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THRIPS (*Thysanoptera*) OCCURING IN EARS OF *Triticum durum* DESF. IN CONDITIONS OF DIFFERENT PROTECTION LEVEL*

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Abstract. The objective of this study was to determine the abundance and species composition of thrips collected from ears of *Triticum durum* Desf. in relation to plant protection intensity. The experiment was set up at the Experimental Research Station of Wrocław University of Environmental and Life Sciences, at Pawłowice (51°09' N; 17°06' E), Poland, in 2006-2008. It was conducted on durum wheat plants at three different levels of plant protection intensity and on common winter wheat plants. The samples of thrips were collected from the ears of the plants at the milk maturity stage of the grain. During three years of the research, eight species of thrips were identified from *Triticum durum*. Most often the eudominants were *Haplothrips aculeatus*, *Limothrips cerealium* and *L. denticornis*. We have demonstrated that there was no statistically significant effect of the plant protection intensity on the thrips abundance. The host species, on the other hand, did not affect the species composition of the studied insects.

Key words: durum wheat, species composition, species dominance, thrips, *Thysanoptera, Triticum durum*

INTRODUCTION

Most species of thrips living on cereals feed and reproduce in ears. They cause direct destruction of flowers, seed damage and in consequence, a decrease in yield [Zawirska and Wałkowski 1997]. Both adult forms and larvae suck juices from forming grains. Feeding at the stage of grain milk maturity results in decreasing protein content and 1000 grain weight, and in worsening of seed germination power [Miętkiewski et al. 1991]. Additionally, damage caused by thrips enable infection by fusarium fungi causing ear diseases.

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Species composition and harmfulness of thrips on cereals were studied and described, among others, by Adomas [1976, 1982], Miętkiewski et al. [1991], Wałkowski [1991] and Żurańska [1985]. According to the authors cited, the species most frequently and numerously occurring on cereals are *Haplothrips aceuleatus* F. and *Limothrips denticornis* Hol., whereas according to Hurej and Twardowski [2004], besides the above mentioned species, *Limothrips cerealium* Hol. occurs frequently on cereals in great numbers.

Due to an increase in production of durum pasta in recent years, great interest is observed in Poland in an opportunity to grow durum wheat (*Triticum durum* Desf.) [Szwed-Urbaś et al. 1995]. Climatic changes that occur in our country create better conditions for breeding and cultivation of this plant. At the beginning of 2009 the first Polish cultivar of winter durum wheat Komnata was registered. However, there are no publications in Poland concerning noxious entomofauna feeding on this species of wheat. They may be expected to be the same phytophagous which occur on winter wheat (*T. aestivum* ssp. *vulgare* L.).

The aim of this study was to determine the number and species composition of thrips occurring in the ears of durum wheat depending on the protection intensity of this plant.

MATERIAL AND METHODS

The study was conducted in 2006-2008 at the Experimental Field Station of the Wrocław University of Environmental and Life Sciences located in Pawłowice (51°09' N; 17°06' E). It was carried out on durum wheat of the cultivar Komnata. The field experiments were set up in the randomized blocks design in four replications. The size of the plots was 33 m^2, and seeding rate of wheat was 5 mln grains·ha^{-1}. This was a part of a larger experiment concerning developing of durum wheat cultivation technology. Observations were conducted also on the common winter wheat of the cultivar Sukces (2006 and 2007) and the cultivar Tonacja (2008) grown nearby, sown within the framework of the Post-registration Variety testing system. Since the species composition of thrips on winter wheat is well known, this wheat only constituted the comparative treatment for the treatments of durum wheat. The following treatments of durum wheat protection were selected to this study:

a – without protection,
b – seed dressing Panoctine 300 LS (guazatine acetate) and herbicide Cougar 600 SC (isoproturon + diflufenican),
c – seed dressing Panoctine 300 LS (guazatine acetate), herbicide Cougar 600 SC (isoproturon + diflufenican) and the mixture of fungicides Alert 375 SC (flusilazole + carbendazim) + Tallius 200 EC (proquinazil).

The winter wheat used in the post-registration experiment was protected in the following way:

– seed dressing Funaben T 480 FS (tiuram + carbendazim), herbicide Maraton 375 SC (pendimethalin + isoproturon), fungicide Cerelux Plus 535 EC (flusilazole + fenpropimorph) and growth regulator Moddus 250 EC (trinexapac-ethyl).

