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## The Pea Leaf Miner, Liriomyza Huidobrensis (Blanchard) Larvae and Some Mortality Factors Affecting the Population Density on Pea Plants

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## ABSTRACT



The current study was conducted in Qaleen city Kafr El Sheikh governorate during 2022/23 and 2023/24 seasons. The larval population density of the leaf miner, Liriomyza huidobrensis (Blanchard) was affected by parasitoids and other abiotic. The highest peaks of healthy larvae were recorded in the third week of December 2022 and in the second week of January 2024 with 47and 66 larvae/100 leaflets during the first and second seasons respectively. Meanwhile, the parasitoid , Diglyphus isaea (Walker) activity increased and recorded the highest peaks in the 1st weeks of February 2023 and March 2024 with 39 and 40 individual during the first and the second seasons, respectively. The unknown dead larvae recorded the highest peaks in 2nd week of February 2023 and 42 individual respectively. The highest peaks of total larvae were recorded in the 2nd week of February 2023 with 70 larvae/100leaflets during season 2022-2023 and in the 2nd and 4th weeks in January 2024 with103 larvae/100 leaflets during season 2023-2024. The rate of parasitism recorded the highest average in January by 53.7% in the first season and 50.67% in March in the second season. While the highest unknown dead larvae percentages were 37.45% and 44% in February for the first and season respectively.

Keywords: Pisum sativum, Liriomyza huidobrensis, parasitoids

### INTRODUCTION

Pea Pisum sativum L. is considers from the best common legumes that is required for the human consumption as a fresh or dry seeds (Awadalla, et al., 2018 and Sadek 2024). It has an economic importance as having a variety of nutritional and bioactive ingredients (Fahmi et al., 2019). The seeds contain about 35-50% starch, 18-30 % protein, and 4-7% fiber (Ibrahim et al., 2020). It has been suggested that eating peas is beneficial to healthy (Han et al 2023). Peas are planted in many countries around the world, It can accumulate nitrogen in the soil by nitrogen-fixing bacteria that found on the roots of the crop so that after its cultivation It involves less nitrogen fertilizers (Liu et al., 2018).

Pea crop is attacked by several pests, that damage the yield from early growth stages and through late developmental stages up to harvest and this reduce the quality and quantity of the crop( Awadalla, et al., 2018). One of these insects is pea leaf miner ,L. huidobrensis. It is highly polyphagous leaf miner attacking many host plants at minimum fifteen plant families (Foba et al., 2015). It can cause direct damage to the leaves by making mines on it (Spencer, 1973) or indirect as the adult female makes punctures during oviposition and feeding processes and effects on the Photosynthesis process(Alves et al., 2014). Leaf miners are susceptible for attacks by numerous parasitoid species. This parasitoids have an effective biological control that manage the population density of leaf miners on plants (Sadek 2024). Diglyphus isaea Walker is consider as the most common larval ectoparasitoids for this insect and causes larval mortality (Carballo et al., 1990) and (Gencer 2004). The female parasitoid prefers well hosts and those which had been attacked before (Coaker and Cheah, 1993). Earlier studies recommend that the variation of

parasitoids effect reliant on on the insect host life stage and environmental conditions (Grabenweger et al. 2010). Therefore, this study aimed to inspect the population profusion of L . huidobrensis larvae on pea plants and the effect of ectoparasitoid , Diglyphus isaea on it.

## MATERIALS AND METHODS

This study was conducted in Qaleen, Kafr El-Sheikh Governorate, where peas were cultivated for two seasons in 2022-2023 and 2023-2024 in the third week of November. The experiment was conducted on an area of 200 square meters, divided into four equal areas. All agricultural operations, including irrigation and fertilization, were carried out without using insecticides. After two weeks of cultivation, the leaf miner was continued weekly until harvest time. Samples were collected randomly and separately From the top, middle and lower parts of pea plants (25 leaves/replicate) for 4 replicates. In the laboratory the samples were examined weekly under binocular microscope for counting the number of ectoparasitoids larvae by Diglyphus isaea (Walker), healthy larvae, and unknown dead larvae

