

THE EFFECT OF DIFFERENT AGROTECHNICAL LEVELS ON WEED INFESTATION IN CROPS OF NAKED AND HUSKED VARIETIES OF OAT (*Avena sativa* L.)

Sylwia Andruszczak, Ewa Kwiecińska-Poppe, Piotr Kraska, Edward Pałys

Department of Agricultural Ecology, University of Life Sciences in Lublin
Akademicka 13, 20-950 Lublin, Poland
e-mail: sylwia.andruszczak@up.lublin.pl

Received: 6.05.2010

Abstract

The present study was carried out in the period 2007–2009 in the Experimental Farm in Bezek near the city of Chełm. The aim of the investigation was to compare weed infestation of the husked (Krezus) and naked (Cacko) oat cultivars cultivated under conditions of different weed control treatments. The following weed control levels were compared: A – control object; B – harrowing twice; C – application of the herbicide Mustang 306 SE; D – herbicide Mustang 306 SE + foliar fertilizer Insol 3; E – herbicide Mustang 306 SE + two foliar fertilizers: Insol 3 and FoliCare 18:18:18.

The husked oat cv. Krezus was more competitive against weeds. Number of dicotyledonous weeds and of monocotyledonous weeds, total weeds, and air-dry weight of above-ground parts of weeds in the crop of this cultivar were all significantly lower compared to the naked cv. Cacko. From the group of dicotyledonous species, *Chenopodium album*, *Galinsoga parviflora*, *Matricaria maritima* ssp. *inodora*, *Polygonum aviculare*, and *Stellaria media* were the dominant species in the crops of the oat varieties under investigation, whereas among the monocotyledonous species *Echinochloa crus-galli*, *Setaria pumila*, *Apera spica-venti*, and *Elymus repens* occurred in greatest numbers. The application of the herbicide Mustang 306 SE decreased the number of dicotyledonous weeds and air-dry weight of weeds, compared to the treatment in which mechanical weed control had been used.

Key words: naked oat, husked oat, weed infestation, weed control level

INTRODUCTION

The existing research on weed infestation of spring cereals shows that they are generally less susceptible to weed pressure than winter cereals (Zawiślak and Grejner, 1988). At the same time, oats compete better against weeds than spring barley

or spring wheat. Their advantage over other cereals are justified by early sowing time, a dynamic increase in above-ground and root mass as well as rich foliage that shades well the soil (Wanic, 1997; Budzyński, 1999; Deryło et al., 2003; Adamiak and Adamiak, 2004; Idziak et al. 2007).

According to Idziak et al. (2007), under conditions of high level tillage, chemical weed control in oat crops can be dispensed with. It is extremely important since, out of concern for the natural environment, efforts are now undertaken to reduce the use of chemical plant protection agents. Leszczyńska (2007) as well as Sułek and Brzóška (2007) are of opinion that, in weed control treatments used in oat crops, mechanical crop protection is of great importance, as oats are sensitive to most herbicides. However, at the initial growth stages (tillering and shooting) oats promote the abundant emergence of early germinating weeds that germinate in low temperatures (Adamiak and Zawiślak, 1991). That is why, under conditions of strong weed infestation of crops, the application of herbicides is recommended as auxiliary treatment (Leszczyńska, 2002; 2007). The selection of an appropriate herbicide is very important, since an inappropriate chemical agent can cause phytotoxicity, thereby inhibiting plant growth (Skrzypczak and Pudełko, 2001; Krawczyk and Stachecki, 2003).

Most papers on weed infestation in oat crops relate only to the husked form, but there are few studies which also cover the naked forms of this plant (Sadowski and Rychcik, 2008). The aim of the presented study was to compare weed infestation in crops of the naked and husked oat varieties grown under conditions of different weed control treatments.

MATERIALS AND METHODS

The present field experiment was conducted in the period 2007–2009 in the Bezek Experimental Farm near the city of Chełm. The experimental field was located on incomplete podzolic soil lying on marl substrate with the granulometric composition of loamy sand. This soil is classified as soil class IVb and good rye complex. It was characterized by slightly acidic pH (pH in 1 mol KCl 6.0), high phosphorus content ($74.6 \text{ mg} \times \text{kg}^{-1}$), average potassium content ($99.6 \text{ mg} \times \text{kg}^{-1}$), and low magnesium content ($22.0 \text{ mg} \times \text{kg}^{-1}$). The humus content was 1.2%.

