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REDUCTION OF POPULATIONS OF RHAGOLETIS CERASI L. AND MYZUS CERASI F. IN INTENSIVE SOUR CHERRY PLANTATIONS

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Abstract: *Research on the two pests in cherry orchards shows that the phytosanitary treatments used in control must be supplemented with technology elements through a three-factor analysis, based on the method of subdivided plots, with the crown shape, the cultivated variety, and the planting distances as factors. The crown shape has a significant influence in determining the frequency of attack, which can reach up to 30%, and a degree of damage of up to 80%. Also, the cultivated variety contributes in a percentage of over 30% frequency, and a degree of damage of 10-12%. Studying the influence of planting distances on the mode of damage, we find that in general, small planting distances (4x2) increase the frequency and degree of attack by up to 10%. Compared to larger distances (4x3) and (4x4). The results obtained aim to improve the technology of cherry cultivation in an intensive system, within which the correlation between tree density, cultivated variety and the attack of the cherry fly Rhagoletis cerasi L and the black aphid Myzus cerasi F was also monitored. In order to establish measures to stop the appearance of the pests, the contact insecticide Decis Expert 100 EC (deltamethrin 100 g/l) 0,75%, Deltasap 2,5 EC 0,05%, Karate Zeon 0,015%, Movento 100 SC 018%, was used, with action both in the larval and adult stages on the pests in the plantation compared to the untreated control.*

Key words: *cherry fruit fly, treatment,variety, black aphid, degree of damage*.

INTRODUCTION

The relatively low yields obtained, compared to the ecological conditions and the biological potential of these species, have necessitated intensified research aimed at diversifying the assortment with new cultivars, expanding intensive orchards, and applying modern methods of maintenance, fertilization, and pest and disease control.

The progress achieved through scientific research in pomology has led to a continuous increase in fruit production and to improvements in fruit quality. A crucial role in obtaining superior results has been played by the introduction of technical advancements, developments in genetics and nutrition, the mechanization of orchard operations, the chemical enhancement of plant protection, the automation of production processes, and the specialization of the workforce.

Fruit production, both in terms of quantity and quality, is inconceivable without the application of appropriate technologies, among which modern measures for disease and pest prevention and control occupy a primary place.

At present, the secondary effects resulting from the excessive and unilateral use of chemical products are well known. These phenomena include the mass multiplication of pests due to disturbances in the natural biological balance, the reduction in the effectiveness of chemical treatments caused by the emergence of resistant pest races, and consequently, an increase in toxic residues and environmental pollution.

For this reason, research has been intensified to introduce into cultivation new cultivars adapted to specific regions or fruit-growing basins, characterized by resistance or tolerance to pest attacks. Such efforts aim to reduce the number of phytosanitary treatments required and, implicitly, to diminish environmental pollution.

The development of integrated pest management (IPM) systems, aimed at reducing pesticide use and ensuring stronger protection of the environment and human health, is based on combining all available control methods—agrotechnical, resistant cultivars, mechanical, physical, chemical, and biological—while applying treatments according to the economic threshold of damage and other treatment adjustment parameters. Special attention is given to combining chemical and biological methods, as well as chemical and natural control approaches. The key issue determining the success of most integrated pest management systems lies in the use of the phenomenon of chemical selectivity.

Over time, a number of scientific studies have been published on the diseases and pests of sour cherry. However, more in-depth research on the biology and integrated control of the main pathogens and pests remains relatively limited. To reduce damage caused by pests under local conditions, studies and experiments have been conducted to better understand the biology, ecology, and control of pests that attack sour cherry trees, as well as to determine the most effective integrated protection complexes for these species.

By developing new integrated control strategies based on a detailed understanding of the biology and ecology of cherry and sour cherry diseases and pests, significant contributions can be made toward achieving higher yields of superior quality, at lower production costs and with minimal environmental pollution.

MATERIALS AND METHODS

The experiment was conducted in an intensive sour cherry plantation comprising several cultivars, 17 years of age, arranged in a rectangular layout. A portion of the orchard was designated as the untreated control, separated by an un-sprayed protective buffer strip. The yield from this untreated control section was not included in the calculation of the treated plots' production.

The applied method consisted of comparing the yield obtained from the plots treated with insecticides to that of the untreated control, in order to determine the economic effectiveness of the insecticides used. Experimental protection complexes were applied in several treatment variants, following post-flowering pest control warnings, with a total of six treatments applied after bloom. In total, ten treatments were carried out for this species—one during the dormant (winter) period and nine during the growing season.

