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The catch of leaf tortricids moths to pheromone traps in apple orchards

Part II. Structure of number

Odłowy motyli zwójkówek liściowych do pułapek feromonowych
w sadach jabłoniowych
Część II. Struktura liczebności

Summary. The purpose of the three years of studies was to establish the population structure of selected species of leaf tortricids in particular types of apple orchards on the basis of the catch into pheromone traps. Four out of the five studied species of leaf tortricids were caught in the orchard without any chemical protection. Those were: *Spilonota ocellana*, *Adoxophyes orana*, *Pandemis cerasana* and *Pandemis heparana*. On the other hand, those species were least numerous in the intensively protected orchard. The differences in the number of the caught males in those two apple orchards, which significantly differed from each other with the system of plant protection, were considerable. In each of the studied orchards the dominating species was *S. ocellana*.

Key words: leaf rollers, pheromone traps, structure of number, apple orchards

INTRODUCTION

Natural conditions in a given area affect the species composition and number of leaf tortricids in apple orchards. However, the species composition in the same regions changes in particular years of studies [Olszak 1995]. For example, in the 1970's *Archips rosana* (L.) occurred with big intensity in the area of northern Poland, even its gradation was observed, while lately this species has been hardly noticed in that area [Płuciennik 2000]. Pheromone traps, whose many years' use makes it possible to register the changes taking place in a given habitat, are very useful in estimating the species composition and population of leaf tortricids [Płuciennik and Olszak 2005].

The purpose of the present studies was to establish the population structure of selected species of leaf tortricids in particular types of apple orchards on the basis of the catch into pheromone traps.

MATERIALS AND METHODS

The area and methods of studies concerning the catch of selected species of leaf tortricids into pheromone traps are presented in detail in part I [Kot 2009]. Besides, the obtained results were submitted to a statistical analysis using the sign test for dependent observations [Stanisz 1999].

RESULTS

Within three years of studies, three species out of the four observed species of leaf tortricids were caught in the orchard without any chemical protection (Tab. 1). Those were: *Spilonota ocellana* (Den. et Schiff.), *Adoxophyes orana* Fisch. v. Rösl. and *Pan-demis cerasana* Hbn. On the other hand, those species were least numerous in the inten-

Table 1. Number of leaf tortricids males caught into pheromone traps in particular apple orchards in the years 1999–2001

Tabela 1. Liczebność samców zwojkówek liściowych odłowionych do pułapek feromonowych w poszczególnych sadach jabłoniowych w latach 1999–2001

Site Stanowisko	Year Rok	Number of males in the trap, in specimens Liczebność samców w pułapce, szt.			
		<i>S. ocellana</i>	<i>P. cerasana</i>	<i>A. orana</i>	<i>A. podana</i>
An orchard without chemical control Sad bez ochrony chemicznej	1999	232	48	48	8
	2000	360	79	37	10
	2001	153	156	98	1
	total ogółem	745	283	183	19
An orchard with a limited program of control Sad o ograniczonym programie ochrony	1999	147	81	24	9
	2000	178	84	13	13
	2001	215	27	24	8
	total ogółem	540	192	61	30
An orchard with intensive control Sad intensywnie chroniony	1999	14	10	10	3
	2000	35	14	10	6
	2001	9	5	2	3
	total ogółem	58	29	22	12
In total Ogółem		1343	504	266	61

sively protected orchard. The differences in the populations of the caught males in those two apple orchards, which differed significantly with the system of plant protection, were considerable. *S. ocellana* males in the non-protected orchard were caught in almost thirteen times as big numbers as in the intensively protected orchard. The other three species were almost 8–9 times as numerous in the non-protected orchards as in the intensively protected one.

Results of the studies presented in Table 1 point out that the male population of *A. podana* in all experimental objects in the course of three-year-long observations was relatively low and it ranged from 1 to 13 individuals throughout the period of vegetation. The highest male number of this species was observed in the orchard with a limited program of protection (30 specimens), while the lowest in the intensively protected one (12 specimens).

