

Study on population dynamic of pink bollworm *Pectinophora malvella* (Lep.: Gelechidae), in Golestan province of Iran

Mojeni, T. D^{1*} and Golmohammadi, Gh²

- 1- Cotton Research Institute of Iran, Agricultural Research, Education and Extension Organization (AREEO), Gorgan, Iran
- 2- Iranian Research Institute of Plant Protection, Agricultural Research, Education and Extension Organization (AREEO), Tehran, Iran

Corresponding author: Mojeni, T. D

ABSTRACT: Cotton is one of the strategic and industrial products in the world. From 1970 in the province of West Azerbaijan due to secondary pests of cotton Red worm (*Pectinophora malvella*) that can be transmitted through the seed, and the risk of transmission to other parts of the country are prone cotton, cotton cultivation is prohibited. According to research conducted over three years, the results indicate that hunting moths in pheromone traps in the second Red worm first half of May recorded and Red worms secondary pest activity from late May to coincide with the start of the *Althaea spp.* plant flowering in June and the spawning population reaches maximum. At the end of June and the first half of July with a peak population has been recorded in pheromone traps. With warm weather in July and August the *Althaea spp.* plant drying plant pest population is reduced. Research on the biology the *Althaea spp.* under natural conditions environment by installing cage *Althaea spp.* Plant was studied in 4 replicates. The embryonic eggs 3 to 5 days of the larval and pupal period 12 to 14 days 11 to 13 days and over a period of generation of 26 to 32 days in the average temperature of 25 ± 2 ° C and average relative humidity lasted 65 ± 5 percent in Golestan province.

Keywords: *Pectinophora malvella*, Biology and Golestan provinces.

INTRODUCTION

Cotton is one of the strategic and industrial products in the world that can be cultivated because of the need for specific climatic conditions such as light and heat in eighty countries, but in 50 countries, cultivation has been considered. The countries of America, China, India and Pakistan are the most important cotton producers in the world. The cultivation area of this product in the world is 32 million hectares and its production is 21 million tons of cotton.

Iran has 214,000 hectares of cultivated land and with a total of 139900 tons of cotton in the year 2003. The average of 10 years (2002-2003) was 333 thousand hectares and the amount of cotton production was estimated at 142 thousand tons (Anonymous, 2003). Cotton pests are one of the important issues in preserving the country's plants, which has been carried out over a period of seventy years of scientific and executive studies. But there is not much information available on the secondary pink bollworm, *Pectinophora malvella* (Lep. Gelechidae). Secondary pink bollworm can be transmitted from seed and can be transmitted to cotton-producing regions of the country. In Iran, the presence of this pest is reported only from Golestan and Azarbaijan provinces (Adaldoost, 1991). In this regard, pest damage in Golestan province is not significant and is mostly based on weeds such as malvaceae and *Althaea*. Due to the damage caused by this pest in cotton-rich countries in Armenia and Azerbaijan, it has been for more than 40 years that cotton cultivation in the West Azarbaijan province has been banned (Shayan, 2009). Path biology, and determining the number of generations, what is the time of emergence of the first generation of pests? Given the limited cotton cultivation in the area after many years, what is the probable rate of damage to cotton? Pink

