

**STUDY ON BIOLOGY AND POPULATION FLUCTUATIONS
OF LEAF MINER *AGROMYZA* SP. ON CHICKPEA
IN KHOMEYN REGION (IRAN)**

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ABSTRACT: The population fluctuations of leaf miner *Agromyza* sp. was selected on chickpea. It was from last decade of May until the end of July 2010 in chickpea farm in the National Center of Bean researching in Khomeyn-Iran. The larvae, pupa and adult stages were surveyed. The sampling of larvae was done for three times a week in two leaves period. The sampling of pupa was done two times a week. For determining of adults population was used from yellow sticky card. The sampling was performed three times a week and were changed the cards at the end of two week. The highest population density was recorded for larvae, pupa and adult leaf miner population in the first decade of June 2010. The egg stage takes 6 days, larval stage usually takes 4 days with 3 instars, pupa stage takes 2-7 days till 2 months depending on environmental conditions. The adult insect life long is 8 days. The duration of each generation is 18-25 days. This pest lives on chickpea for three generations. The highest altitude of adult insect population was in the first decade of June.

KEY WORDS: Chickpea, Leaf miner, *Agromyza* sp., Population fluctuations.

The leaf miner is one of the most important pests of vegetables and chickpea in Iran. The larvae produce mine that start from apex and finish in the base of leaflet. When the larvae reach in the base of leaflet, move to different sides and produce a thread route that is wide in terminal. The mature larvae stays in terminal part of mine for some hours and fall down in the ground finally. The chickpea leaf has 12-14 leaflets. The tunnels become dry because of the sun and leaflet will be scald.

This insect lives from May to second decade of August and it has 4 generations in Karaj province of Iran (Sadri, 1964; Baghdar, 1980). There are some factors that effect on comparative seasonal of leaf miner like pesticides (Parrella, 1987). The chickpea is one of important crops in Iran. There are some pests that attack it and produce damage on its foliage. The Agromyzid flies attack chickpea, flowers and vegetables in Iran. The sampling methods are different but the most important methods are based on counting the larvae in the mines (Wolfenbarger & Wolfenbarger, 1966). The other methods are counting the number of pupa and adults (Zhender & Trumble, 1985). The sticky cards were suggested to survey the adult population (Musgrave et al., 1975). The yellow sticky cards are effective for catching leaf miners (Chandler, 1981).

MATERIAL AND METHODS

The chickpea seeds were planted in the end of March 2010 in chickpea farm in National Center of Bean researching in Khomeyn-Iran. The fluctuations of larvae population was surveyed in 3 stages:

1. The larval stage
2. The pupa stage
3. The adult stage

1. The sampling of larval stage was done for three times a week in two leaves period. The sampling of larval stage was done for three times a week in two leaves period. It was estimated 1 meter for margin the farm. Then was selected 1 plant and picked up 2 leaves of it randomly. The sampling method was continued like crosswise. The 60 leaves were selected from the farm and they were collected in plastic packet and were transferred to the laboratory. In laboratory were counted the number of leaflet and larvae in per leaf. It was continued 8 weeks until harvest time. The Relative Variation (RV) was calculated in first sampling. Our samples were more than number of samples that was calculated with sample size formula.

2. We used traps that were made of pasteboard (37×29 cm) to estimate the fluctuations of pupa population. The 40 traps were provided and we cut them in 2 parts. They were transferred to farm and were located around 40 chickpea plants that were selected randomly. Two parts of each trap were joined together with flat tape around plants. Thus each plant was located in the center of trap. The sampling of pupa stage was done for two times a week in two leaves period. This space was necessary form the pupa in the field. The pupas were counted two times a week. The first time was on Thursday and second time was on Sunday. Then were located traps on other plants that were selected on Sunday randomly. This method was performed in 8 weeks until harvest time.