### **RESULTS AND DISCUSSION**

Data in fig. (1) Indicated the weekly numbers of healthy, ectoparasitized, unknown mortality larvae and total larval number of L. huidobrensis during season 2022/2023 on pea plants. The maximum peak of healthy larvae was recorded in the 3rd week of December 2022 by 47 larvae /100 leaflets, while the highest peak of ectoparasitized larvae with Diglyphus isaea recorded in the 1st week of February 2023 by 39 individual, the highest peak of unknown dead larvae recorded in the 2nd week of February by 36 larvae /100 leaflets and the highest total numbers of larvae recorded in the

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2nd week of February with 70 larvae/100 leaflet. The highest average number of larvae recorded in the ectoparasitized larvae by  $17.22\pm3.18$ , followed by healthy larvae and unknown dead larvae by $13.61\pm3.3$ ,  $10.67\pm258$ , respectively and the total average numbers recorded  $41.50\pm5.32$ . As a

conclusion during the first season the numbers of healthy larvae start to increase from November tell the 3rd week of December and the ectoparasitoid increased and reduce it till the end of March. Both of the ectoparasitized larvae and total larvae increased in the 2nd of February.



Fig. 1. The healthy larvae, ectoparasitized larvae, unknown dead larvae and total larvae of L. huidobrensis on pea plants (Quleen city Kafr El Sheikh Governorate)during season 2022/23

Data in fig. (2) indicated the weekly numbers of healthy larvae, ectoparasitized larvae, unknown dead larvae and total larval number of L. huidobrensis on pea plants in the first season 2023/24. The maximum peak of healthy larvae was recorded in the 2nd week of January by 66 larvae /100 leaflets, the maximum peak of ectoparasitized larvae with Diglyphus isaea recorded in the first week of March by 40 individual, the highest peak of unknown dead larvae recorded in the 4th week of January by 42 larvae /100 leaflets and the highest total numbers of larvae recorded in the 2th and 4th weeks of January by 103 larvae /100 leaflets . The maximum average number of larvae recorded in the healthy larvae by  $22.94\pm4.48$ , followed by unknown dead larvaewith $19.06\pm2.85$  then ectoparasitized larvae with $16.06\pm2.54$  and the total average numbers recorded  $58.06\pm8.15$ . As a conclusion the healthy larvae and total larvae started to increase gradually and reached to the highest peaks in the 2nd week of January, while the unknown dead larvae was in the 4th week of the same month. The maximum peak for ectoparasitoid larvae was in the 1st week of March.



Fig. 2.The healthy larvae, ectoparasitized larvae, unknown dead larvae and total larvae of L. huidobrensis on pea plants (Quleen city Kafr El Sheikh Governorate) during season 2023-2024

Data in Table (1) indicated the monthly rate of healthy larvae, ectoparasitized larvae and unknown dead larvae of L. huidobrensis on pea plants during season 2022/23. The highest percent of healthy larvae recorded in December by 74.1%, the highest ectoparasitized larvae recorded in January by 53.7%, the highest unknown dead larvae recorded during February by 44.0%. The monthly means percentage of ectoparasitized larvae recorded 33%, followed by Healthy larvae and unknown dead larvae with 25.72% and 21.18% respectively.

Data in Table (2) indicated the monthly percentage of healthy larvae, ectoparasitized larvae, and unknown dead larvae of L. huidobrensis on pea plants during season 2023/24. The highest percent of healthy larvae registered in December with 57.3%, and the highest ectoparasitized larvae recorded in March with 50.6%, while the highest unknown dead larvae recorded during February by 37.4%. The highest mean percentage was for healthy larvae with 29.68% followed with unknown dead larvae with 25.96% and at last ectoparasitized larvae with 24.24%.

Table 1. Monthly rate of healthy larvae, ectoparasitized larvae and unknown dead larvae of L. huidobrensis on pea plants in (Qaleen city Kafr El Sheikh governorate) during season 2022/23

En Sheikii governorate) during season 2022/25				
Months	Healthy	Ectoparasitized	Unknown dead	
	larvae%	larvae %	larvae %	
November	0.0	0.0	0.0	
December	74.1	19.5	6.3	
January	29.9	53.7	16.4	
February	13.6	42.4	44.0	
March	11	49.4	39.2	
Mean	25.72	33.00	21.18	

huidobrensis on pea plants in (Qaleen city Kafr El Sheikh Governorate) during season 2023/24				
Months	Healthy larvae%	Ectoparasitized larvae %	unknown dead larvae %	
November	0.0	0.0	0.0	
December	57.3	16.4	26.2	
January	48.9	19.3	31.6	
February	27.6	34.9	37.4	
March	14.6	50.6	34.6	
Means	29.68	24.24	25.96	

Table 2. Monthly rate of healthy larvae, ectoparasitizedlarvae and unknown dead larvae of L.huidobrensis on pea plants in (Qaleen city Kafr

The present results indicated that the ectoparasitoid, Diglyphus isaea and the larval unknown mortalities were effective factors for decreasing the larval population density for the pea leaf miner , L. huidobrensis.