worms secondary cotton, *Pectinophora (Pexicopla, Platyedra) malvella* (Lep; Gelechiidae), because of similarities to the pink bollworm cotton, *Pectinophora gossypiella* (Lep. Gelechiidae), known by that name. In the southeast of England, it is active on *Althaea rosea*, *Althaea officinalis* Malvaceae, and has a generation per year (Bolam, 1932; Barnes, 1937). Nakhchivan cotton was one of the most important pests (Anonymous, 1979). In Mazandaran and Gorgan, on the margins of cotton fields on the plant, larvae of pests can be seen in fruits. In these areas, cotton did not attack cotton but in the cities of Mako and Poldasht (West Azarbaijan Province), cotton is one of the major hosts (Shayan, 2009). So far, there has not been a report on pest damage to cotton in Golestan province. In West Azarbaijan, with the observation of pests in 1966, cotton cultivation was immediately banned there, and no follow-up was carried out (Adaldoost, 1991 and Anonymous, 2007). Eggs are elliptical and scattered on brackets or buds. The larvae, when leaving the egg, have a length of 2 mm and white, the brown head capsule and the first chest on the back surface have a chitinous brownish-yellow shield, and the first two breasts, especially in the abdominal red. The larvae enter the stomach and even the branches after eating the contents inside the bud. With the warming of the air and the increase in the growth rate, the larvae enter the flower gardens, and gradually feed on the fruit that grows and grows. Usually, no more than one larva is seen inside any fruit and spends its entire life within the same fruit. The larvae's body length reaches 12 mm when fully grown. The larvae become pupated after full growth of the cells within the soil. The larvae and in the state of the diapause are wintering (Carter, 1984 and Adaldoost, 1991). The study of biology of pink bollworm was carried out in the bio control laboratory, Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari during December-January 2017 at room temperature of $28.34 \pm 3.15^\circ\text{C}$ and relative humidity of 40.00 ± 7.20 per cent wherein the larvae were reared on cotton seed based standardized artificial diet suggested by Dharajothi *et al.*, 2016, the gravid moth laid eggs singly or in batches of 4 to 5 eggs on flower bud or terminal leaves having an average duration of 4.9 ± 0.99 days. The developmental duration of first, second and third instar larvae were 2.34 ± 0.48 , 4.31 ± 0.76 and 4.66 ± 0.59 days, respectively. The total larval period in male and female pink bollworm was 15 to 21 and 15 to 23 days, respectively. The duration of pre-pupa was 1.60 ± 0.52 and 1.65 ± 0.49 days whereas of pupae it was 7.40 ± 0.84 and 7.30 ± 0.73 days when developed as male and female, respectively. The life span of female from egg to till death of adult ranged from 46 to 70 (56.30 ± 9.84) days; whereas, it was 31 to 46 (38.40 ± 4.48) days in male (Zinzuvadiya, *et al.*, 017). Cacayroin, *etal.*, 1992, found pupal periods of 7.42 ± 0.20 days. Muraalimohan, *et al.*, 2009, found shortest pupal period (7.96 ± 1.37 days) on when reared on phase diet (cotton seed flour and okra). The present separated as male duration larvae was deviated from the study of Venilla, *etal.*, 2007, who found 9-14 days in hotter region.

Material and Methods:

From the beginning of the growing season and from the beginning of April 2015, one hectare farms, Weekly visits to the existing cotton fields of the Malvaceae family, especially weeds, were visited and sampled and transferred to the lab. At each sampling time (at least 30 capsule samples), a biological stage of the pest was observed.

The net cages were surveyed daily on the daily bushes (4 capsule reps. Figure 1). After examining the necessary biological properties of the insect including the amount of wintering, the number of pest generations, the length of each generation, the length of the egg, larvae, pupae, and complete insects, their damage was determined.

To determine peak flight flies and to investigate the population fluctuations of delta traps with three tangle-covered interior surfaces and centered on pheromone (Qlure-PEM, Russel IPM CO., Flintshire, UK) ((Tóth, *et al.*, 1986)).

In each of the fields, 2 traps were installed at a height of one meter, and to increase the monthly efficiency, the pheromone and trap glue were renewed. The number of trapped was also the daily amount was counted (Carter, 1984).

Results and Discussion:

According to research conducted on two years (2015-2016). There is *Althaea spp.* weed in the margin or in the cotton fields of the Golestan province. In Mazandaran and Gorgan, on the margins of cotton fields on the plant, larvae of pests can be seen in fruits. In these areas, cotton did not attack cotton but in the cities of Mako and Poldasht (West Azarbaijan Province), cotton is one of the major hosts (Damnabi, 1967 and Adaldoost, H.991). The results show that the second red worm has been recorded in pheromone traps in the first half of May and the activity of the second red worm has been observed on the end of May on *Althaea spp.* In late June to the first half of July, population peak has been recorded in pheromone traps (Figure 1, 5). With the warming of the air in July and August, when drying the plant, the population of the pest decreases (Figure 3, 4).