For determination of thrips species composition, 25 ears were taken from the central part of each plot, when kernels were at the milk maturity stage (BBCH 75). The ears were put into foil sacks and transported to a laboratory. In the lab, thrips were shaken out of the ears onto a white sheet of paper. Larvae and adult insects were counted, and

then preserved in 75% ethyl alcohol. Species identification of thrips was made by dr Halina Kucharczyk from the Institut of Biology of UMCS in Lublin.

Qualitative and quantitative structure of thrips was determined by means of the following analytical indexes: species number, total size, individual domination of species, also referred to as the domination index (D). For descriptive presentation of the domination index value, domination classes were adopted for groups which were not numerous in terms of species [Kasprzak and Niedbała 1981]. To compare the average numbers of thrips in ears in each year of the study, the analysis of variance (ANOVA) and Tukey's test (HSD) were used. Means were compared at the level of significance 5%.

RESULTS AND DISCUSSION

In 2006, a total of 693 thrips belonging to 8 species were found in ears collected from all the treatments of durum wheat and winter wheat (Table 1). This was the highest number of determined *Thysanoptera* during the third years of the study (Tables 1-3).

Table 1. Number and species composition of thrips feeding in ears of *Triticum durum* and *T. aestivum* in 2006 (number of larvae is presented in brackets)

Tabela 1. Liczebność i skład gatunkowy przylżeńców żerujących w kłosach pszenicy twardej i zwyczajnej w 2006 roku (w nawiasie podano liczbę larw)

Species – Gatunek *Thysanoptera*	*Triticum durum* – Pszenica twarda			*Triticum aestivum* Pszenica zwyczajna	Total Razem
	a*	b	c		
Aeolothrips intermedius Bagnall, 1934	–	2(2)	–	–	2(2)
Anaphothrips obscurus Müller, 1776	–	–	1(0)	1(0)	2(0)
Frankliniella tenuicornis Uzel, 1895	21(3)	13(0)	7(0)	27(16)	68(19)
Haplothrips aculeatus Fabricius, 1803	108(104)	108(102)	111(107)	220(219)	547(532)
Haplothrips tritici Kurdjumov, 1912	–	–	–	4(4)	4(4)
Limothrips cerealium Haliday, 1836	13(0)	11(0)	11(0)	6(1)	41(1)
Limothrips denticornis Haliday, 1836	9(0)	8(0)	6(0)	2(0)	25(0)
Thrips tabaci Lindeman, 1889	1(0)	–	–	3(1)	4(1)
Total – Suma	152(107) ab**	142(104) b	136(107) b	263(241) a	693(559)
Species number – Liczba gatunków	5	5	5	7	–

* a – without protection – bez ochrony, b – seed dressing Panoctine 300 LS (guazatine acetate) and herbicide Cougar 600SC (isoproturon + diflufenican)– zaprawa nasienna Panoctine 300 LS (octan guazatyny) oraz herbicyd Cougar 600 SC (izoproturon + diflufenikan), c – seed dressing Panoctine 300 LS (guazatine acetate), herbicide Cougar 600 sc (isoproturon + diflufenican) and mixture of fungicides Alert 375 sc (flusilazole + carbendazim) + Tallius 200 ec (proquinazil) – zaprawa nasienna Panoctine 300 LS (octan guazatyny), herbicyd Cougar 600 SC (izoproturon + diflufenikan) oraz mieszanina fungicydów Alert 375 SC (flusilazol + karbendazym) + Tallius 200 EC (proquinazil)

** numbers marked with different small letters differ significantly ($F = 5.09$; $df = 12$; $p = 0.016740$) – liczby oznaczone różnymi małymi literami różnią się istotnie ($F = 5{,}09$; $df = 12$; $p = 0{,}016740$)

Table 2. Number and species composition of thrips feeding in ears of *Triticum durum* and *T. aestivum* in 2007 (number of larvae is presented in brackets)

Tabela 2. Liczebność i skład gatunkowy przylżeńców żerujących w kłosach pszenicy twardej i zwyczajnej w 2007 roku (w nawiasie podano liczbę larw)