These results showed that the number of healthy larvae were decreased with the increasing of ectoparasitoids, also unknown mortality increased which agree with (Awadalla et al., 2018) who recorded a gradual increase in the healthy larvae which reached to the highest peak in the 3rd week of December and then decreased by increasing Diglyphus isaea and unknown mortality. These results are compatible with (Bahlai et al., 2006) who found increasing of the unknown dead larvae and parasitism rates in 2002 than 2003 and varied with different plants.

### REFRENCES

- Alves, F.M., Diniz, J.F.S., Silva, I.W., Fernandes, F.L., Silva, P.R. and Gorri, J.E.R. (2014). A sampling plan for Liriomyza huidobrensis (Diptera: Agromyzidae on a potato (Solanum tuberosum) plantation. Amer J. of Potato Res. 91: 663–672.
- Awadalla, S. S., El-Serafi, Hala A., El-Fakharany, Sanaa K. and Abou-Attia, Samar F. (2018). Field Studies on the Pea Leaf Miner ,Liriomyza huidobrensis (Blanchard) and its Associated Ectoparasitoid ,Diglyphus isaea (Walker). J. Plant Prot. and Path., Mansoura Univ. 9 (6): 357 – 361.
- Carballo, M., Leon, G.R. and Ramirez, A. (1990). Biol. control of Liriomyza sp.(Diptera: Agromyzidae) in horticultural crops at Costa Rica. Manejo. Integrado.de. plagas. (16):4-11.
- Coaker, T.H. and Cheah C.A. (1993). Conditioning as a factor in parasitoid host plant preference. Biocontrol Science and Technology. 3(3): 277-283.
- Fahmi, R., Ryland, D., Sopiwnyk, E., Aliani, M.(2019) . Sensory and Physical Characteristics of Pan Bread Fortified with Thermally Treated Split Yellow Pea (Pisum sativum L.) Flour. J. Food Sci. 84: 3735–3745.

- Foba, C.N., Salifu, D., Lagat ,Z.O., Gitonga ,L.M., Akutse, K.S. and Fiaboe, K.K.M.(2015). Species composition, distribution, and seasonal abundance of Liriomyza leafminers (Diptera :Agromyzidae) under different vegetable production systems and agroecological zones in Kenya. Environ .Entomol. 44(2): 223-232.
- Gencer, L. A.(2004). Study on the chalcidoid (Hymenoptera: chalcidoidea) parasitoids of leaf miners (Diptera: Agromyzidae) in Ankara Province. Turk J Zool.28:119-122.
- Grabenweger, G., Kehrli, P., Zweimuller, I., Augustin, S. and Avtzis, N. (2010). Temporal and spatial variations in the parasitoid complex of thehorse chestnut leaf miner during its invasion of Europe. BiologicalInvasions. 12(8): 1–17. https://doi.org/10.1007/s10530-009-9685-z
- Han, X., Akhov, L., Ashe, P., Lewis, C., Deibert, L., Irina Zaharia, L., Forseille, L., Xiang, D., Datla, R., and Nosworthy, M.(2023). Comprehensive Compositional Assessment of Bioactive Compounds in Diverse Pea Accessions. Food Res. Int., 165, 112455.
- Ibrahim, H., Dangora, D.B., Bubakar B.Y.A. and Suleiman A.B.(2020). Insect and vertebrate pests associated with cultivated field pea (Pisum sativum Linn) in northern Guinea Savanna of Nigeria. Science World Journal. 15(1): 40-44.
- Kumari, T. and Deka, S.C.(2021). Potential Health Benefits of Garden Pea Seeds and Pods: A Review. Legume Sci. 3, e82.
- Liu, M., Wu, N. N., Yu, G. P., Zhai, X. T., Chen, X., Zhang, M., Tian, X.H., Liu, Y.X., Wang, L.P. and Tan, B. (2018). Physicochemical Properties, Structural Properties, and in vitro Digestibility of Pea Starch Treated with High Hydrostatic Pressure. Starch-Starke 70, 9.
- Milla, K. and Reitz, S. (2005). Spatial/temporal model for survivability of pea leaf miner (Liriomyza huidobrensis) in warm climates: a case study in South Florida, U.S.A. European Journal of Scientific Research. 7: 65-73.
- Sadek, Aneesa S. (2024). Insect pests, snails and spider mite associated with cultivated field peas, and Liriomyza spp parasitoids Journal of Applied Entomologist, 4(3):01-08.
- Spencer, K.A. (1973). Agromyzidae (Diptera) of economic importance. Series Entomologica. 9:1-418.