Tillage was done following generally accepted agricultural practice recommendations. Winter triticale was a forecrop for oat crops. Oat (*Avena sativa* L.) seeds were sown in the 3rd decade of April at an amount of 500 seeds per 1 m^2 . The following doses of mineral fertilizers were applied (in kg of pure component per hectare): N–80; P–26.2; K–66.4.

The two-factor field experiment was set up according to a randomized block design, in 4 replicates. The plot area was 15 m^2 . The experiment included two oat varieties (naked oats var. Cacko and husked oats var. Krezus) and five weed control levels: a) control object; b) harrowing twice at the tillering

stage; c) application of the herbicide Mustang 306 SE; d) herbicide Mustang 306 SE + foliar fertilizer Insol 3; e) herbicide Mustang 306 SE + foliar fertilizers Insol 3 and FoliCare 18:18:18. The herbicide Mustang 306 SE (florasulam – a compound from the group of triazolopyrimidines – $6.25 \text{ g} \times \text{l}$; 2,4-D EHE – a compound from the group of phenoxy acids– $300 \text{ g} \times \text{l}$) was applied at the tillering stage (BBCH 23-29), at a dose of $0.4 \text{ l} \times \text{ha}$. Spraying with the foliar fertilizers, Insol 3 and FoliCare 18:18:18, was done twice – at the tillering stage (BBCH 23-29) and at the shooting stage (BBCH 33-39), at a dose of $1 \text{ l} \times \text{ha}$ and $20 \text{ kg} \times \text{ha}$, respectively. The chemical composition of the fertilizers is shown in Table 1.

Weed infestation of the crop was determined using the quantitative gravimetric method about 2 weeks before the harvest of oats. Number of weeds, weed species composition and air-dry weight of the above-ground parts of weeds were determined based on the sampling sites marked out by a $1 \text{ m} \times 0.25 \text{ m}$ frame, in four randomly selected places in each plot. The obtained results were statistically processed using the variance analysis method and least significant differences were calculated using Tukey's confidence half-intervals with a 5% risk of error.

Table 1
Chemical composition of foliar fertilizers (%)

Foliar fertilizer	N	P	K	Mg	S	B	Cu	Fe	Mn	Mo	Zn
Insol 3	11.5	–	–	2.84	–	0.28	0.56	1.20	1.68	0.01	1.12
FoliCare 18:18:18	18.0	18.1	18.0	1.5	7.2	0.02	0.10	0.20	0.10	0.01	0.02

RESULTS AND DISCUSSION

One of the methods of weed infestation reduction in crop plants is the selection of varieties showing greater competitiveness against weeds. The importance of oat varieties in weed management is not well-recognized. Assessing the susceptibility of husked oat varieties to weed pressure, Adamiak and Adamiak (2004) showed that the variety Boryna competed better with weeds at the early growth stages (tillering), whereas the variety Kwant demonstrated greater competitiveness when the crop was at full growth (flowering). In the present experiment, irrespective of the weed control level, the husked variety Krezus was more competitive against weeds, which was probably attributable to plant height and high panicle density per unit area. Number of dicotyledonous weeds and of monocotyledonous weeds, total weeds, and air-dry weight of above-ground parts of weeds in the crop

of this variety were all significantly lower compared to the naked variety Cacko (Table 2).

A total of 44 weed species were identified in the oat crop – 39 from the group of dicotyledonous weeds and 5 monocotyledonous species. Only single specimens occurred in the case of most of the taxa (Table 3). The floristic composition primarily comprised the following taxa: *Chenopodium album*, *Galinsoga parviflora*, *Matricaria maritima* ssp. *inodora*, *Polygonum aviculare*, and *Stellaria media* from the group of dicotyledonous weeds, while *Echinochloa crus-galli*, *Setaria pumila*, *Apera spica-venti*, and *Elymus repens* from monocotyledonous species. The abovementioned species were classified as dominant weeds, since they accounted respectively for 84.0% and 87.9% of the total number of weeds in the crops of the varieties Cacko and Krezus.