Research on biology of pest on *Althaea spp.* plant under natural conditions of the environment by installing net cage on the stem of the plant *Althaea*. Egg of during for 3 to 5 days, larval of during 12 to 14 days, pupal of during 11 to 13 days and the length of a generation season is 26 to 32 days In average, the temperature was $25 \pm 2^\circ\text{C}$ and

the average relative humidity was $65 \pm 5 \%$ (table 1,2).The results of two years of research in Golestan province are similar to studies in other countries, so that the present separated as male duration larvae was deviated from the study of Venilla, *et al.*, 2007, who found 9-14days in hotter region, pupae of during for 11 to 13 days Cacayroin,*etal.*,1992,found pupal periods of 7.42 ± 0.20 days.Muralimohan *et al.*, 2009,found shortest pupal period(7.96 ± 1.37 days) on when reared on phase diet(cotton seed flour and okra). The gravid moth laid eggs singly or in batches of 4 to 5 eggs on flower bud or terminal leaves having an average duration of 4.9 ± 0.99 days (Dharajothi *et al.*, 2016).

The life span of female from egg to till death of adult ranged from 46 to 70 (56.30 ± 9.84) days; whereas, it was 31 to 46 (38.40 ± 4.48) days in male (Zinzuvadiya, *et al.*, 2017).

Pest activity during three years of study was never observed in cotton fields and it is recommended that weeds of the plant are not removed at the margins of the cotton fields or other crops in the province.

Table 1. Determination of biology *P.malvella* on *Althaea sp.* in the environmental condition (ave. temp. $25 \pm 2^\circ \text{c}$ ave.hum. $65 \pm 5 \%$ Golestan Province.

length of a generation	Pupal of during	larval of during	Egg of during	Plant num.(repl.)
29 ± 0.80	12 ± 0.50	13 ± 0.75	4 ± 0.25	1
30 ± 1.60	13 ± 0.75	14 ± 0.50	3 ± 0.50	2
26 ± 1.75	11 ± 0.90	12 ± 1.25	3 ± 0.75	3
32 ± 1.50	13 ± 0.25	14 ± 0.25	5 ± 1.25	4
29 ± 1.41	12.25 ± 0.63	13.25 ± 0.45	3.75 ± 0.75	Ave.

Table 2. Developmental stage of larval *P. malvella* on *Althaea sp.* in the environmental condition (ave. temp. $25 \pm 2^\circ \text{c}$ ave.hum. $65 \pm 5 \%$ Golestan Province.

Larvae	No.	Period(days)		Ave. \pm SD
		Min	Max	
I instar	20	2	3	2.35 ± 0.52
II instar	20	3	3	3.12 ± 0.78
III instar	20	3	4	3.42 ± 0.68
IV instar	20	4	4	4.22 ± 0.72



Figure 1. How to place a net cage on a branch of the *Althaea spp.* in a repl. test environmental condition



