Acta fytotechnica et zootechnica, Vol. 4, 2001, Special Number
Proceedings of the International Scientific Conference on the Occasion of the 55th Anniversary of the Slovak Agricultural University in Nitra

WEED INFESTATION OF WINTER WHEAT IN INTEGRATED AND ECOLOGICAL ARABLE FARMING SYSTEM

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Summary

Ecological and integrated arable farming systems were established on brown clay-loamy soil in the south Slovakia in 1990. The influence of these systems on weed infestation in winter wheat was investigated in 1998-2000. The development of winter wheat and weed infestation were influenced mainly by weather conditions and cultivation measures within the farming systems. Higher weed infestation expressed by number of weeds per m^2, number of weed species, but also dry matter weight of weeds before the harvest of winter wheat, was in ecological system. Weed infestation in spring, in the stage of the end of tillering of winter wheat, was very high with the following dominant weed species in integrated system: Tripeurospermum perforatum, Medicago sativa, Cirsium arvense, Cardaria draba. In ecological system the dominant weed species were: Medicago sativa, Cirsium arvense, Tripeurospermum perforatum, Cardaria draba. During vegetation period, the degree of weed infestation was changed in both systems. In integrated system, applied herbicides lowered the weed occurrence from 43.2 to 2.6 weeds per m^2. In ecological system, non-chemical measures and concurrence ability of winter wheat lower the number of weeds from 64.9 pieces per m^2 in spring to 14.4 pieces per m^2 before harvest. But the dry matter weight of weeds was in ecological system 5.9 times higher than in integrated.

Key words: integrated system, ecological system, actual weed infestation, winter wheat

Introduction

Weeds, as a very important harmful factor, occur every year in the fields in various species composition and amount. High degree of weed infestation can cause significant lowering of quantity and quality of production. A well balanced system of weed regulation within sustainable crop production system can eliminate the use of herbicides on ecologically acceptable level. Owing to chemical selection there is an evident increase of weed species with genetically based tolerance against herbicides (Kohout, 1993; in. Týr, 2000). Present weed infestation of cereals is mainly caused by species like: *Apera spica-venti, Avena fatua Cirsium arvense, Sonchus spp., Cardaria draba, Convolvulus arvensis* (Schroeder et al., 1993; Týr - Pospišil, 1999). Our previous results showed that the most important problem in ecological system are perennial weed species (Lacko-Bartošová et al., 2000).

Materials and Methods

Long term field experiments of integrated and ecological arable farming systems were established in the autumn of 1990 at the Slovak Agricultural University Research Station near Nitra on brown clayloamy soil. In both systems natural regulation processes are supported by crop rotations with intercrops, integrated crop nutrition, integrated and non-chemical crop protection. In both systems conventional soil cultivation is used. Crop rotations are shown in Table 1.

Table 1: Crop rotations of integrated and ecological systems.

No.	*Integrated system*	***Ecological system***
1.	winter wheat / intercrop	field bean + alfalfa
2.	common pea	alfalfa
3.	winter wheat / intercrop	winter wheat / intercrop
4.	maize for silage	common pea / intercrop
5.	spring barley	maize for silage
6.	alfalfa	spring barley / intercrop

Weed infestation of winter wheat stand was determined in the spring (before chemical and mechanical treatment) in four replicates from the area of 1 m^2 by counting method and before harvest of winter wheat by counting and weighting methods.

Results and discussion

On the basis of statistical evaluation, in our experiments was determined high influence of farming system on actual weed infestation during vegetative period of winter wheat. Weed infestation is the most important factor of successfulness of ecological production. In the stand of winter wheat, in comparison with the other crops in crop rotation, is the influence of weed infestation and the damages caused by weeds lower, because of relatively soon development of stand in the spring.

Actual weed infestation in the spring during the years of observation was very high and varied from 25.5 to 78.8 weeds per m^2 and was from 1.1 to 2.5 times higher in ecological than in integrated system. In integrated system the herbicides Granstar 75 WG and Agritox 50 SL was used, with good to excellent efficacy on weed flora. Number of weeds and their weight before the harvest of winter wheat were in integrated system lower by 4.2 – 22.6 times in comparison with ecological system. The dominant weed species in ecological system were perennials: *Medicago sativa, Cirsium arvense, Cardaria draba* and annual weed species: *Tripleurospermum perforatum*. Concurrence ability of winter wheat stand and applied mechanical measures lower the number of weeds at later stages of winter wheat development and growth.

Table 2: Actual weed infestation of winter wheat stand (average for 1998 – 2000)

Year	Farming systems	No. of weeds in spring		Most frequent weeds in spring	No. of weeds before harvest per m^2	%	Dry matter weight of weeds $g.m^{-2}$	%	Most frequent weeds in summer
		No.m^{-2}	%						
1998	A	25.23	100.0	TRIPE, CARDR, CAPBP, CIRAR	0.25	100.0	0.29	100.0	CONAR, LATTU, - , -
	B	63.23	250.6	TRIPE, CARDR, CAPBP, CIRAR	1.91	764.0	6.54	2255.2	CIRAR, TRIPE, STEME, -
	XAB	44.39	-	TRIPE, CARDR, CAPBP, CIRAR	1.08	-	3.42	-	CIRAR, TRIPE, CONAR, LATTU
1999	A	71.12	100.0	CIRAR, TRIPE, MEDSA, CHEAL	1.75	100.0	8.49	100.0	CONAR, CIRAR, - , -
	B	78.80	110.8	CIRAR, TRIPE, MEDSA, CHEAL	12.8	731.4	84.30	992.9	CONAR, CIRAR, TRIPE, -
	XAB	74.96	-	CIRAR, TRIPE, MEDSA, CHEAL	7.26	-	46.40	-	CONAR, CIRAR, TRIPE, -
2000	A	33.19	100.0	MEDSA, TRIPE, CIRAR, CAPBP	5.75	100.0	20.40	100.0	CONAR, CIRAR, MEDSA, TRIPE
	B	46.75	140.9	MEDSA, CIRAR, TRIPE, STEME	28.50	495.7	81.63	400.2	CIRAR, MEDSA, TRIPE, SONAR
	XAB	39.97	-	MEDSA, CIRAR, TRIPE, STEME	17.13	-	51.02	-	CIRAR, CONAR, MEDSA, TRIPE
98-00	XA	43.18	100.0	TRIPE, MEDSA, CIRAR, CARDR	2.58	100.0	9.73	100.0	CONAR, CIRAR LATTU, MEDSA
	XB	62.93	145.7	MEDSA, CIRAR, TRIPE, CARDR	14.40	558.1	57.49	590.9	CIRAR, CONAR, MEDSA, TRIPE
	xAB	53.06	-	MEDSA, TRIPE, CIRAR, CARDR	8.49	-	33.61	-	CIRAR, CONAR, MEDSA, TRIPE

Legend: A – integrated system, B – ecological system, xAB – average AB, TRIPE - *Tripleurospermum perforatum*, CARDR – *Cardaria draba*, CAPBP – *Capsella bursa-pastoris*, CIRAR – *Cirsium arvense*, CONAR – *Convolvulus arvensis*, LATTU – *Lathyrus tuberosus*, STEME – *Stellaria media*, CHEAL – *Chenopodium album*, MEDSA – *Medicago sativa*.

References

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