For observations, three trees were selected per replication, examining a total of 900 leaves, 150 shoots, and 300 fruits. Observations regarding defoliating insects and leaf phytotoxicity were performed after the fifth treatment, corresponding to the petal-fall stage.

To evaluate the effectiveness of each experimental variant in reducing pest attacks caused by the cherry fruit fly (*Rhagoletis cerasi* L.) and the black cherry aphid (*Myzus cerasi* F.), the degree of infestation and damage caused by the larvae of these pests was determined.

RESULTS AND DISCUSSIONS

The major pests affecting sour cherry cultivation—the cherry fruit fly (*Rhagoletis cerasi* L.) and the black cherry aphid (*Myzus cerasi* F.)—increasingly damage intensive sour cherry plantations, particularly when maintenance operations are not performed according to appropriate technological standards.

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The data presented in Tables 1 and 2 illustrate the behavior and influence of the analyzed factors on pest incidence within the plantation.

By examining the effect of planting distance on the extent of pest damage, it was found that, in general, smaller planting distances (4 × 2 m) increase the frequency, intensity, and overall degree of pest attack compared to wider spacings (4 × 3 m and 4 × 4 m). At smaller distances, the attack frequency of *Rhagoletis cerasi* reached 43.1%, while the degree of infestation was 21.6%. Similarly, higher values were also recorded for the black cherry aphid (*Myzus cerasi*), which showed increased frequency and severity of infestation under closer planting conditions.

Table 1

Behavior of Sour Cherry in Relation to Major Pests

Cultivar	Planting distance	*Rhagoletis cerasi*		*Myzus cerasi*	
		F%	**GA%**	**F%**	**GA%**
Ilva	4x2	27,3	6,8	27,3	2,7
	4x3	21,1	2,1	12,7	0,4
	4x4	18,7	1,9	13,1	0,4
Schattenmorelle	4x2	43,1	21,6	38,3	3,8
	4x3	32,7	8,2	15,7	0,5
	4x4	30,3	7,5	16,1	0,5
Pitic	4x2	30,7	7,7	27,7	2,8
	4x3	31,3	7,8	20,1	0,6
	4x4	20,1	2,0	21,3	0,6
Oblacinska	4x2	23,3	2,3	18,7	0,6
	4x3	18,1	1,8	15,1	0,5
	4x4	13,7	0,4	14,7	0,4

