



THE LEAF MINERS *LIRIOMYZA* SPP. (DIPTERA: AGROMYZIDAE) : THE DAMAGE NATURE AND THE ECONOMIC IMPORTANCE : A REVIEW

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Abstract

The Leaf Miner are important pests that cause significant economic losses to most agricultural crops. Leaf miners return to the order Diptera and the Agromyzidae family. The review focused on four main objectives related to the Leaf miners, the first aims is to identify the species that cause damage in the field, the second is to show the economic importance in the field, the third clarify the Leaf miners family range and the generations numbers, fourth the importance of using yellow traps in control Leafminer.

Keywords: Leaf Miners, *Liriomyza* spp., Damage Nature, Economic Importance

Introduction

The Leaf Miner are serious pests that attack a number of plants belonging to 31 plant families (Spencer, 1973). Include an economic importance vegetable crops such as cucumbers, tomatoes, potatoes and eggplants, as well as attacking ornamental plants causing destruction of the leafy area by feeding the larvae between the two leaf surfaces, which leads to damage the leaves tissues and reduce the ability to complete the photosynthesis process, due to lack of chlorophyll content, then yellowing and falling leaves, small fruits, low productivity, as well as feeding holes and deposition eggs holes made by adults in leaf tissue causing tissue death, and adults transmit viral diseases (Waterhouse and Norris, 1987; AL-Mashhadani, 1998). The Leaf Miner belong to four insect orders and include Lepidoptera, Coleoptera, Diptera and Hymenoptera (Hering, 1951).

Most of The Leaf Miner belong to the Diptera order, as (Dursun *et al.*, 2010, Shahreki *et al.*, 2012) indicate that the Agromyzidae family is one of the largest families of Diptera orders around the world and includes more than 3000 species and is widespread but the most common It was found of 30 genera and about 1165 species which are small, some of them along the wing in hot and humid areas. *Liriomyza* was recorded by Mik in 1894.

Distribution

The Leaf Miner origins belonging to the genus *Liriomyza* originate from the South America continent, then spread to other world countries leading to injuries in most vegetable crops in open fields and greenhouses. There are several species such as *L. sativae*, *L. bryoniae*, *L. trifolii* and *L. huidobrensis*. This pest has become resistant to most conventional chemical pesticides (Babi, 2001), Tokumaru *et al.* (2005) reported that The Leaf Miner *L. sativae* spread rapidly in western Japan and significantly damaged vegetable crops, especially in cucumbers and tomatoes, causing great losses in their productivity.

In Vietnam, many researchers have pointed out that The Leaf Miner *L. sativae* is a very dangerous pest on local beans, French beans, peas, tomatoes, cucumbers, pumpkins

and watermelons (Andersen *et al.*, 2002). It is also spread in most European and Asian countries, especially near The Mediterranean Sea, including Syria, is also recorded in most African countries and in Central, North and South America, as well as Australia and the former Soviet Union.

Economic importance

Spencer (1973) notes that *L. bryoniae* is a polyphagous that attacks most of the plants belonging to the eggplant, crucifers, pumpkins, marshmallows, legumes, narcissus, tentacles, composites, and slices. It is also a major pest on greenhouses tomatoes in the United States and have several generations per year (Multivoltin) and reach its highest peak in April, while (Abul-Nasr and Assem, 1961) found that this insect is one of the main pests on the pumpkin, lettuce and tomato crops in Egypt under the greenhouses conditions in all stages of the gesture to adult plants, leading to vegetative and chlorophyll weakness and low productivity.

Spencer (1990) noted that The Leaf Miner *L. sitrigata* is a polyphagous insect recorded on 240 plant genus from more than 35 families worldwide, while The Leaf Miner *L. huidobrensis* has caused economic losses of up to 30% and 60-70% on vegetables in Indonesia and 100% in Western Europe (Chavez and Raman, 1987; Rauf *et al.*, 2000; Milla and Reitz, 2005).

Infection and Damage Nature

Abdul Razzaq and Deeb (2011) stated that the damage caused by The Leaf Miner *L. bryoniae* appears in leaf and plant tissue damage and poor weakness photosynthesis process as well as yellowing of the plant due to lack of food transfer between tissues followed by small fruit size in infected plants and subsequent plant death, and also reduces the marketing value of crops. Foliage such as lettuce and spinach.

The Leaf Miner adult *L. sativae* implanted eggs under the plant leaf epidermis, after hatching first larval age is appear, which feeds on the middle layer tissue of the leaf between the leaf top and bottom surface, leading to the emergence of zigzag tunnels distinguish this insect. Adult

feeds very well by scratching the leaf tissue by female genitalia (Ovipositor) and feeding on place scratching (Jooda, 2014).

The Leaf Miner species damage arises from the larvae as a result of feeding them inside the foliage or the normal leaves leading to the plant weakening. The plant may die when the early infection. Abul-Nasr and Assem (1961) indicated that the infestation begins in the gourd family plants from the gesture stage to the lower leaves and then moves to infect apical leaves in case of persistence and intensification of infection, Cotyledons may contain more than ten larvae and at this degree of infection the leaves become yellow and fall off, leading to their death. The fall of infected leaves affects the fruits size and maturity and may cause them to fall (Audemard and Aguilar, 1973). In addition to the larvae damage, there is another damage caused by the adult insect by feeding it on the cellular juice of the leaf tissue through the holes caused by insect female in epidermis leaf by female genitalia (Ovipositor).