3. After were counted the larvae in laboratory, they were held in plastic vials and were surveyed every day. The leaf miner flies in vials were transferred to identify. For determining of adult population fluctuations we used yellow and sticky cards (9.8×24.8 cm, Russell IPM Cards). The 45 cards were installed up in the farm randomly. The used cards were located vertical (Parrella & Jones, 1981). The adult counting was done three times a week and the cards replaced after two weeks. This method was continued until harvest time.

We calculated the mean No. of larvae, pupa and adult. The first sampling time for larvae and adult was in 30 May to end of July 2010. The data for temperature and relative humidity (RH) were gave from weathering office in Khomeyn.

RESULTS AND DISCUSSION

1. Leaf miner Biology:

The diagrams show that each generation takes 18-25 days in this region conditions. The growth occurs in 18.8 °C. The adults spent their life on chickpea or weeds. The leaf miner has 3 generations on chickpea plants in these conditions.

Egg:

The first eggs were observed in second decade of May. The eggs were transparent and some times white and very tiny. From egg lying to complete the larval body takes 4-6 days. The egg lying is occurs on the upper surface of leaflet apex some times swept into the side of main leaflet vein. The female damage is observed in parallel of main leaf vein. It is similar tiny holes with yellow color that is caused for entry ovipositor and eating plant juice (Fig. 1). The females prefer

low leaves in each plant for laying the eggs. When these leaves drop on the ground, the infestation was observed in upper leaves gradually.

Larvae:

The larvae instar 3 is about 2.4-2.9 mm long. It is vermiform and white-yellow in color that changes to yellow (Fig. 2). It has 3 instars (Fig. 3). The mine is similar to question mark and the mature larvae locate in the base of leaflet (Fig. 4 and 5). There are discontinuous excrements of larvae in the mine. It was estimated that each larvae move in 4-5 mm for 44 hours. At first the mining is white and then becomes light yellow (Fig. 6). The larval stage usually takes 4 days and fall down and changes pupa in the ground. We were observed the first group of larvae in the last decade of May (Fig. 7).

Pupa:

The leaf miner spends the winter in shape pupa. The pupa body is about 1.4-3 mm long and is articulate absolutely. The pupa is light yellow and then becomes chromatic (Fig. 8). The pupa stage takes 2-7 days till 2 months depending on environmental conditions. We were observed the first group of pupa in the first decade of June in pupa traps (Fig. 9 and 10).

Adult:

The adult body is about 1.7-2.2 mm long. The body is some black that there are some black lines on the tergites. The head and plural parts of abdomen are yellow (Fig. 11). The females lay the eggs on one line in parallel of main vein of the leaflet. The mine is forming in the over surface of leaflet and was sawed in one sample under the leaflet surface. The adult insect life long is 8 days depending on weather conditions. This insect lives from last decade of May until middle of July in Khomeyn region.

2. Population fluctuations:

Larvae:

The mean No. of larvae was increased in the end of May and the first of June 2010 and there was a population peak in May 3rd. There was second peak in June eighth. The population was decreased in second decade of June until the end of June. In July 1st, there was third peak of population and after that was decreased until harvest time. It was not observed any larvae in July eighteenth (Fig. 12).

Pupa:

The one peak of population was occurred in June tenth. There were two other peaks in June 27th and July 4th. After that was not observed any pupa until harvest time (Fig. 13).

Adult:

There were 3 peaks for adult populations in 3rd and 1st June and July 1st. The population was decreased after July 2nd until harvest time (Fig. 14).

The results show that life cycle is start in 18.8-22 °C in Khomeyn region. This temperature degree was expressed in 15 °C in Karaj-Iran (Sadri, 1964; Baghdar, 1980). The larval stage in Khomeyn (4-6 days) is shorter than Karaj (6-8 days). This pest takes 3 generations in chickpea and has more generation in Khomeyn in other seasons in every year. It is necessary to do more studies about it. This pest has highest damage on chickpea in 22.8 °C and %30 RH. The highest peak of population was in second decade of June. This damage was occurred by second generation of leaf miner *Agromyza* sp. in Khomeyn region. Thus this time is suitable to control this pest. Some suggested methods like collect the pupas and use the yellow sticky cards are useful. But it is better to decrease using insecticides in vegetable and chickpea fields in this region.