# يرقات صانعة أنفاق أوراق البسلة (Liriomyza Huidobrensis (Blanchard وبعض عوامل الموت التي تؤثر على كثافة التعداد علي نباتات البسلة

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#### الملخص

أجريت الدراسة الحالية في مدينة قلين بمحافظة كفر الشيخ خلال موسمي 23/2022 و 24/2023. تأثرت الكافة الحدية ليرفلت صنعات الأنفاق Einomyza huidobrensis أجريت الدراسة الحالية في مدينة قلين بمحافظة كفر الشيخ خلال موسمي 23/2022 و 22/2023. تأثرت الكافة الحدية ليرفلت صنعات الأنفاق Ilanchard) الموجودة على نبتلت البسلة بالطغليات وعوامل حقلية أخرى. سُجلت أعلى قمم للبرقلت السليمة في الأسبوع الثلث من ديسمبر 2022 وفي الأسبوع الثلتي من يناير 2024 حيث بلغت (Blanchard) و100 وريقة خلال للموسمين الأول والثلتي على التوالي. بينما زاد نشاط طغل Diglyphus isaea (Walker) وسجل أعلى قمم في الأسبوع الثلتي من فيراير 2023 ومارس 2024 موسمي 2024 وريقة خلال الموسمين الأول والثلتي على التوالي. بينما زاد نشاط طغل Diglyphus isaea (Walker) وسجل أعلى قمم في الأسبوع الألتي من فيراير 2023 ومارس 2024 بنعت بلغت بعداد 39 و40 فرد خلال الموسمين الأول والثلتي على التوالي. سجلت أعلى قم لير 2023 ومارض 2024 وسجل أعلى قمة في الأسبوع الثلثي من فيراير 2023 ومارس 2024 بولغ و40 في 2024 وسجل أعلى قم في الأسبوع الأول من فيراير 2023 ومارس 2024 بنعت 120 فرد خلال الموسمين الأول والثلتي على التوالي. سجلت البر 2023 والغي مع موتها أعلى قمة في الأسبوع الثلثي من فيراير 2023 ورقع 30 و بتعاد 39 و 60 فرد خلال الموسمين الأول والثلتي على التوالي. سجلت البر 2023 بتحاد 70 بيرقة/100 وريقة خلال الموسم الأول وفي الأسبوع الذلتي والرابع من يناير 2024 وقع 36 و 2014 مولي التربي عالي الموسم الثلثي على التوالي على متوسط في يناير بنسبة 3.77% في الموسم الأول وفي الأسبوعين الثاني. في حين أن أعلى نسبة 2017 في الموسم الأول وفي الأسبوعين الثاني. في حين أن أعلى نسبة 2017 إلى حينة 2017 إلى ويرفقة خلال الموسم الثلي. في حين أن أعلى نسبة 2017 إلى حين التوالي مالول في الأسبوع الثلثي . ليولي من يناير 2024 بنه 2010 ورابية ويرابونه 30 و بلغت 2010 وروبية خلال الموسم الثلق أعلى متوسط في يناير بنسبة 2017 إلى ول 2015% في شهر مارس في الموسم الثلي. في حين أن أعلى نسبة 2017 إلى حين البريقة خلال الموسم الثلي . 2017 إلى الموسم الأول و 2016% في الموسم الأول و أسبوم مارس في الموسم الثلي. في حين أن