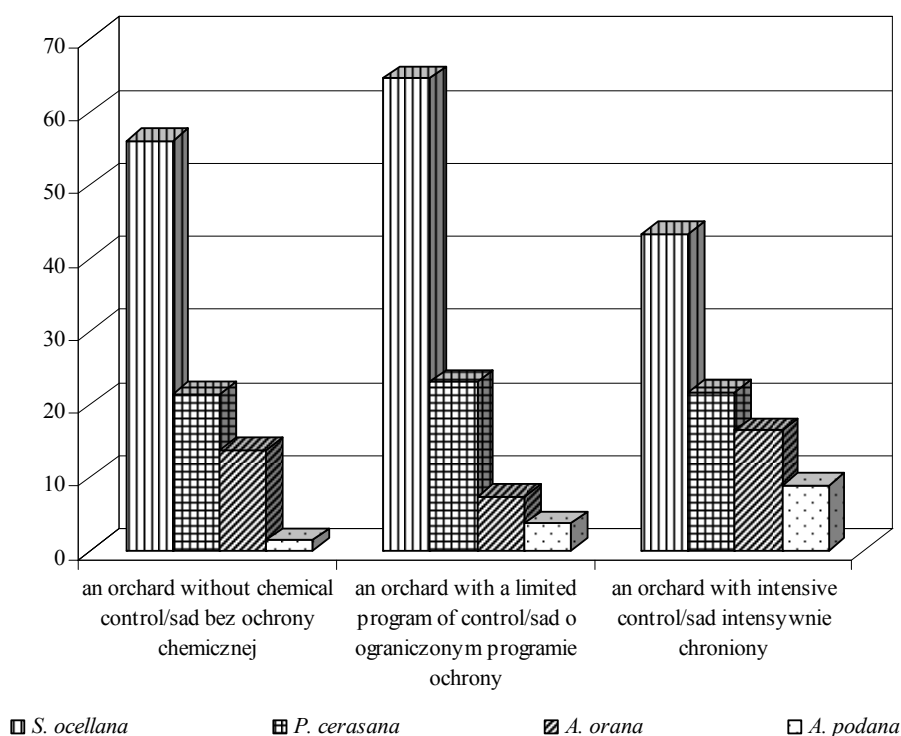


Fig. 1. Percentage contribution of males of particular leaf tortricides species caught into pheromone traps in studied apple orchards in 1999–2001

Rys. 1. Procentowy udział samców poszczególnych gatunków zwójków liściowych odłowionych do pułapek feromonowych w badanych sadach jabłoniowych w latach 1999–2001

The statistical analysis using the method of the sign test for dependent observations proved that all the compared experimental variants differed significantly from each other regarding the total number of the caught males of *S. ocellana* and *A. orana*. On the other hand, significant differences in the male population of *P. cerasana* occurred between the orchard without any chemical protection in Leonów and the intensively protected or-

chard in Jastków, and between the orchard with a limited program of plant protection and the intensively protected one. Whereas no significant differences were found out between the orchard without any chemical protection and the orchard with a limited program of protection.

Regarding the total number of the caught males of *A. podana*, significant differences occurred between the orchard with a limited plant protection program and the intensively protected one. On the other hand, no significant differences were found comparing the populations of the caught moths in the orchard without any chemical protection and the one with a limited program of plant protection.

The population structure of the caught males of leaf tortricids in particular apple orchards was similar (Fig. 1). *S. ocellana* was the dominating species in all orchards. Its percentage ranged from 43.3 to 64.6%, depending on the site. *P. cerasana*, which constituted about 20% of all the caught moths in particular orchards, took the second place regarding its number. The proportion of the other three species was lower and it ranged from 1.4 to 16.4%, depending on the species and the site.

DISCUSSION

Significant differences in the number of the caught males in different orchards and in the percentage of particular species were observed by Płuciennik *et al.* [1998], and her findings were confirmed in the present authors' studies.

The domination of *S. ocellana* was observed in the material caught into pheromone traps in the period of three-year-long studies. On the other hand, the domination of *Archips rosana* (L.) was found on the basis of the collected caterpillars and pupa in the same apple orchards [Kot and Jaśkiewicz 2007]. A similar situation was also observed in the case of *P. cerasana*. Its participation in the species structure established on the basis of the catch into pheromone traps was high in all experimental orchards, while the number of the collected caterpillars of this species was low. Such a relation probably resulted from the fact that all species of leaf tortricids are polyphagous also occurring on the accompanying plants. Besides, moths are attracted to pheromone traps from considerable distances, which is why they could fly in from other orchards and non-horticultural plant in the vicinity [Płuciennik *et al.*, 1998].