The weed community in the crop of the naked variety Cacko numbered 38 species, whereas the weed

flora of the husked variety Krezus comprised a total of 35 species (Table 3). As many as 24 species from the group of dicotyledonous weeds and all monocotyledonous weeds (5 species) were common to the crops of both varieties. In addition, 9 taxa appeared in the naked oat crop, among others *Veronica agrestis*, *Stachys palustris*, *Sonchus arvensis*, and *Cirsium arvense*. At the same time, species such as: *Veronica persica*, *Centaurea cyanus*, *Convolvulus arvensis*, *Anthemis arvensis*, *Anchusa arvensis*, and *Trifolium pratense* were sporadically noted in the plots with husked oats. Analysing the species composition of the weeds colonising the oat crops, it can be concluded that, in the light of literature data, it was typical of this cereal grain (Deryło et al. 2003; Vanhala and Pietola, 2003; Sadowski and Rychcik, 2008).

The numbers of weeds in the oat crop was dependent on the weed control level. Harrowing twice during the plant growth period reduced the number of dicotyledonous weeds, monocotyledonous weeds, and total weeds by 6%, 41% and 25%, respectively, compared to the control object (Table 4). The results of the studies of Sadowski and Rychcik (2008) prove the beneficial effect of mechanical plant protection on weed infestation of oat crops. These authors found a 75% reduction in the number of weeds at the milk maturity stage in the plot which had been harrowed twice, compared to the spring evaluation. But weed biomass, expressed as air-dry weight of weeds, gives fuller information on the competitiveness of oats against weeds. In the present experiment, this parameter of weed infestation evaluation did not change under the influence of mechanical weed control (Table 4).

The number of weed species in the oat crop in which mechanical weed control was used was similar to the control object (Table 5). In the treatment with harrowing twice, the presence of 28 dicotyledonous and 5 monocotyledonous species was found, whereas in the control plots 31 dicotyledonous and 5 monocotyledonous species occurred. Mechanical control of dicotyledonous weeds in the oat crop completely eliminated 4 species (*Stachys palustris*, *Mentha arvensis*, *Anthemis arvensis*, and *Papaver rhoeas*) and reduced the population of 11 taxa, compared to the control object. At the same time, 14 species increased their proportion in the weed community. In the group of monocotyledonous weeds, the same species were predominant in both treatment combinations, but in the object with mechanical protection *Echinochloa crus-galli* and *Setaria pumila* occurred with twice lower intensity.

In line with expectations and the results of studies of other authors, the weed-killing effect of the applied herbicide was higher than that of mechanical weed control (Hyvönen and Salonen, 2002;

Deryło et al., 2003; Sadowski and Rychcik, 2008). The number of dicotyledonous weeds declined between 56.3% and 70.2%, while air-dry weight of weeds between 18.1% and 24.1%, compared to the object in which weeds were controlled by using harrowing (Table 4). At the same time, the number of monocotyledonous weeds in the herbicide-treated plots was higher on average by 61.8% up to 133.8% than under conditions of mechanical weed control. This probably resulted from the fact that florasulam and 2,4-D EHE are substances which have an effect only on dicotyledonous weeds. While reducing their numbers, good conditions for the development of monocotyledonous taxa were created. When Deryło et al. (2006) introduced more intensive weed control by applying a herbicide, among others, they obtained a reduction in the number of weeds per 1 m² by 31.7% and of their air-dry weight by 15.5% compared to mechanical crop protection. In other studies (Deryło et al. 2003), chemical protection of oat crops against weeds significantly decreased their numbers by 72% and biomass by 76% compared to mechanical protection. Moreover, the number of species was reduced by 6 as well as most dominant species were reduced. In the present experiment, the application of the herbicide Mustang 306 SE decreased the number of species by 7 in relation to the control object (Table 5). Among others, *Coryza canadensis*, *Geranium pusillum*, *Stachys palustris*, and *Gypsophila muralis* were eliminated from the crop, but single individuals of *Veronica persica*, *Cirsium arvense*, *Lamium amplexicaule*, and *Trifolium pratense* appeared. At the same time, there was a distinct decrease in the numbers of almost all the dicotyledonous species. Among the monocotyledonous species, *Echinochloa crus-galli* significantly increased its proportion in the community, while the remaining taxa were generally reduced compared to the control object.