Figure 2. Adults of *P. malvella*

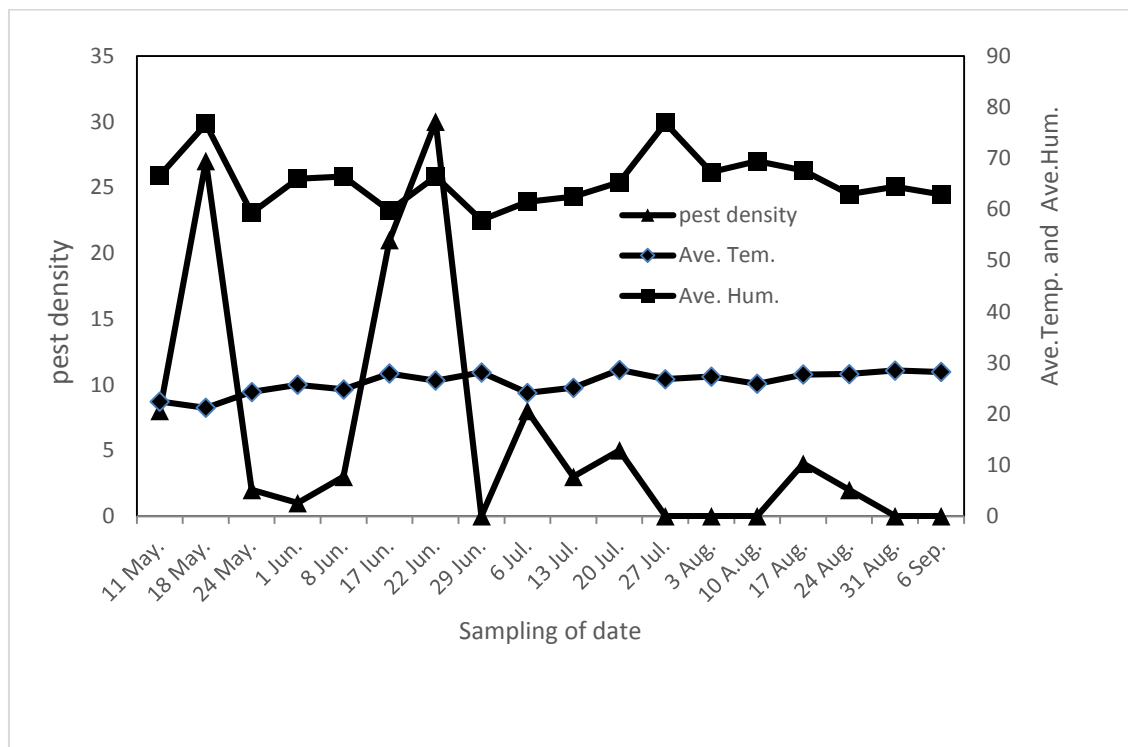


Figure 3. population of fluctuation *P. malvella* on *Althaea* SP. in the fields Golestan province on 2015 year.