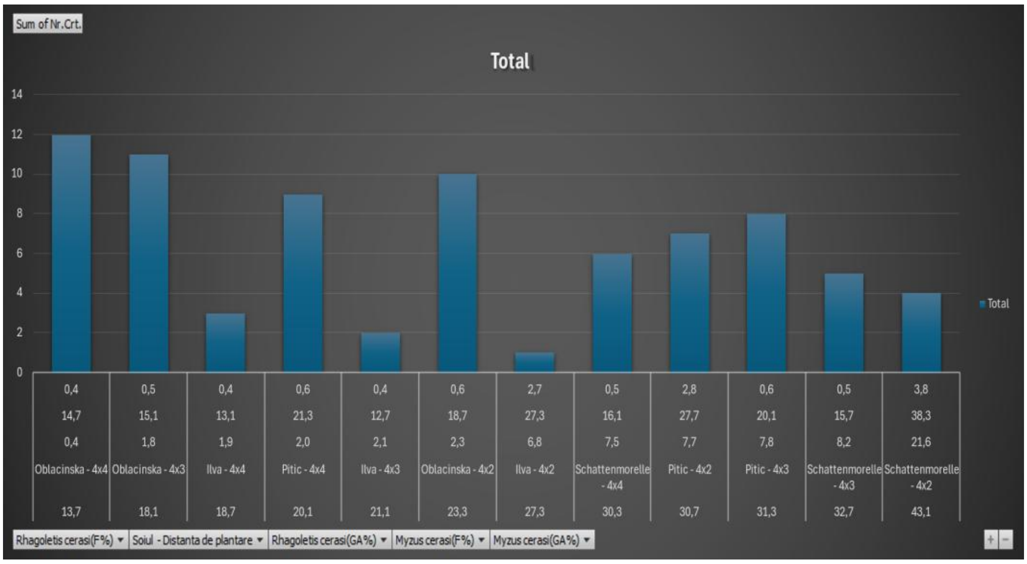

Figure 1. Behavior of Sour Cherry in Relation to Major Pests

Table 2

Individual Effects of Factors on Sour Cherry Susceptibility to Pests

Factors	***Rhagoletis cerasi***		***Myzus cerasi***	
	F%	**GA%**	**F%**	**GA%**
A (shape of the crown), cultivar Ilva				
A1 pyramid	26,9	7,9	20,0	1,1
A2 bush	26,9	7,9	20,0	1,1
A3 palmet	26,9	7,9	20,0	1,1
B (cultivar)				
B1 Ilva	22,4	3,6	17,7	1,2
B2 S. Morelle	35,4	12,4	23,3	1,6
B3 Pitic	27,4	5,8	23,0	1,3
B4 Oblacinska	18,4	1,5	16,2	0,3
C (planting distance)				
C1 4x2	32,9	12,2	26,8	2,3
C2 4x3	25,8	5,3	16,4	0,5
C3 4x4	21,8	3,4	16,8	0,5

Table 3

Efficacy of Investigated Pesticides in Controlling Pests on Sour Cherry, 'Ilva' Cultivar

Nr. Var.	**Pesticide**	**Conc%**	**Leaf**		**Sprout**		**Fruits**	
			F%	**Semn.**	**F%**	**Semn.**	**F%**	**Average prod. kg/tree**
1	Decis Expert 100 EC	0,75%	2,0	***	7,3	***	0	11,6
2	Deltasap 2,5 EC	0,05%	0,7	***	0	***	0	12,5
3	Karate Zeon	0,015%	13,3	***	22,7	***	0	10,7
4	Movento 100 SC	0,18%	5,3	***	10,7	***	0	11,5
5	Non-treated control	-	40,7	-	36		2,0	5,5
	DL 5%	2,25		2,01				
	DL 1%	3,02		2,69				
	DL 0,1%	3,98		3,49				

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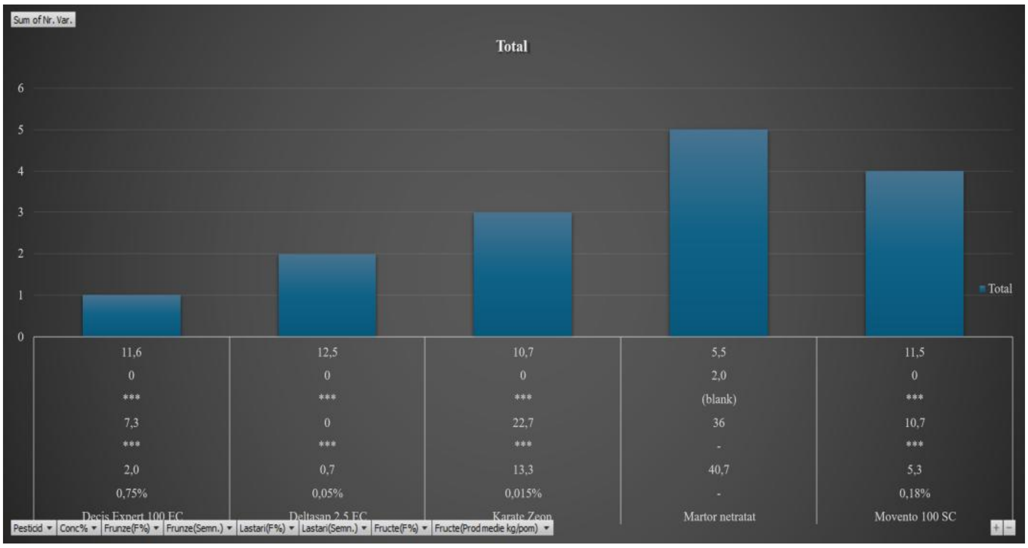

Figure 2. Efficacy of Investigated Pesticides in Controlling Pests on Sour Cherry, 'Ilva' Cultivar

The data presented in Table 3 indicate that the tested pesticides showed highly significant efficacy in controlling the two major pests—the cherry fruit fly (*Rhagoletis cerasi* L.) and the black cherry aphid (*Myzus cerasi* F.)—compared to the untreated control. In the treated variants, the frequency of attack on leaves was reduced to as low as 0.7%, compared with 40.7% in the untreated control. The highest efficacy was recorded in the variant treated with Deltasap 2.5 EC, which required only a single application.

The overwintering larvae of *Myzus cerasi* attack inflorescences, shoots, and young leaves, while beginning with the first generation, the larvae also infest the fruits.