In the plots which were foliar fertilized with Insol 3 and Insol 3, together with the formulation Foli-Care 18:18:18, the number of dicotyledonous species was 25 and 22, respectively, whereas from the monocotyledonous group there were 5 species in each of them. Foliar feeding of plants generally intensified the occurrence of individual taxa compared to the object in which the herbicide Mustang 306 SE was used without the foliar fertilizers. This applied in particular to the dominant species such as *Echinochloa crus-galli* or *Chenopodium album*. Additionally, new species appeared in the foliar-fertilized plots, among others *Geranium pusillum* and *Veronica agrestis*. However, their proportion in the weed community was low and did not generally exceed 0.4%.

Table 2
Number and air-dry weight of weeds per 1 m² in the oat crop depending on variety, mean for 2007-2009

Trait	Variety		LSD _{0.05}
	Cacko	Krezus	
Number of dicotyledonous weeds	40.7	17.7	10.06
Number of monocotyledonous weeds	79.7	41.2	18.27
Total number of weeds	120.4	58.9	20.59
Air-dry weight of weeds in g×m ²	89.5	56.1	12.81

Table 3
Species composition and number of weeds per 1 m² in the oat crop depending on variety, mean for 2007-2009

Weed species	Variety		Weed species	Variety			
	Cacko	Krezus		Cacko	Krezus		
Dicotyledonous			27	<i>Chamomilla suaveolens</i> L.	0.1	0.0	
1	<i>Chenopodium album</i> L.	6.7	3.6	28	<i>Polygonum lapathifolium</i> L. subsp. <i>lapathifolium</i>	0.1	0.0
2	<i>Galinsoga parviflora</i> Cav.	6.2	1.0	29	<i>Mentha arvensis</i> L.	0.1	-
3	<i>Matricaria maritima</i> subsp. <i>inodora</i> (L.)	4.4	2.7	30	<i>Papaver rhoeas</i> L.	0.1	-
4	<i>Polygonum aviculare</i> L.	3.1	1.5	31	<i>Cerastium arvense</i> L.	0.0	-
5	<i>Stellaria media</i> (L.) Vill.	3.0	2.0	32	<i>Lamium amplexicaule</i> L.	0.0	-
6	<i>Viola arvensis</i> Murray	2.5	0.3	33	<i>Oxalis fontana</i> Bunge	0.0	-
7	<i>Amaranthus retroflexus</i> L.	2.4	0.2	34	<i>Veronica persica</i> Poir.	-	0.2
8	<i>Plantago major</i> L.	1.8	0.6	35	<i>Centaurea cyanus</i> L.	-	0.1
9	<i>Spergula arvensis</i> L.	1.1	0.5	36	<i>Convolvulus arvensis</i> L.	-	0.1
10	<i>Gnaphalium uliginosum</i> L.	1.1	0.1	37	<i>Anthemis arvensis</i> L.	-	0.1
11	<i>Fallopia convolvulus</i> L.	1.0	0.9	38	<i>Anchusa arvensis</i> L.	-	0.1
12	<i>Veronica arvensis</i> L.	1.0	0.4	39	<i>Trifolium pratense</i> L.	-	0.0
13	<i>Capsella bursa-pastoris</i> L.	0.9	0.3	Total dicotyledonous weeds		40.7	17.7
14	<i>Vicia hirsuta</i> L.	0.8	0.3	Number of dicotyledonous species		33	30
15	<i>Geranium pusillum</i> L.	0.7	0.4	Monocotyledonous			
16	<i>Anagallis arvensis</i> L.	0.6	0.1	40	<i>Echinochloa crus-galli</i> L.	42.6	12.4
17	<i>Galium aparine</i> L.	0.6	0.8	41	<i>Setaria pumila</i> (Poir.) Roem. & Schult	17.7	10.8
18	<i>Gypsophila muralis</i> L.	0.5	0.2	42	<i>Apera spica-venti</i> L.	11.5	8.3
19	<i>Conyza canadensis</i> L.	0.4	0.5	43	<i>Elymus repens</i> L.	5.9	9.5
20	<i>Raphanus raphanistrum</i> L.	0.4	0.1	44	<i>Poa annua</i> L.	2.0	0.2
21	<i>Myosotis arvensis</i> L.	0.3	0.5	Total monocotyledonous weeds		79.7	41.2
22	<i>Vicia tetrasperma</i> L.	0.2	0.1	Number of monocotyledonous species		5	5
23	<i>Veronica agrestis</i> L.	0.2	-	Total number of weeds		120.4	58.9
24	<i>Stachys palustris</i> L.	0.2	-				
25	<i>Sonchus arvensis</i> L.	0.1	-				
26	<i>Cirsium arvense</i> L.	0.1	-				