Species – Gatunek *Thysanoptera*	*Triticum durum* – Pszenica twarda			*Triticum aestivum* Pszenica zwyczajna	Total Razem
	a*	b	c		
Aeolothrips intermedius Bagnall, 1934	8(8)	5(5)	9(9)	8(8)	30(30)
Anaphothrips obscurus Müller, 1776	–	–	1(1)	–	1(1)
Frankliniella tenuicornis Uzel, 1895	5(4)	7(6)	14(14)	3(3)	29(27)
Frankliniella intonsa Uzel, 1895	–	–	1(0)	–	1(0)
Haplothrips aculeatus Fabricius, 1803	27(25)	25(21)	23(23)	15(13)	90(82)
Haplothrips setiger Priesner, 1921	–	–	–	1(0)	1(0)
Haplothrips tritici Kurdjumov, 1912	4(4)	1(1)	1(1)	–	6(6)
Limothrips cerealium Haliday, 1836	40(1)	31(0)	18(2)	3(2)	92(5)
Limothrips denticornis Haliday, 1836	26(0)	13(0)	23(0)	2(0)	64(0)
Thrips atratus Haliday, 1836	–	1(0)	–	–	1(0)
Thrips tabaci Lindeman, 1889	1(1)	3(3)	–	2(2)	6(6)
Total – Suma	111(43) a**	86(36) ab	90(50) ab	34(28) b	321(157)
Species number Liczba gatunków	7	8	8	7	–

* for explanations see Table 1 – objaśnienia pod tabelą 1

** numbers marked with different small letters differ significantly (F = 4.79; df = 12; p = 0.020227) – liczby oznaczone różnymi małymi literami różnią się istotnie (F = 4,79; df = 12; p = 0,020227)

In the case of durum wheat, no significant differences were found in the number of insects feeding in ears depending on the treatment. 152 individuals were feeding in the treatment without protection, 142 individuals in the treatment where seed dressing and the herbicide were applied, and 136 individuals in the treatment where the fungicide was applied additionally to the dressing and the herbicide. In each treatment of durum wheat protection, 5 species of *Thysanoptera* were determined in the collected entomological material. *Haplothrips aculeatus* appeared to be eudominant in all the treatments (Table 4). During ear harvesting, mostly larvae of this species were feeding on them. *Frankliniella tenuicornis* was additionally classified as eudominant in the treatment without protection. Species dominating in the ears of durum wheat were represented by *Limothrips cerealium, L. denticornis* and additionally, in the treatment where seed dressing and herbicide protection were applied (b), *F. tenuicornis*. In the case of these species, adult insects were most frequently recorded. In the ears of winter wheat, almost twice as many feeding thrips were found (263 individuals) in comparison

to all the other treatments of durum wheat (a – 152 individuals, b – 142, c – 136). These insects were identified into 7 species (Table 1). Also in the case of *Triticum aestivum* L. the most numerous species was *H. aculeatus* (Table 4). It also should be noted that *Haplothrips tritici*, which was determined in the ears of winter wheat, did not occur on durum wheat.

Table 3. Number and species composition of thrips feeding in ears of *Triticum durum* and *T. aestivum* in 2008 (number of larvae is presented in brackets)

Tabela 3. Liczebność i skład gatunkowy przylżeńców żerujących w kłosach pszenicy twardej i zwyczajnej w 2008 roku (w nawiasie podano liczbę larw)

Species – Gatunek *Thysanoptera*	*Triticum durum* – Pszenica twarda			*Triticum aestivum* Pszenica zwyczajna	Total Razem
	a*	b	c		
Aeolothrips intermedius Bagnall, 1934	–	–	1(1)	4(4)	5(5)
Anaphothrips obscurus Müller, 1776	1(0)	1(0)	–	1(0)	3(0)
Frankliniella tenuicornis Uzel, 1895	–	13(2)	2(0)	20(5)	35(7)
Haplothrips aculeatus Fabricius, 1803	14(3)	72(63)	18(8)	10(7)	114(81)
Haplothrips tritici Kurdjumov, 1912	–	4(4)	–	2(2)	6(6)
Limothrips cerealium Haliday, 1836	41(0)	94(4)	39(0)	35(1)	209(5)
Limothrips denticornis Haliday, 1836	1(0)	11(0)	1(0)	7(0)	20(0)
Thrips tabaci Lindeman, 1889	–	2(1)	1(1)	–	3(2)
Total – Suma	57(3) b**	197(74) a	62(10) b	79(19) b	395(106)
Species number Liczba gatunków	4	7	6	7	–

