



# Biological characteristics of *Liriomyza cicerna* – a leaf mining fly and its damage by types of plants

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## Annotation:

This article is focused on a number of references referring to bioecological characteristics of *Liriomyza cicerna* Rodani type of leaf mining flies. The article also comprises the observation references on the damage of the larvae of this pest to types of plants. Apart from it, a number of observations were carried out on the damage level of leaf mining fly to agricultural plants and application of *Dacnusa siberica* entomophages against this pest in conditions of laboratory were included.

**Key words:** pesticide, *Liriomyza cicerna* Rodani, bioecology, entomophages.

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**Introduction.** All over the world it is observed that numerous problems have been appeared in protecting vegetable plants from pesticides and diseases in the process of their germination and that average 20-40% of vegetable plants grown in the world is being destroyed under the influence of pesticides and diseases [1]. Continental climate of our Republic is convenient to farm conditions but at the same time it is creating variety of opportunities to reproduction of harmful organisms. Vegetable growing is developing rapidly as other farm branches in our Republic. Especially, its development is important in increasing the export share of fruit-vegetables and developing the economy of agriculture. In developing vegetable growing creating new sorts, developing the measures of fighting against pesticides is considered to be very important questions of today. Protecting plants from

harmful organisms is considered to be of governmental importance. At present it is obvious that it is impossible to apply protecting measures practically not having objective information about pesticides, diseases and weeds of agricultural plants on one hand and being aware of objective knowledge on environment and its changing tendencies on the other hand. Therefore, it is important to study the development, spread of harmful organisms in agricultural plants and the level of their harm to plants.

Vegetable plants are being sown and planted in more than 344 thousand hectares of land in the open area and in more than 10 thousand hectares of land in greenhouses in our Republic. Vegetable plants are harmed by a number of pesticides and some members of Agromyzidae family are considered to be main pesticides. Protection of vegetable plants from



pesticides, diseases and weeds is considered to vital in supplying food security and developing export share in or Republic in order to preserve the crop fertility of agricultural plants and supply the population with qualitative food.

In the result of occurrence of globalization process during the last 100 years the temperature of the planet Earth raised to 0.6 C°. In the result of decreasing the the thickness of icy territories on the Earth to 10% rapid changes were observed in northern hemispheres and this may result in widening geographical borders of harmful organisms [1].

As Sh.T.Hujayev regards, the lowest favorable temperature for the development of eggs, larvae and puparium of leaf mining flies is +9-10°C.

In +25-30°C temperature, 7-9 days is needed for the development of eggs and larvae of the leaf mining fly. Under the same temperature for the development of puparium 8-9 days are needed. In 15°C the growth and development of eggs, larvae and puparium last 25-30 days [2].

Liriomyza cicerina Rodani started to appear in Turkey from the 2nd half of April when the air temperature was 9-14.3°C and the

soil temperature was 19.2-21.2°C. In 3-20 days after imago appeared and when the plant height was 5-10 cm, the larvae started to appear. The pesticide density was high 2 times, at the end of May and June [3].

The forehead of Liriomyza cicerina Rodani is 1.5 times larger than its eyes, the wings are 1.3-1.5 mm. the color of its forehead is reddish-yellow, the 3rd part of its mustachio is of dark color. Legs are black, pelvis is mainly yellow. Puparium is reddish, back respirators have 7-9 joints. In Europe L.cicerina harms chickpeas, L. Brynoe harms tomato and pumpkins, L. neitzkei harms onions mainly [4].

During 2020-2021 we carried out a number of investigations on determining the fertility of L.Ciceirna type of leaf mining fliers in the laboratory of Andijan branch of Tashkent state Agrarian University. In order to study the fertility of female flies, the experiments were carried out in 3 repetitions in 4 different air temperature varieties (18-20°, 20-25°, 25-30°, 30-35°C) and 3 relative humidity (40%,60%,80%). The results of the carried experiments are given in table 1.