0.0 – Species occurring in less than 0.1 per m²

Table 4

Number and air-dry weight of weeds per 1 m² in the oat crop depending on weed control treatment, mean for 2007-2009

Trait	Weed control treatment					LSD _{0.05}
	A*	B	C	D	E	
Number of dicotyledonous weeds	49.7	46.7	13.9	15.8	20.4	22.38
Number of monocotyledonous weeds	61.0	36.1	58.4	84.4	62.0	40.64
Total number of weeds	110.7	82.8	72.3	100.2	82.4	ns**
Air-dry weight of weeds in g × m ⁻²	81.7	84.4	64.5	69.1	64.1	ns

ns** – difference not significant

A* – control treatment

B – harrowing twice

C – Mustang 306 SE

D – Mustang 306 SE + Insol 3

E – Mustang 306 SE + Insol 3 + FoliCare 18:18:18

Table 5

Species composition and number of weeds per 1 m² in the oat crop depending on weed control treatment, mean for 2007-2009

No.	Weed species	Weed control treatment					No.	Weed species	Weed control treatment				
		A*	B	C	D	E			A*	B	C	D	E
	Dicotyledonous						27	<i>Chamomilla suaveolens</i> Pursh	0.1	0.2	-	-	-
1	<i>Chenopodium album</i> L.	12.5	9.4	0.1	1.6	2.2	28	<i>Sonchus arvensis</i> L.	0.1	0.2	-	-	0.1
2	<i>Stellaria media</i> (L.) Vill.	5.2	6.1	0.4	0.6	0.3	29	<i>Vicia tetrasperma</i> L.	0.1	0.2	0.1	0.2	0.2
3	<i>Galinsoga parviflora</i> Cav.	4.5	5.8	1.6	1.0	5.1	30	<i>Centaurea cyanus</i> L.	0.1	0.1	-	0.1	-
4	<i>Matricaria maritima</i> subsp. <i>inodora</i> (L.)	3.8	4.8	2.5	3.4	3.4	31	<i>Papaver rhoeas</i> L.	0.1	-	-	0.1	-
5	<i>Plantago major</i> L.	3.2	2.0	0.2	0.2	0.3	32	<i>Veronica persica</i> Poir.	-	0.2	0.1	0.1	-
6	<i>Amaranthus retroflexus</i> L.	3.2	1.0	0.1	-	2.1	33	<i>Cirsium arvense</i> L.	-	-	0.2	-	0.2
7	<i>Polygonum aviculare</i> L.	2.7	3.1	3.2	1.5	1.0	34	<i>Lamium amplexicaule</i> L.	-	-	0.1	-	-
8	<i>Viola arvensis</i> Murray	2.4	1.4	0.7	1.6	0.9	35	<i>Trifolium pratense</i> L.	-	-	0.1	-	-
9	<i>Fallopia convolvulus</i> L.	1.9	1.2	0.4	0.6	0.5	36	<i>Veronica agrestis</i> L.	-	-	-	0.4	0.2
10	<i>Spergula arvensis</i> L.	1.3	0.5	0.7	0.7	0.8	37	<i>Anchusa arvensis</i> L.	-	-	-	0.2	-
11	<i>Conyza canadensis</i> L.	1.2	1.0	-	0.2	-	38	<i>Oxalis fontana</i> Bunge	-	-	-	0.1	-
12	<i>Geranium pusillum</i> L.	1.2	0.9	-	0.4	0.2	39	<i>Cerastium arvense</i> L.	-	-	-	-	0.1
13	<i>Capsella bursa-pastoris</i> L.	1.1	0.6	0.8	0.4	0.2		Total dicotyledonous weeds	49.7	46.7	13.9	15.8	20.4
14	<i>Vicia hirsuta</i> L.	1.0	1.0	0.4	-	0.2		Number of dicotyledonous species	31	28	24	25	22
15	<i>Galium aparine</i> L.	1.0	1.8	0.3	0.2	0.3		Monocotyledonous					
16	<i>Myosotis arvensis</i> L.	0.6	0.7	0.1	0.5	-	40	<i>Echinochloa crus-galli</i> L.	21.4	11.9	29.7	41.0	33.5
17	<i>Stachys palustris</i> L.	0.4	-	-	-	-	41	<i>Setaria pumila</i> (Poir.) Roem. & Schult	20.5	9.5	12.5	17.5	11.2
18	<i>Gypsophila muralis</i> L.	0.3	1.3	-	-	-	42	<i>Elymus repens</i> L.	9.8	7.6	8.8	6.0	6.4
19	<i>Anagallis arvensis</i> L.	0.3	0.4	0.4	0.4	0.2	43	<i>Apera spica-venti</i> L.	8.6	6.2	6.8	18.7	9.0
20	<i>Gnaphalium uliginosum</i> L.	0.2	1.6	0.2	0.3	0.7	44	<i>Poa annua</i> L.	0.7	0.9	0.6	1.2	1.9
21	<i>Veronica arvensis</i> L.	0.2	0.6	1.0	0.8	0.9		Total monocotyledonous weeds	61.0	36.1	58.4	84.4	62.0
22	<i>Raphanus raphanistrum</i> L.	0.2	0.4	0.1	0.2	0.3		Number of monocotyledonous species	5	5	5	5	5
23	<i>Mentha arvensis</i> L.	0.2	-	-	-	-		Total number of weeds	110.7	82.8	72.3	100.2	82.4
24	<i>Convolvulus arvensis</i> L.	0.2	0.1	-	-	-							
25	<i>Polygonum lapathifolium</i> L. subsp. <i>lapathifolium</i>	0.2	0.1	0.1	-	-							
26	<i>Anthemis arvensis</i> L.	0.2	-	-	-	-							