Several researchers (Parrella *et al.*, 1985; Minkenberg and Van Lenteren, 1986) noted that adults and *L. bryoniae* larvae causes significant damage in the resulted holes from the adult females deposition egg process, and the resulted tunnels from feeding larvae between the top and bottom leaf layers. This damage leads to weakness photosynthesis process, high drought areas in the leaves and modern leaves growth weakness and indirectly causes the fungi and bacteria entry and cause inside leave pollution as a result of feeding and deposition eggs in the tunnel and plant viruses transformation.

Parrella (1987) reported that The Leaf Miner *L. bryoniae* female operates two types of holes in the plant leaf, the first is a propeller hole and is used for feeding only, the second is the tubular hole used for both feeding and egg laying. OEPP / EPPO (1992) indicated that The Leaf Miner *L. bryoniae* female perforates the young leaves of the host plant with female genitalia (Ovipositor) causing wounds that act as feeding or deposition eggs sites.

Tawfik (1993) showed that The Leaf Miner *L. huidobrensis* may cause limited damage in the plant leaves within its life cycle and thus its damage is minor and real damage occurs by increasing the larvae number dug in the plant tissue resulting in these tissues damage and irregular leachate and disruption of the plants materials supply, that it needs to keep growing and surviving, as the female genitalia (Ovipositor) pokes the plant tissues shredding, Leading to dryness. Most of the damage occurs in the plant growth early stages as it severely affects some crops in case of severe infection, has indirect damage as it grows as a fungi and bacteria result, increasing the damage.

CABI / EPPO (2006) indicated that male and female The Leaf Miner *L. sativae* may be a vector of viral diseases during deposition eggs or feeding. Doudin (2007) explained that the main damage to The Leaf Miner *L. trifolii* on vegetable crops comes from larvae that feed on the leaf's mesophilic middle layer. The tunnel becomes visible 4-3 days after deposition eggs and becomes larger in size as the larvae age.

Host plant Range

Several plant hosts attacked by The Leaf Miner belonging to the *Liriomyza Agromyzidae* genus (Diptera), a

polyphagous insect, recorded *L. sativae* on nine hosts plant, although they prefer to be nourished by the Cucurbitaceae, Solanaceae and Cucurbitaceae (Spencer, 1990). The Leaf Miner *L. bryoniae* recorded On 16 plant families cultivated under greenhouse conditions, like Solanaceae such as tomato and leguminisae such as beans, beans and Cucurbitaceae such as pumpkin, watermelon, sophistication and cucumber, are considered a feeding voracious pest (Abul-Nasr and Assem, 1961 Lee; *et al.*, 1990). While (Mahmalji and Bashir, 2011) reported that The Leaf Miner *L. trifolii* of polyphagous insect and attack a large number of aromatic plants and also attack vegetable crops such as eggplant, okra, onions, garlic, beans, watermelon, peas, pepper, sugar beet, cotton, soybeans, peanuts and spinach.

Use of yellow sticky traps to attract adult *Liriomyza* spp.:

The importance of using yellow sticky traps is through monitoring the presence of leaf miners and estimating the population density, in addition to the traps helping to reduce the density of the insect from the attraction of adults and their attachment to the trap and its death. Al-Mashhadani, (1998) indicated that the number of adult insects of *L. bryoniae* has reached 23750 adult insects, or about 40,000 adult insects, and this confirms their effectiveness in combating the adult insect and reducing damage.

Cisneros and Mujica (1997) found that the use of yellow traps by 60 traps / ha reduced the use of pesticides from 6-4 sprinkles per season to 1-2 sprinkles per season to control *L. huidobrensis* also indicated the use of 100-80 traps /A hectare yielded a large productivity by catching approximately 50 million insects / ha. Galande (2001) found that yellow adhesive traps are highly efficient in catching the *L. trifolii* leafmill tunnel maker that affects tomato crops, as the number of insects caught is 7.73 dults.

Buda and Radziute (2008) foun out the effective role of adhesive traps in attracting adults of tomato leaf tuner *L. bryoniae* and managing their numbers in reducing adult numbers by attracting, sticking, and dying them and reducing the number of spending on leaves in greenhouses.

Shahabuddin *et al.* (2015) found the use of yellow sticky traps in the fight against *Liriomyza* spp. in three cucumber crops, tomato and beans. The results showed a correlation between the number of traps and the density of the lesion where the density was significantly reduced when using yellow stick traps in the field.

Generations Numbers

The Leaf Miner *Liriomyza* has 10-5 generations per year Tawfik (1993), while (Babi, 2001) reported that The Leaf Miner *L. huidobrensis* has 15-12 generations per year, it is a multivoltine type. Their generations are intertwined, and the varies generation duration depending on temperature is reach 40 days at 15° C, 26 days at 20° C and 17 days at 25° C (Bape, 2001).

Conclusion

- The Leaf Miner has a number of species, the most important of which are *L. sativae*, *L. bryoniae*, *L. trifolii* and *L. huidobrensis*.
- This insect has a great economic importance as it is a Polyphagous and attack most of the plants belonging to several families, including (Solanaceae, Brassicaceae,

Cucurbitaceae Malvaceae, leguminisae, Convolvulaceae, Amaryllidaceae, Apiaceae, Asteraceae, Nepetoideae).

- The Leaf Miner *Liriomyza Agromyzidae* genus (Diptera) recorded on many plant families that attacked them. *L. sativae* was recorded on nine plant families and The Leaf Miner *L. bryoniae* recorded 16 host plant families cultivated under greenhouse conditions.
- The Leaf Miners have several generations (multivoltine), these generations are intertwined, and the varies generation duration is depending on the temperature.
- The use of yellow traps is of great importance in control Leaf miner.

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