**Table 1.**

**Fertility of L.ciccerina in different conditions (Laboratory experiment, 2020-2021).**

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Experiment versions	Air temperature, t0	Relative humidity of the air, %		
		40%	60%	80%
		Level of fertility, piece		
1	18-20°C	30.4	74.2	37.6
2	20 -25°C	136.4	201.6	129.3
3	25-30 °C	189.4	205.3	190.7
4	30-35 °C	71.6	148.6	79.3

Here, it was confirmed that in conditions with 18-20°C of air temperature and 40% of air humidity fertility of pesticides composed 30.4 pieces, under 60% of air humidity fertility was equal to 74.2 pieces and when the air humidity was 80% the fertility composed 37.6 pieces.

In the 2nd version when the air temperature was 20-25°C and the air humidity was 40% the fertility of leaf mining flies composed 136.4 pieces, when the air humidity was relatively 60% it composed 201.6 pieces and

when the humidity was 80% the fertility composed 129.3 pieces.

In the 3rd version the air temperature was appointed to be 25-30°C. In this version we studied the fertility of pesticides under three kinds of relative air humidity too. Here, when the relative air humidity was 40%, the average quantity of pesticide eggs composed 189.9 pieces, when the relative air humidity was 60% it composed 205.3 pieces. When the relative air humidity was 80% the fertility composed 190.7 pieces.

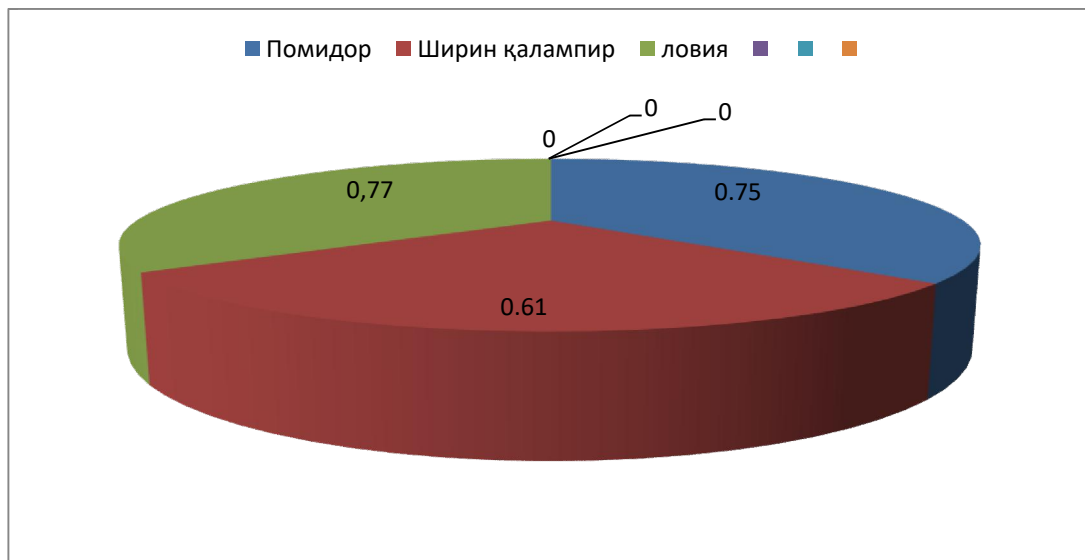


In the 4th version, the air temperature was appointed to be 30-35°C. When the relative air humidity is 40%, the fertility of leaf mining flies composed 71.6 pieces, when the relative air humidity was 60% it composed 148.6 pieces. When the relative air humidity was 80% the fertility composed 79.3.

We can see from it that the most favorable condition for *Liriomyza ciccernae* type of leaf mining flies is 25-30° and 60% of relative air humidity. Here, the pest may lay up to 205.3 pieces of eggs. When the air temperature is 16°C the pest stops feeding and starts to prepare for diapauses. Thus 20°C of air temperature is considered to be relatively low degree for the development, reproduction of the pest and that 30-35°C of air temperature is not a favorable condition for the pest development.

In order to determine the harm of leaf mining fly *L.ciccernae* to beans, tomato and bell pepper, we grew tomatoes, bell peppers and beans in the flower pot for laboratory experiments. Puparia of the pest were brought from the damaged plant leaves and were put in 10 test tubes, they were kept until they turned into flies. As soon as the flies appeared they were put into the plants isolated from each other. Observations on the time of laying eggs, the time and place of larvae coming out hollows were carried out. We took 15 hollows so that observe the state of larvae development and they were observed with magnifying glass, their sizes were defined with the help of micrometer lens. The harms made larvae to plants were identified every 24 hours.