A* – Explanations as in Table 4

CONCLUSIONS

1. The husked variety Krezus proved to be more competitive against weeds. Number of dicotyledonous weeds and of monocotyledonous weeds, total weeds, and air-dry weight of above-ground parts of weeds in the crop of this variety were all significantly lower compared to the naked variety Cacko.
2. In the crops of the oat varieties in question, *Chenopodium album*, *Galinsoga parviflora*, *Matricaria maritima* ssp. *inodora*, *Polygonum aviculare*, and *Stellaria media* were the dominant species from the group of dicotyledonous species, while *Echinochloa crus-galli*, *Setaria pumila*, *Apera spica-venti*, and *Elymus repens* among the monocotyledonous species.
3. In-crop harrowing, though it significantly reduced the number of monocotyledonous weeds, proved to be less effective in the reduction of air-dry weight of above-ground parts of weeds compared to chemical weed management.
4. More intensive weed control, in which the herbicide Mustang 306 SE was applied, reduced the number of dicotyledonous weeds (in particular the dominant species) and air-dry weight of weeds relative to the control object without herbicide protection. At the same time, the number of weed species decreased in the herbicide-treated plots (between 6 and 9), while the taxa such as, among others, *Gypsophila muralis*, *Convolvulus arvensis*, or *Chamomilla suaveolens* were eliminated.
5. Foliar feeding of plants with the foliar fertilizers Insol 3 and FoliCare 18:18:18 generally intensified the occurrence of individual weed taxa compared to the object in which the herbicide Mustang 306 SE was applied without the foliar fertilizers. Weed species such as, among others, *Polygonum aviculare*, *Capsella bursa-pastoris*, *Vicia hirsuta*, *Anagallis arvensis*, *Veronica arvensis* were an exception.

REFERENCES

- Adamiak E., Adamiak J., 2004. Effect of varied crop sequence and chemical control of the stand on weed infestation of oat. *Acta Sci. Pol. Agricult.* 3 (1): 119-128.
- Adamiak E., Zawisłak K., 1991. Fitocenozy chwastów owsa uprawianego w płodozmianie i wieloletniej monokulturze. Synteza i perspektywa nauki o płodozmianach. / Weed phytocoenoses of oat cultivated in crop rotation and in long term monoculture. Synthesis and prospect of crop rotation science. Cz. II, Wyd. ART Olsztyn: 207-214 (in Polish).
- Budzyński W., 1999. Ten years of studies on oat cultivation in Poland: a review. *Żywność, Supl.* 1 (18): 11-25.
- Deryło S., Szymankiewicz K., Grotkowska Z., Stachowska J., 2003. Weed infestation of oats at

a rotation and at a multispecies monoculture of small grain crops. *Biul. IHAR*, 229: 73-84.