The linear regression equation of larvae, pupa and adult density and Standard Error (SE) of the mean is showed. The regression equation is positive in 3 figures and “r” is high. The “r” value for pupa is less than larvae and adult (Fig. 15, 16 and 17).

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Figure 1. Egg.



Figure 2. Larvae.



Figure 3. Larval instars.



Figure 4. Larval mining.



Figure 5. Larvae in mine.



Figure 6. Leaf damage.



Figure 7. Plant damage.



Figure 8. Pupa.



Figure 9. Pupa in vial.



Figure 10. Pupa trap.



Figure 11. Adult on a yellow trap.

(All photos take by simin changizi, May-July 2010)

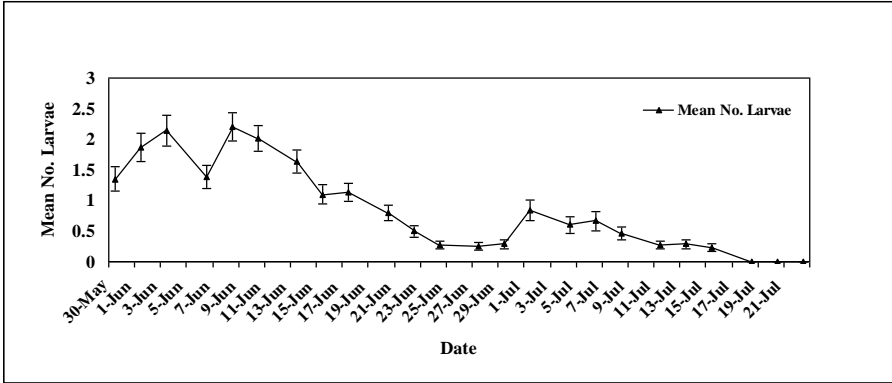


Figure 12. Mean No. of Larvae in sampling dates.

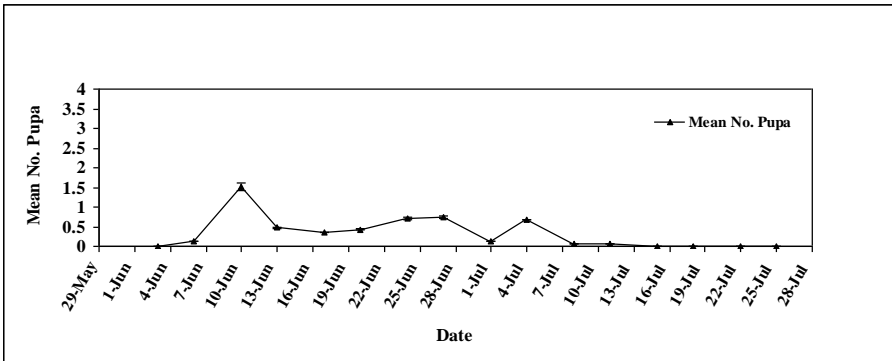


Figure 13. Mean No. of Pupa in sampling dates.

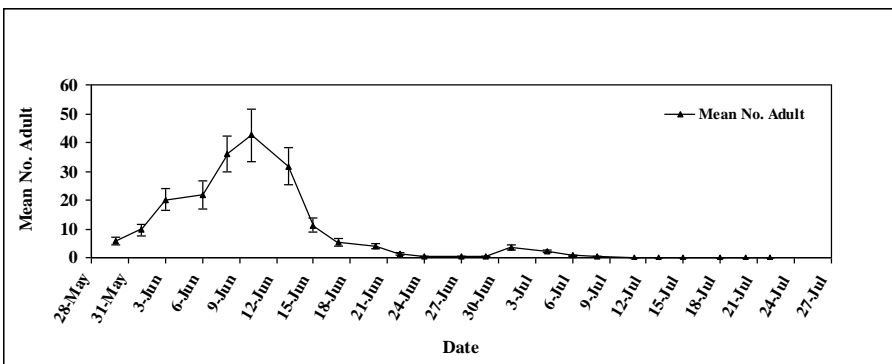


Figure 14. Mean No. of Adult in sampling dates.