Picture 1.2. Harm of leaf mining fly (*L.ciccernae*) to the surface of beans, tomato, bell pepper during its larvae period (cm<sup>2</sup>)



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According to it, the larvae of the pest has its larvae period during 5-5.3 days. The results of the experiment are given in the picture 1.2. We can see from the picture above that a leaf mining fly- *L.ciccernae* harmed 0.77cm<sup>2</sup> of bean plant surface, 0.61 cm<sup>2</sup> of the leaf surface of bell pepper and 0.75cm<sup>2</sup> of the leaf surface of tomato plant during its larvae period.

According to Kenneth Spenser's observations, *Liriomyza* generation of leaf mining flies harms plants all over the world noticeably. 24 out of 300 types of this generation is considered to be economically

important. A polyphage *L. sativae* which is one of them is an insect. It harms the plants belonging to Solanaceae family, Fabaceae family and Cucurbitaceae family. In US tomato is the most damaged plant and cotton is less damaged from this insect [5.].

Another type *Liriomyza cicerina* Rodani was determined in a cherry tree by Bekmann in 1681 in Frankfurt for the first time. In 1875 it harmed peas and damaged the annual pea crop a lot. This type is met in such countries as Afghanistan, Armenia, Azerbaijan, Georgia, India, Jordan, Iran, the Ukraine, the United Emirates, Uzbekistan and Turkmenistan. 376

types of *Liriomyza* were identified. 136 out of which were found in Europe. *Liriomyza cicerina* Rodani harms plants in two ways: until its imago lays eggs and its larvae. Adult females perforate leaf surface with and consumes with their exudates. The larvae consumes among the leaves [6].

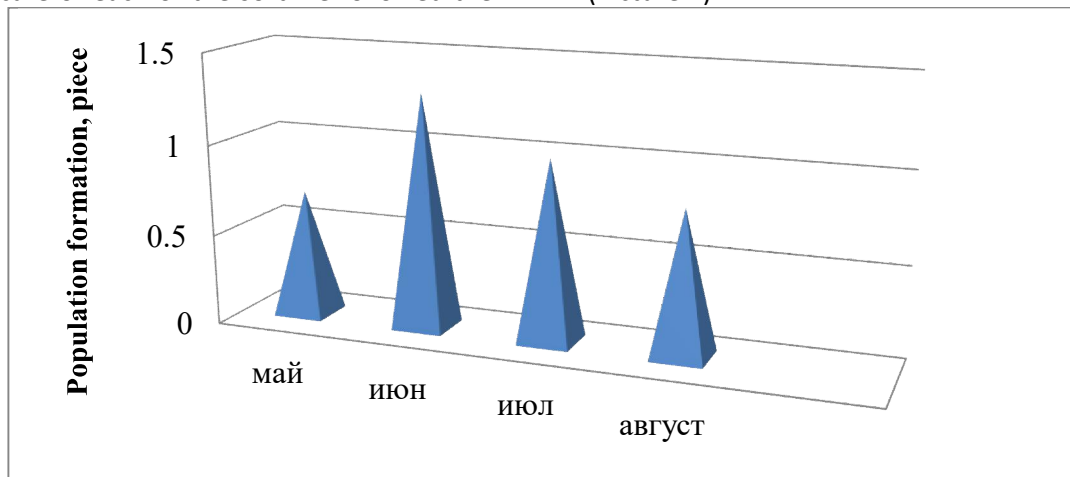
*L. trifolii* belongs to the 28th family and feeds on more than 400 plants [7]. Total multiply of leaf mining flies was observed in Thailand in 1994 when they damaged cotton plants [8].

According to the references given by Dorge S.K., Dalaya V.P, *Liriomyza brassicae* is a type of polyphage and usually damage cabbage, peas, tomatoes, tobacco, pepper, raddish and other plants [9].

There was observed huge damage of more than 10 types of plants belonging to Solanaceae family, Cucurbitaceae family and Fabaceae family. Out of these plants, it was observed that beans, tomatoes, cucumber and pumpkin plants were damaged the most.