When analyzing the adult populations, it was observed that the flight period for both pests began on July 2 and extended over a ten-week interval. The flight curve reached its peak during the sixth week, corresponding to the beginning of the first decade of August. The flight activity of this generation ended toward the end of August.

CONCLUSIONS

The pests find highly favorable conditions for development and spread in all respects: optimal temperature and humidity, abundant food resources in spring, and, in some cases, the absence of phytosanitary treatments—all of which contribute to high pest densities, particularly in certain variants.

The herbaceous vegetation that serves as an initial host for the overwintering species is abundant, especially in intensive plantations, where overwintering adults find optimal feeding and development conditions.

Although certain cultivated sour cherry varieties exhibit tolerance or resistance to pest attacks, the damage caused in infested plantations can reduce yields by as much as 70–100%.

In recent years, the presence and spread of pests in plantations have increased, both due to the lack of financial resources for increasingly expensive phytosanitary treatments and because of insufficient awareness among growers regarding pest emergence and the importance of timely control measures.

Within agricultural ecosystems, and particularly under the framework of the integrated pest management (IPM) concept, special emphasis is placed on the use of preventive measures to avoid mass pest outbreaks, as well as on the implementation of unconventional or alternative pest control methods.

BIBLIOGRAPHY

AGEE, H.R.; BOLLER, E.; REMUND, U.; DAVIS, J.C.; CHAMBERS, D.L. – 1982. Spectral sensitivities and visual attractant studies on the Mediterranean Fruit Fly, Ceratitis capitata (Wiedemann), Olive Fly, *Dacus oleae* (Gmelin), and the European Cherry Fruit Fly, *Rhagoletis cerasi* (L.) (*Diptera*, *Tephritidae*). J. Appl. Entomol. 1982, 93, 403–412.

BAKER, B. - 2013.Dispersal of *Rhagoletis cerasi* in commercial cherry orchards: Efficacy of soil covering nets for Cherry Fruit Fly control. Insects, 4, 168–176.

BARRINGER, L. – 2018. First record of the European cherry fruit fly, *Rhagoletis cerasi* (Linnaeus) (*Diptera: Tephritidae*), in North America. Insecta Mundi 2018, 0622, 1–4. WAKIE, T.T.; YEE,

BOLLER, E.; PROKOPY, R.J. – 1976. Bionomics and management of *Rhagoletis*. Annu. Rev. Entomol, 21, 223–246.

BOLLER, E.F.; AVILLA, J.; JOERG, E.; MALAVOLTA, C.; WIJNANDS, F.G.; ESBJERG, P. – 2004. Integrated Production. Principles and Technical Guidelines, 3rd ed.; OILB/WPRS Bull; IOBC: Wädenswil, Switzerland; Volume 27.

CARUSO, S.; TOMMASINI, M.G.; BARBARI, G.; IORIATTI, C.; ALTINDISLI, F.Ö.; BØRVE, J.; ESCUDERO-COLOMAR, L.A.; LUCCHI, A.; MOLINARI, F. - 2013. Investigation on adulticide bait (Spintor-Fly®) to control the cherry fruit fly in Emilia-Romagna (North Italy). Trials 2010–2012. IOBC/wprs Bull., 91, 37–42.

DANIEL, C.; GRUNDER, J. – 2012. Integrated management of European cherry fruit fly Rhagoletis cerasi (L.): Situation in Switzerland and Europe. Insects, 3, 956–988.

DANIEL, C.; MATHIS, S.; FEICHTINGER, G. – 2014. A new visual trap for *Rhagoletis cerasi* (L.) (*Diptera*: *Tephritidae*). Insects, 5, 564–576.

DANIEL, C.; WYSS, E. – 2009. Susceptibility of different life stages of the European Cherry Fruit Fly, *Rhagoletis cerasi*, to entomopathogenic fungi. J. Appl. Entomol. 2009, 133, 473–483.

DANIEL, C.; WYSS, E. – 2010. Field applications of Beauveria bassiana to control the European Cherry Fruit Fly *Rhagoletis cerasi*. J. Appl. Entomol, 134, 675–681. [CrossRef]

DEMAEYER, L.; COMPANYS, V.; RICCI, M.; HYZY, N.; IZQUIERDO CASAS, J.; ABTS, W.; ENGEL, C.; BELIEN, T.; CLYMANS, R.; SHIRRING, A. – 2020. Mass trapping with Decis™ Trap to manage fly control of *Rhagoletis cerasi* and *Drosophila suzukii* in IPM cherry orchards. Acta Hortic., 1286, 219–226.