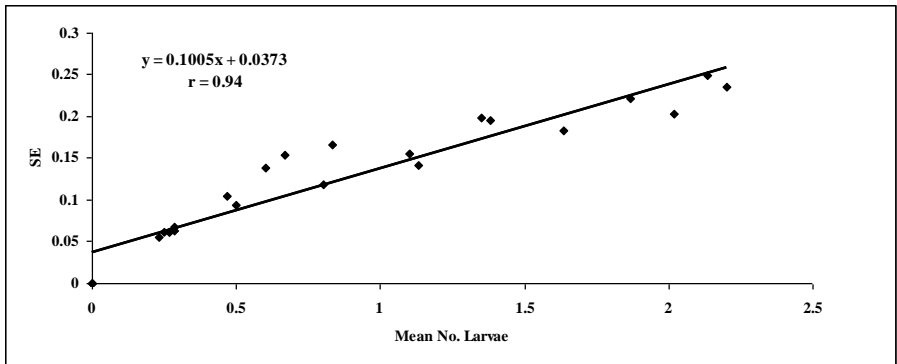


Figure 15. The linear regression equation of mean No. of larvae and SE (Standard Error).

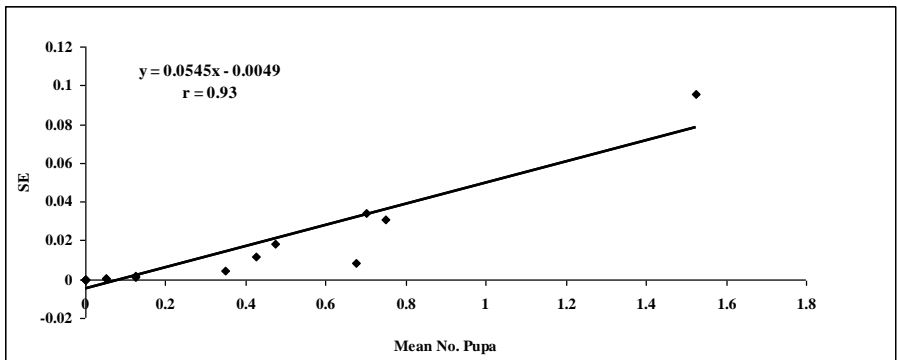


Figure 16. The linear regression equation of mean No. of pupa and SE (Standard Error).

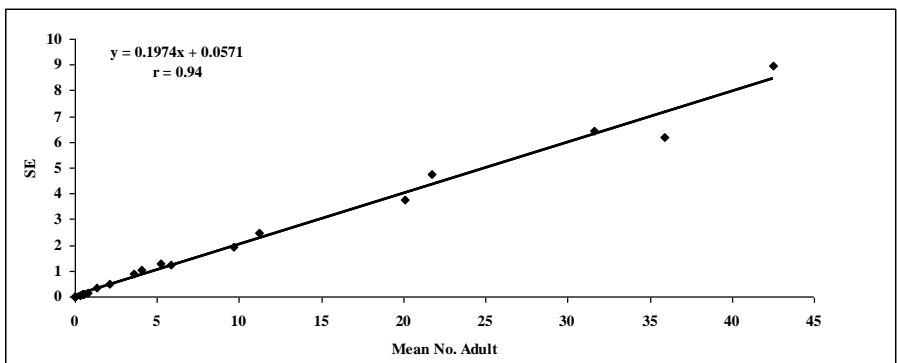


Figure 17. The linear regression equation of mean No. of adult and SE (Standard Error)