* for explanations see Table 1 – objaśnienia pod tabelą 1

** numbers marked with different small letters differ significantly (F = 6.22; df = 12; p = 0.008546) – liczby oznaczone różnymi małymi literami różnią się istotnie (F = 6,22; df = 12; p = 0,008546)

In 2007, a total of 321 thrips were found in the ears of durum wheat and winter wheat (Table 2), including 157 larvae. All collected insects were identified into 11 species. The total number of *Thysanoptera* settling durum wheat ears in the treatment without protection (a) (111 individuals), was significantly higher in comparison to the treatment with winter wheat (d) (34). Insects representing 7 (a) or 8 (b, c) species occured in each treatment. *H. aculeatus*, *L. cerealium* and *L. denticornis* were classified as eudominants that year (Table 4). Only in the treatment with the most intensive protection (c), *Aeolothrips intermedius* and *F. tenuicornis* were additionally classified as this domination class. The two latter species represented dominants in treatment b, whereas *A. intermedius* was a dominant in the treatment without protection (a). In 2007, only 34 thrips representing 7 species occurred in the ears of winter wheat. In this case, *H. aculeatus* and *A. intermedius* appeared to be eudominants.

Table 4. Thrips dominance structure in ears of *Triticum durum* and *T. aestivum* in different treatments in 2006-2008

Tabela 4. Struktura dominacji przylżeńców w kłosach pszenicy twardej i zwyczajnej w różnych kombinacjach doświadczenia w latach 2006-2008

Treatment Kombinacja		Year Rok	Eudominants (more 10%) Eudominanty (powyżej 10%)	Dominants Dominanty (5-10%)	Subdominants Subdominanty (2-5%)	Recendents Recedenty (1-2%)	Subrecendents (less 1%) Subrecedenty (poniżej 1%)
Triticum durum – Pszenica twarda	a*	2006	*H. aculeatus* *F. tenuicornis*	*L. cerealium* *L. denticornis*	*A. intermedius*		*T. tabaci*
		2007	*L. cerealium* *H. aculeatus* *L. denticornis*	*A. intermedius*	*F. tenuicornis* *H. tritici*		*T. tabaci*
		2008	*L. cerealium* *H. aculeatus*		*L. denticornis* *A. obscurus*		
	b	2006	*H. aculeatus*	*F. tenuicornis* *L. cerealium* *L. denticornis*		*A. intermedius*	
		2007	*L. cerealium* *H. aculeatus* *L. denticornis*	*F. tenuicornis* *A. intermedius*	*T. tabaci*	*T. atratus* *H. tritici*	
		2008	*L. cerealium* *H. aculeatus*	*F. tenuicornis* *L. denticornis*	*H. tritici*	*T. tabaci*	*A. obscurus*
	c	2006	*H. aculeatus*	*F. tenuicornis* *L. cerealium*	*L. denticornis*		*A. obscurus*
		2007	*H. aculeatus* *L. denticornis* *L. cerealium* *F. tenuicornis* *A. intermedius*			*H. tritici* *F. intosa* *A. obscurus*	
		2008	*L. cerealium* *H. aculeatus*			*L. denticornis* *T. tabaci* *A. obscurus*	
Triticum aestivum Pszenica zwyczajna		2006	*H. aculeatus*	*F. tenuicornis*	*L. cerealium*	*T. tabaci* *H. tritici*	*A. obscurus* *L. denticornis*
		2007	*H. aculeatus* *A. intermedius*	*L. denticornis* *L. cerealium* *T. tabaci*	*F. tenuicornis* *H. setiger*		
		2008	*L. cerealium* *F. tenuicornis* *H. aculeatus*	*L. denticornis* *A. intermedius*	*H. tritici*	*A. obscurus*	

