, endosulphan 0.05% or endrin 0.04% kill the eggs, larvae and adults on the surface (Kumar & Tiwari 2009, Prabhakar & Roy 2009)^{7,8}. Destroy the infected parts of plants. Cultivate the improved and resistant variety of *Abelmoschus esculentus* Moench the Lady's finger plant.

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