- Hyvönen T., Salonen J., 2002. Weed species diversity and community composition in cropping practices at two intensity levels – a six-year experiment. *Plant Ecology*, 154: 73-81.
- Idziak R., Michalski T., Osiecka B., 2007. Weed infestation and yielding of spring barley – Atos mixtures under differentiated plant protection conditions. *Zesz. Probl. Post. Nauk Rol.* 516: 55-63.
- Krawczyk R., Stachecki S., 2003. Sensitivity of common oats (*Avena sativa*) to selected herbicides controlling monocotyledonous weeds in cereals. *Prog. Plant Protect.* 43 (2): 755-757.
- Leszczyńska D., 2002. Uprawa owsa nieoplewionego – stan obecny i przyszłość / Cultivation of naked oat – the current state and the future. *Pam. Puł.* 130: 463-469 (in Polish).
- Leszczyńska D., 2007. Znaczenie owsa nagoziarnistego i elementy jego agrotechniki / The importance of naked oat and elements of agronomical practices used in its cultivation. *Studia i Raporty IUNG-PIB*, 9: 89-98 (in Polish).
- Sadowski T., Rychlik B., 2008. Comparison of chemical and mechanical weed control in oat. *Prog. Plant Protect.* 48 (2): 656-659.
- Skrzypczak G., Pudełko J., 2001. Assessment of weed control efficacy of herbicides in naked oats (*Avena sativa* var. *nuda*). *Prog. Plant Protect.* 41 (2): 910-912.
- Sulek A., Brzóška F., 2007. Uprawa i wykorzystanie owsa. Wyd. IUNG, Puławy (in Polish).
- Vanhala P., Pietola L., 2003. Effect of conservation tillage and peat application on weed infestation on a clay soil. *Agricult. Food Sc. Finland*, 12: 133-145.
- Zawisłak K., Grejner M., 1988. Community of weeds in the cereal monocultures and the chemical weed-killing efficiency. *Roczniki Nauk Rol. ser. A.* 107 (3): 135-146.

Wpływ poziomu agrotechniki na zachwaszczenie zasiewów nagoziarnistej i oplewionej odmiany owsa (*Avena sativa* L.)

Streszczenie

Doświadczenie polowe przeprowadzono w latach 2007–2009 w Gospodarstwie Doświadczalnym Bezek koło Chełma. Celem badań było porównanie zachwaszczenia łąnów oplewionej (Krezus) i nagoziarnistej (Cacko) odmiany owsa uprawianych w zróżnicowanych warunkach agrotechnicznych. Uwzględniono następujące poziomy agrotechniki: a – obiekt kontrolny; b – dwukrotne bronowanie; c – herbicyd Mustang 306 SE; d – Mustang 306 SE + nawóz dolistny

Insol 3; e – Mustang 306 SE + nawozy dolistne Insol 3 i FoliCare 18:18:18.

Bardziej konkurencyjna wobec chwastów była oplewiona odmiana Krezus. Zarówno liczba chwastów dwuliściennych, jednoliściennych i ogółem, jak i powietrznie sucha masa części nadziemnych chwastów w łanie tej odmiany były istotnie mniejsze w porównaniu z chwastami w łanie nagoziarnistej odmiany Cacko. Chwastami dominującymi w łanach porównywanych odmian owsa były *Chenopodium album*,

Galinsoga parviflora, *Matricaria maritima ssp. inodora*, *Polygonum aviculare* i *Stellaria media* z grupy chwastów dwuliściennych, natomiast z jednoliściennych *Echinochloa crus-galli*, *Setaria pumila*, *Apera spica-venti* i *Elymus repens*. Wyższy poziom agrotechniki uwzględniający zastosowanie herbicydu Mustang 306 SE obniżył liczbę chwastów dwuliściennych i powietrznie suchą masę chwastów w odniesieniu do obiektu z mechanicznym pielęgnowaniem roślin.