* for explanations see Table 1 – objaśnienia pod tabelą 1

In 2008, a total of 395 thrips belonging to 8 species were collected and determined, including 106 larvae (Table 3). From 57 (a) to 197 (b) individuals of this group of insects were recorded on durum wheat. The number of *Thysanoptera* in treatment b, i.e. after the application of seed dressing and the herbicide, was significantly higher as compared with all the other experimental treatments (a, c, d). The number of determined species was varied. Fewest species were determined in the treatment without protection (4), whereas the most in the treatment where seed dressing and the herbicide were applied (7). In all the treatments, the most numerous species (eudominants) were *H. aculeatus* and *L. cerealium* (Table 4). In the treatment where most thrips were

observed (b), also *F. tenuicornis and L. denticornis*, representing the dominant class, occurred numerously. In the material collected from winter wheat 79 thrips were determined, belonging to 7 species. In the case of this wheat, three species were classified as eudominants, i.e. *H. aculeatus, L. cerealium and F. tenuicornis*, whereas the two others as dominants (*L. denticornis* and *A. intermedius*).

There is no information concerning thrips feeding on durum wheat in Polish scientific literature. Results of the study conducted indicate that 8 species of thrips can occur in the ears of this wheat, of which 7 species are phytophagous and one is a predatory species (*A. intermedius*). *H. aculeatus*, *L. cerealium* and *L. denticornis* most often belong to eudominants. Also *F. tenuicornis* and *A. intermedius* occur numerously on this species of wheat. Żurańska [1985], determined 5 species of thrips on winter winter wheat. Dominating species during grain maturing were *H. aculeatus.* and *L. denticornis*. The same species occurred in great numbers in the ears of durum wheat and winter wheat in the present study. According to Zawirska and Wałkowski [1977], *L. cerealium* and *L. denticornis* develop on the vegetative parts of winter wheat and in Poland they occur mainly in West Pomerania. Investigations conducted in the vicinity of Wrocław indicate that the species mentioned are also very numerous in the ears of durum wheat in the area of Lower Silesia.

CONCLUSIONS

1. Eight species of thrips were determined in the ears of durum wheat during three years of the study. *Haplothrips aculeatus* (F.), *Limothrips cerealium* (Hol.) and *L. denticornis* (Hol.) belonged to the most numerous species (eudominants). Also *Frankliniella tenuicornis* Uzel and *Aeolothrips intermedius* Bag. occurred in great numbers on this species of wheat.
2. No significant effect of plant protection applied on the abundance of the tested group of insects on durum wheat was observed.
3. The species of thrips occurring in the ears of durum wheat were the same which were determined in the ears of winter wheat. In most cases, also the same species were the most numerous.

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PRZYLŻEŃCE (*Thysanoptera*) ZASIEDLAJĄCE KŁOSY OZIMEJ PSZENICY TWARDEJ (*Triticum durum* DESF.) W ZALEŻNOŚCI OD INTENSYWNOŚCI OCHRONY

Streszczenie. Celem badań było poznanie liczebności i składu gatunkowego przylżeńców (*Thysanoptera*) występujących w kłosach pszenicy twardej (*Triticum durum* Desf.) w zależności od intensywności ochrony tej rośliny. Doświadczenie prowadzono w latach 2006-2008, w Rolniczym Zakładzie Doświadczalnym w Pawłowicach (51°09' N; 17°06' E), należącym do Uniwersytetu Przyrodniczego we Wrocławiu. Badaniami objęto pszenicę twardą bez ochrony chemicznej, chronioną środkami chemicznymi oraz porównawczo pszenicę zwyczajną. W celu określenia składu gatunkowego przylżeńców pobierano kłosy, których ziarniaki były w fazie dojrzałości mlecznej. W ciągu trzech lat badań w kłosach pszenicy twardej oznaczono 8 gatunków przylżeńców. Do eudominantów najczęściej należały *Haplothrips aculeatus*, *Limothrips cerealium* i *L. denticornis*. Nie stwierdzono wyraźnego wpływu zastosowanej ochrony roślin na liczebność badanej grupy owadów na pszenicy twardej. W kłosach pszenicy twardej występowały te same gatunki przylżeńców jak w kłosach pszenicy zwyczajnej.

Słowa kluczowe: dominacja gatunków, pszenica twarda, przylżeńce, skład gatunkowy, *Thysanoptera, Triticum durum*

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