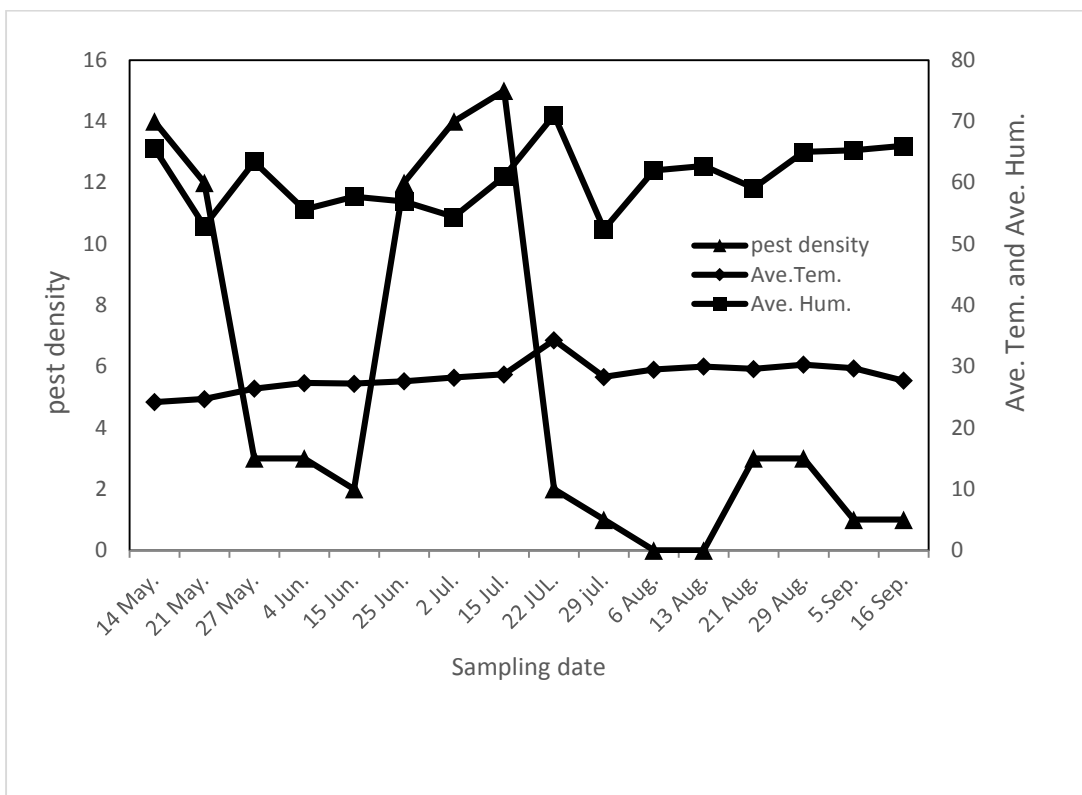


Figure 4. population of fluctuation *P. malvella* on *Althaea* SP. in the fields Golestan province on 2016 year

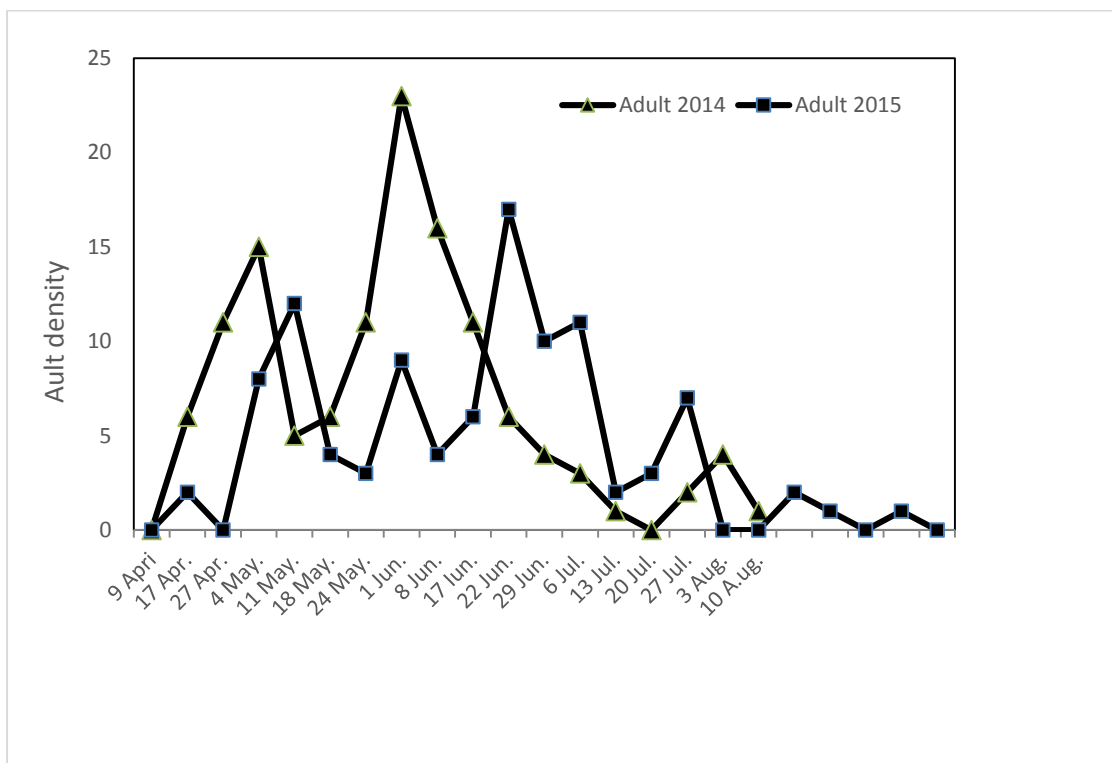


Figure 5. population of fluctuation *P. malvella* on *Althaea* SP. in pheromon at the Hashem Abad station of Golestan province.