The males number of *A. podana* within three years of studies was on a very low level as compared to other regions of Poland [Koślińska *et al.* 1990]. Only single individuals of this species were also found in the caterpillar rearing [Kot and Jaśkiewicz 2007]. Such results would point to a small degree of harmfulness of *A. podana* in orchards in the area of Lublin province. On the other hand, Płuciennik *et al.* [1994] found out a domination of this species together with *A. orana* and *P. heparana* in northern Poland.

CONCLUSIONS

1. Among five species of leaf tortricids caught into pheromone traps, four were most numerous in the orchard without any chemical protection.

2. The males of the studied leaf tortricids were the least numerous in the intensively protected orchard.

3. In each studied orchards the dominating species was *S. ocellana*, its participation ranged from 43.3 to 64.6%.

4. The population of *A. podana* moths in the course of three years of studies was very low, which would point to a low degree of harmfulness of this species on orchard cultivations in the area of the Lublin province.

REFERENCES

- Kot I., 2009. The catch of leaf tortricids moths to pheromone traps in apple orchards. Part I. Dynamics of moths flight. *Annales UMCS, sec. EEE*, 19(1), www.versita.com/science/agriculture.
- Kot I., Jaskiewicz B., 2007. Leaf tortricids (*Lepidoptera, Tortricidae*) inhabiting apple orchards of the vicinity of Lublin. Part I. The species composition and the number. *EJPAU, Topic Horticulture*, 10, 1, www.ejpau.media.pl
- Koślińska M., Tworkowska U., Wojtas-Kozieł B., Gromisz Z., Prędko S., Bachnacki R., 1990. Przebieg lotu zwójki siatkóweczki – *Adoxophyes reticulana* Hbn. i zwójki rdzaweczki – *Archips podana* Scop. (*Lepidoptera, Tortricidae*) w Polsce w latach 1984–1987. *Pr. Inst. Sad. Kw., ser. A., t. 29*, 75–85.
- Olszak R. W., 1995. Zagrożenia, problemy i tendencje w ochronie roślin sadowniczych przed szkodnikami. *Ogólnopol. Konf. Ochr. Roślin Sad., Skierniewice*, 1–2 lutego, 10–16.
- Pluciennik Z., 2000. Zwójki liściowe – zagrożenie i zwalczanie. V Ogólnopol. Spotkanie Sadowników w Grójcu, 19–20 stycznia 2000 r., ISiK Skierniewice, 106–110.
- Pluciennik Z., Olszak R. W., 2005. Zwójkówki w sadach. *Plantpress Kraków*, 53.
- Pluciennik Z., Rejnuś M., Banyś M., Brożbar J., 1994. Zwójki liściowe – występowanie i problemy zwalczania. *Mat. Ogólnopol. Konf. Ochr. Roślin Sad., ISiK Skierniewice*, 51–55.
- Pluciennik Z., Olszak R. W., Tworkowska U., 1998. Skład gatunkowy zwójkówek liściowych w różnych rejonach klimatycznych Polski. *Ogólnopol. Konf. Ochr. Roślin Sad., Skierniewice* 19–20 lutego, 91–94.
- Stanisz A., 1999. Podstawy statystyki dla prowadzących badania naukowe. *Testy nieparametryczne – cz. II. Medycyna praktyczna* 10, 167–169.

Streszczenie. Celem trzyletnich badań było ustalenie struktury liczebności wybranych gatunków zwójkówek liściowych w sadach jabłoniowych o zróżnicowanym systemie ochrony roślin na podstawie odłowów do pułapek feromonowych. Spośród czterech badanych gatunków tych motyli trzy najliczniej odławiano w sadzie bez ochrony chemicznej. Były to: *Spilonota ocellana*, *Adoxophyes orana* oraz *Pandemis cerasana*. Natomiast najmniej licznie gatunki te występowały w sadzie intensywnie chronionym. Różnice w liczebności odławianych samców w tych dwóch sadach jabłoniowych istotnie różniących się systemem ochrony roślin były znaczne. W każdym z badanych sadów gatunkiem dominującym był *S. ocellana*.

Słowa kluczowe: zwójkówki liściowe, pułapki feromonowe, struktura liczebności, sady jabłoniowe