ACTA AGROBOTANICA
Vol. 63 (2)
2010

AUTHOR INDEX

- Chudzik Barbara, Szczuka Ewa, Domaciuk Marcin, Pavlov Danail: The structure of the ovule of *Sida hermaphrodita* (L.) Rusby after pollination 3
- Elżbieta Weryszko-Chmielewska, Anna Matysik-Woźniak, Dagmara Sadowska: The structure and distribution of glandular trichomes on the stems and leaves of drug eyebright (*Euphrasia stricta* D. Wolff ex J. F. Lehm.) 13
- Mirosława Chwil: The structure of some floral elements and the nectar production rate of *Polemonium caeruleum* L. 25
- Beata Żuraw, Elżbieta Weryszko-Chmielewska, Halina Laskowska, Elżbieta Pogroszewska: The location of nectaries and nectar secretion in the flowers of *Allium giganteum* Regel 33
- Elżbieta Weryszko-Chmielewska, Mirosława Chwil: Ecological adaptations of the floral structures of *Galanthus nivalis* L. 41
- Magdalena Kucewicz, Ewa Gojło, Anna Kowalska: The effect of achene heteromorphism on progeny traits in the shaggy soldier [*Galinsoga ciliata* (Rafin) S. F. Blake] 51
- Magdalena Pogorzelec: The species richness of the flora of selected sections of the Miciułka river in the Polesie National Park 57
- Katarzyna Jabłońska, Piotr Rapiejko: Using the results of a nationwide phenological network to examine the impact of changes in phenology of plant species on the concentration of plant pollen in the air. 69
- Katarzyna Dąbrowska-Zapart: Types of hazel (*Corylus* spp.) and alder (*Alnus* spp.) pollen seasons in Sosnowiec 1997 – 2007 (Poland) 75
- Dorota Myszkowska: The grass pollen season dynamics in relation to the meteorological conditions in Cracow, southern Poland, 1991-2008 85
- Małgorzata Malkiewicz, Kamilla Klaczak: Pollen concentrations of some plants in the air over Olszanica (Bieszczady Niskie Mountains) and Wrocław in the 2008 season 97
- Adam Okorski, Jacek Olszewski, Katarzyna Głowacka, Sylwia Okorska, Agnieszka Pszczółkowska: The effect of the application of the biological control agent EMI on gas exchange parameters and productivity of *Pisum sativum* L. infected with *Fusarium oxysporum* Schlecht. 105
- Joanna Ciszewska-Marciniak, Małgorzata Jędryczka, Stanisław Jeżowski, Jerzy Przyborowski, Katarzyna Wojciechowicz, Elżbieta Zenkteler: Morphology of uredinia and urediniospores of the fungus *Melampsora larici-epitea* Kleb. a damaging pathogen of common osier (*Salix viminalis* L.) in Poland 117
- Agnieszka Pszczółkowska, Gabriel Fordoński, Jacek Olszewski, Tomasz Kulik, Iwona Konopka: Productivity and seed health of husked oats (*Avena sativa* L.) grown under different soil moisture conditions 127
- Joanna Katarzyna Jarmońkiewicz, Jacek Olszewski: Gas exchange parameters in leaves and ears of winter wheat *Triticum aestivum* and its productivity under fungicide control conditions 135
- Małgorzata Materska, Irena Perucka: Accumulation of phenylpropanoids in green and red pepper fruits of semi-hot cultivars *Capsicum annuum* L. 149
- Beata Janowska, Roman Andrzejak: Effect of gibberellic acid spraying and soaking of rhizomes on the growth and flowering of calla lily (*Zantedeschia* Spreng.) 155
- Edward Borowski: The effect of the method of application and concentration of Asahi SL on the response of cucumber plants to chilling stress. 161
- Aleksandra Głowacka: Changes in weed infestation of common bean (*Phaseolus vulgaris* L.) under conditions of strip intercropping and different weed control methods 171
- Cezary Kwiatkowski: Evaluation of yield quality and weed infestation of common valerian (*Valeriana officinalis* L.) in dependence on weed control method and forecrop 179
- Teresa Skrajna, Maria Ługowska: Stubble field plant communities of the Mazowiecki Landscape Park 189
- Sylwia Andruszczak, Ewa Kwiecińska-Poppe, Piotr Kraska, Edward Pałys: The effect of different agrotechnical levels on weed infestation in crops of naked and husked varieties of oat (*Avena sativa* L.) 207