REFERENCES

- 1- Anonymous, 2003. Statistics of the Ministry of Jihad-e-Agriculture Iran .75 p.
- 2- Anonymous .2007. EPPO collection of phytosanitary regulations: Quarantine Lists of Azerbaijan. European and Mediterranean plant protection organization.
- 3- Adaldoost, H.1991. Additional investigation of condition and secondary infection of *Pectinophora* spp. Research Report of Urmia Plant Pests and Diseases Laboratory. 25 p.
- 4- Barnes, H.F. 1937. The Hollyhock seed moth (*Platyedra malvella* (Hub.), together with notes on the distribution of *Apion radiolus* and an associated Glinodiplosis species. *Annals of Applied Biology* (24): 589–599.
- 5- Bolam.1932. The Lepidoptera of Northumberland and the eastern borders. *History of the Berwickshire naturalists' club*. 27: 236.
- 6- Carter, D.J. 1984. *Pest Lepidoptera of Europe*. Dr. W. Junk Publishers. The Netherlands. 437 p.
- 7- Cacayorin, .D. Domingo, E.O.; Sensano, D.R.; Solsoloy, A.D.andolsoloy, T.S.1992.Ocurrence and biology of pink bollworm, *P. gossypiella* (Sau.) on cotton. *Cotton Research Journal Philipines*, 5:66-75.
- 8- Damnabi, K. 1967. Study of a kind of red worm, *Pectinophora malvella*, in Shahabad Maku. Report of the Laboratory of Plant Pests and Diseases of Tabriz. 15 p.
- 9- Dharajothi, B.; Naik, V.C.B.; Kranthi, S.; Kranthi,K.R. and Valarmathi.R. 2016. Viable mass production method for cotton pink bollworm *P. gossypiella* (Sau.). *The Journal of Basic and Applied Zoology*, 73:9-12.
- 10- Muralimohan, K.;Kamath,P.;Mohan,K.S.;Ravi,K.C.;D Eeba, F.; Sivasupramaniam,S. and Head.P.G.2009. Mass rearing for the pink bollworm,*P.gossypiella* (Lep.Gelichieadae) and its susceptibility to insecticidal B.t proteins.*Int.J.Trop.Insect Cci*.29:102-107.
- 11- Shayan, A.2009. Bait and trapping instructions for cotton red worm, *Pecxicopia malvella* (Lep: Gelechiidae). Quarantine Deputy of the Organization for plant Protection of Iran. 7 p.
- 12- Tóth, M; Sziráki,G. And G. Szcs .1986. Sex attractants for *Pexicopia malvella* and *Platyedra subcinerea*, pests of malvaceous ornamentals and cotton. *Entomologia Experimentalis ET Applicata* 40: 147-150.
- 13- Cacayorin, N. D., Domingo, E. O., D. R. Sensano., A. D. Solsoloy, and T. S. Solsoloy, 1992. Occurrence and biology of pink bollworm, *P. gossypieella* (Saunders) on cotton. *Cotton Research* Cacayorin, N. D., Domingo, E. O., D. R. Sensano., A. D. Solsoloy, and T. S. Solsoloy, 1992. Occurrence and biology of pink bollworm, *P. gossypieella* (Saunders) on cotton. *Cotton Research* Cacayorin, N. D., Domingo, E. O., D. R. Sensano., A. D. Solsoloy,
- 14- and T. S. Solsoloy, 1992. Occurrence and biology of pink bollworm, *P. gossypieella* (Saunders) on cotton. *Cotton Research*
- 15- Venilla, S.; Biradar, V.K.;Sabesh,M. and Bambawale,O.M.2007.Know you cotton insect pests:pink bollworms. Crop protection Folder Series.7 of 11.CICR.Nagpur.
- 16- Zinzuvadiya, H.D.; D, Esaf, H.R.; Lakum,M.B. and Rajkumar,K. 2017. The life span of female from egg to till death of adult ranged from 46 to 70 (56.30±9.84) days; whereas, it was 31 to 46 (38.40±4.48) days in male. *Biosciences10* (25).P:5363-5371.