We carried out an experiment in Andijan experiment station of vegetable, melon and potato growing scientific-investigational Institute in Andijan district of Andijan region in field with "Korean" sort of beans were sown. In taking care of each of the sort we followed the

most favorable agro technologies of farming. In each of these plants dynamics of pesticide development was investigated. Due to it, we carried out 10 observations in each type of plant. 10 imagos of leaf mining flies grown in laboratory conditions were put on the experimental plants (here the proportion of male and female was as 2:6). This was during the period of blossoming. Because in this period plants were well grown and the leaf system of plants were developed well. Here due to the plant type average 1 imago was sufficient to 1 plant in the experiment. Beginning from the 6th day after the day of spread we started observing the development of pesticides. In the period of pesticide development the average air temperature was + 26C, the relative air humidity composed 65%. Besides this, the speed of population development and mutual relations with entamophages and their mutual relativeness were also investigated. In order to summarize experiment results observation months were taken into consideration. According to it, in May month in beans the development of leaf mining flies increased rapidly and the observation results were controlled and registered every 10 days, average 1 months changes were calculated (Picture 1).



Picture 1. Development dynamics of *L.cicerna* leaf mining fly population in bean plants (Andijan district, Andijan region, 2020-2021).

According to it, we calculated the larvae of pesticides in one leaf, in May month it composed 0.7 pieces on average one leaf. The air temperature was average +26.2°C and the relative air humidity composed 56%. Next

month average indices were registered too and the number of larvae of leaf mining flies on average one leaf of one plant in June month composed 1.3 pieces. In this period the average air temperature was +30.6°C, the average air humidity composed 49%. In July month the number of larvae on average one plant composed 1.0 piece (the air

temperature was average +32.8°C, the relative air humidity was 38%).

In August month (when the air temperature was +30.8°C and the air humidity composed 40 %) the number of pesticides was normal and the number of larvae on one leaf composed average 0.8 pieces.

It was known from the above investigations that, in investigations carried on beans formation and development of pesticide population was observed to be the highest in June and July months.

Taking into consideration the fact that leaf mining flies are becoming the main pesticides for vegetable plants of our Republic, we must organize the measures of fighting against them properly and on time. Here,

applying biological methods will protect the environment from poisoning with chemical means and supply preservation of natural balance.

*Dacnusa siberica* and *Diglyphus isae* parasites were brought to Uzbekistan in 2012 by a group of scientists of Tashkent state Agrarian University and were applied in the green house of Tashkent state Agrarian University for the first time. They were spread to melon and vegetable fields of Sirdarya region. In order to make an experiment we brought entomophages from the center of biological protection of plants and multiplied them in biological laboratory of Andijan branch of Tashkent state Agrarian University on the basis of a German scientist Sheriff Khasan (Table 1).

**Table 1.**  
**Levels of damaging different plants by *L.cicerna* type of leaf mining flies (Andijan region, Andijan district 2020-2021).**

Types of plants	Number of pesticides on one plant leaf, piece				
	Day 3	Day 7	Day 14	Day 21	Day 28
Tomato	-	0.4	1.6	3.6	4.7
Beans	-	0.7	2.4	4.2	5.1
Cucumber	-	0.3	2.1	3.8	4.9
Egg-plant	-	0.1	1.3	2.1	2.8
Bell pepper	-	0.3	1.8	2.9	4.1

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For this, first of all the best master plant was chosen. Tomato, beans, cucumber, egg plants, bell pepper were sown and grown in 10 flower pots each. When it was time of blossoming we harmed the plants with *L.sativae* type of leaf mining flies. For this, we brought the plant leaves damaged with leaf mining flies and spread them among plant leaves.

In 3 days after harming the plants with *L. Cicerna* type of leaf mining flies we started to observe them. Because, we had to know how the pesticide adapted the plant. On the 7th day of our observation we witnessed that there were average 0.4 piece of pesticide on one

tomato leaf, 0.7 piece on a bean leaf, 0.3 piece on one cucumber and bell pepper leaf and 0.1 piece on egg plant leaf.