FIMIANI, P. – 1983. Multilarval infestations by *Rhagoletis cerasi* L. (*Diptera: Trypetidae*) in cherry fruits. In Fruit Flies of Economic Importance; Cavalloro, R., Ed.; Balkema: Rotterdam, The Netherlands; pp. 52–59. .

FLORIAN, T.; MACAVEI, L.I.; HULUJAN, I.B.; VASIAN, I.; TOTOS, S.; GORGAN, M.; FLORIAN, V. 2022. Testing of semio-chemical products in monitoring and control of *Rhagoletis cerasi* L. AgroLife Sci. J. 2018, 7, 61–68. Horticulturae, 8, 869 13 of 1.

GRODNER, J.; ´ SWIECH, K.; ROZPARA, E.; DANELSKI, W. - 2016. Food attractant to control the population of *Rhagoletis cerasi* L. (*Diptera: Tephritidae*) and its use in organic sweet cherry orchard in Poland. J. Res. Appl. Agric. Eng., 61, 167–172.

HERZ,A.;KÖPPLER,K.;VOGT,H. – 2007. Kannder Einsatz Entomopathogener Nematodenzur Nachhaltigen Bekämpfungder Kirschfruchtfliege Beitragen? 9. Wissenschaftstagung Ökologischer Landbau; Zikeli, S., Claupein, W., Dabbert, S., Kaufmann, B., Müller, T., Valle Zárate, A., Eds.; Verlag Dr. Köster: Berlin, Germany; Available online: https://orgprints.org/13795/ (accessed on 22 June 2022).

IOANNOU, C.S.; PAPANASTASIOU, S.A.; ZARPAS, K.D.; MIRANDA, M.A.; SCIARRETTA, A.; NESTEL, D.; PAPADOPOULOS, N.T. – 2019. Development and field testing of a spatial decision support system to control populations of the European cherry fruit fly, *Rhagoletis cerasi*, in Commercial Orchards. Agronomy, 9, 568.

KATSOYANNOS, B.I. – 1976. Female attraction to males in *Rhagoletis cerasi*. Entomol. Soc. Am. 1976, 5, 474–476.

KATSOYANNOS, B.I.; PAPADOPOULOS, N.T.; STAVRIDIS, D. – 2000. Evaluation of trap types and food attractants for *Rhagoletis cerasi* (*Diptera: Tephritidae*). J. Econ. Entomol., 93, 1005–1010.

KÖPPLER, K.; PETERS, A.; VOGT, H. – 2005. Initial Results in the Application of Entomopathogenic Nematodes against the European Cherry Fruit Fly *Rhagoletis cerasi* L. (*Diptera*: *Tephritidae*). IOBC/WPRS Bull, 28, 13–18.

KÖPPLER, K.; VOGT, H.; STORCH, V. – 2008. Bait sprays to control the European Cherry Fruit Fly *Rhagoletis cerasi*. IOBC/WPRS Bull., 37, 59–66.

KUSKE, S.; DANIEL, C.; WYSS, E.; SARRAQUIGNE, J.; JERMINI, M.; CONEDERA, M.; GRUNDER, J. – 2005.Biocontrol potential of entomopathogenic nematodes against nut and orchard pests. IOBC/WPRS Bull., 28, 163–167.

MARTÍN GIL, A.; LOZANO, C.M.; CRUZ, J.I. – 2005. (Eds.) Guía de Gestión Integrada de Plagas: Frutales de Hueso: Albaricoque, Melocotón, Nectarina, Ciruelo y Cerezo; Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente: Madrid, Spain; pp. 83–85.

PROKOPY, R.J.; BOLLER, E. – 1971. Response of European Cherry Fruit Flies to colored rectangles. J. Econ. Entomol, 64, 1444–1447.

SARLES, L.; VERHAEGHE, A.; FRANCIS, F.; VERHEGGEN, F.J. – 2015. Semiochemicals of *Rhagoletis* fruit flies: Potential for integrated pest management. Crop Prot., 78, 114–118.

W.L.; NEVEN, L.G. Assessing the risk of establishment of *Rhagoletis cerasi* (*Diptera: Tephritidae*) in the United States and globally. J. Econ. Entomol. 2018, 111, 1275–1284.

***Registro deProductos Fitosanitarios. MAPA (Spanish Ministry of Agriculture, Fisheries and Food). Available online: https://www. mapa.gob.es/es/agricultura/temas/sanidad-vegetal/productos-fitosanitarios/registro/menu.asp (accessed on 22 August 2022).