On Day 14th, we determined that there were average 1.6 pieces on one tomato leaf, 2.4 pieces on a bean leaf, 2.1 pieces on a cucumber leaf, 1.8 pieces on a bell pepper leaf, 1.3 pieces on an egg plant leaf. On the 21st day of the experiment, there were average 3.6 pieces on one tomato leaf, 4.2 pieces on a bean leaf, 3.8 pieces on a cucumber leaf, 2.9 pieces on a bell pepper leaf, 2.1 pieces on an egg plant leaf. On the 28th day of our investigations we observed average 4.7

pieces on one tomato leaf, 5.1 pieces on a bean leaf, 4.9 pieces on a cucumber leaf, 4.1 pieces on a bell pepper leaf, 2.8 pieces on an egg plant leaf.

Based on the above investigation results we can say that as the most favorable master plant for *L. Cicerina* type of leaf mining fly, bean plant was determined.



Picture 3. Bean plants sown in order to reproduce the leaf mining flies.

**Table 3.**

Reproduction of *Dacnusa sibirica* parasite in *L.cicerina* type of leaf mining flies in different air temperature (Biological laboratory of Andijan branch of TsAU 2020-2021, the relative air humidity is 60-65%)

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N	Air temperature	Number of pesticides on one leaf, piece	Number of pesticides after applying parasites, piece			
			Day 3	Day 7	Day 14	Day 21
1	15°C	3.1	-	2.4	2.6	1.7
2	20°C	3.5	-	2.5	1.6	0.6
3	25°C	4.0	-	2.1	1.3	0.2
4	30°C	3.2	-	2.8	2.1	1.2

There are average 3.1 pieces off pesticides on one bean leaf. We observed that on the 7th day of our observations the pesticide larvae decreased to 2.4 pieces. On the 14th day, the pesticide larvae decreased to 2.6 pieces and on the 21st day it decreased up to 1.7 pieces.

In the 2nd version our investigations were carried out under 20°C of air temperature and when the average air humidity was 60-65%. There are average 3.5 pieces of pesticide larvae on one bean leaf. On the 7th day of our observations, we noticed that the pesticide larvae decreased to 2.5 pieces. On the 14th day the pesticide larvae decreased to 1.6 pieces and on the 21st day up to 0.6 pieces.

In the 3rd version, the air temperature was appointed as 25°C and the average air humidity to be 60-65%. There were average 4.0

pieces of pesticide larvae on one bean leaf. On the 7th day of our observations, we noticed that the pesticide larvae decreased to 2.1 pieces. On the 14th day the pesticide larvae decreased to 1.2 pieces and on the 21st day up to 0.2 pieces.

In the 4th version we appointed the conditions of our experiments as the following: the air temperature was 30°C and the average air humidity was 60-65%. There were average 3.8 pieces of pesticide larvae on one bean leaf. On the 7th day of our observations, we noticed that the pesticide larvae decreased to 2.8 pieces. On the 14th day the pesticide larvae decreased to 2.1 pieces and on the 21st day up to 1.2 pieces.

So, based on the above mentioned observations, we conclude that the most

favorable air temperature for the development of *Dacus sibirica* in 60-65% air humidity is 25°C.

Again we made our experiments in 4 versions under different air temperature and 60-65% of air humidity. Due to it, in the 1st version the air temperature was appointed as 15°C and air humidity to be 60-65%. We determined that there were 4.0 pieces of pesticide larvae on one bean leaf. On the 7th day of our observations, we observed that 3.1 pieces of larvae were left. On the 14th day the pesticide larvae decreased to 2.1 pieces and on the 21st day up to 1.2 pieces.

In conclusion we can say that the most favorable condition for the development of *Liriomyza ciccernae* type of leaf mining fly was 25-30° of air temperature and the relative air humidity was 60%.

*Liriomyza ciccerna* of leaf mining fly were determined to be highly met in 4 members of Cucurbitaceae family i.e. in melons (*Cucumis melo*), water melons (*Citrullus lanatus*), cucumber (*Cucumis sativus*) and pumpkin (*Cucurbita maxima*), in such members of Solanaceae family: tomato (*Solanum lycopersicum*) and a member of Fabaceae family – peas (*Cicer arietinum*) and beans (*Pisum sativum*). Leaf mining flies are average met in members of Solanaceae family eggplants (*Solanum melongena*), pepper (*Capsicum*). During the season we noticed that the pesticides were met in plants of other families rarely.

In investigations carried out on beans the formation of pesticide population was observed to be frequent in June and July months.

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