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WEED INFESTATION OF WINTER WHEAT IN ECOLOGICAL AND CONVENTIONAL FARMING SYSTEMS

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Summary

The aim of this work was to investigate the influence of ecological and conventional farming system on weed seedbank in soil and actual weed infestation on winter wheat at selected agricultural farms in Sebechleby, Plavé Vozokany and Dačov Lom. At the co-operative Sebechleby were determined significant differences between higher weed seedbank in ecological (22 800 weed seeds per m^2) than in conventional system (6 600 weed seeds per m^2). Higher number of determined weed species was detected in weed seedstock in ecological system at Plavé Vozokany and Sebechleby. Dominant weed species in ecological system at all farms was *Chenopodium album L.*, with the share of 45,6 % (Sebechleby), 44,8 % (Dačov Lom) and 38,5 % (Plavé Vozokany). Before the harvest of winter7 wheat, the degree of weed infestation was almost equal in ecological system at all co-operative farms. Characteristics of ecological systems was occurrence of perennial species *Cirsium arvense*. In accordance with our expectation, higher degree of weed infestation was determined in ecological system.

Key words: ecological farming system, conventional farming system, weed seedbank, actual weed infestation

Introduction

Agricultural farmers, without differences are they ecological or conventional growers say that weed management is one of the biggest challenges they face.
Surface and subsurface weed seedbank in soil is a suitable indicator of weed flora in deferent farming and cultivation systems. Knowledge about weed seedbank gives us an evidence about crop cultivation in the past and at the same time it helps to set prognosis for the future.

Material and methods

The objectives of this study were to investigate the influence of farming system (ecological and conventional) on weed seedbank and actual weed infestation of winter wheat. Experiment were realised at agricultural farms in Sebechleby, Plavé Vozokany and Dačov Lom.

Table 1 Characteristics of regions

Agricultural farms	*Sebechleby*	*Plavé Vozokany*	*Dačov Lom*
altitude (m)	300	200	590
average temperature (˚C)	7,5	9,5	8,5
annual precipitation (mm)	674	534	713

Weed seedbank was determined in 1998 in the depth of 0,0-0,15 m according to the methodology of Hron and Kohout (1974), from monitoring places of the field plot in seven replicates. Actual weed infestation was determined in 1998 and 1999, two times during vegetative period (spring and summer aspect), in five replicates (1x1 m) which represented all parts of the field (middle, margins). Weed coverage was determinate by estimation method, species composition and number of weeds per m^2 by counting.

Results and discussion

The whole seedstock in the depth of 0,0-0,15 m of soil reached the highest rate 38 900 and 35 300 weed seeds per m^2 at the co-operative farm of Plavé Vozokany in both farming system (tab. 2). There were no significant differences between the systems at the farms of Plavé Vozokany and Dačov Lom. Significant differences were determined at the co-operative Sebechleby, with higher weed seedbank in ecological (22 800 weed seeds per m^2) than in conventional system (6 600 weed seeds per m^2). In our previous work, there were no significant differences between the system when using conventional soil cultivation. Minimum cultivation significantly rose up the weed seedstock in the soil (L.- Bartošová et al. 2000). Higher number of determined weed species in weed seedstock was detected in ecological system at Plavé Vozokany and Sebechleby, whereas at co-operative Dačov Lom the broader spectrum of weed species was detected in conventional system. Number of detected weed species in ecological system was equal at all cooperative farms and represented eight

weed species. In conventional system number of weed species varied from six to ten. Dominant weed species in ecological system at all farms was *Chenopodium album L.*, with the share of 45,6 % (Sebechleby), 44,8 % (Dačov Lom) and 38,5 % (Plavé Vozokany). Second most important weed species were *Rumex crispus L.* and *Amarathus retroflexus L.* In conventional system dominant weed species at co-operative farm Sebechleby was also *Chenopodium album L.*, whereas this weed was the second most important at Plavé Vozokany and Dačov Lom. Here dominant weed species was *Amaranthus retroflexus L.* with the share of 53,5 % at Plavé Vozokany farm and 44,8 % at Dačov Lom. Similar soil cultivation in both farming systems at all agricultural farms caused no significant differences between vertical layout of seeds. Only at co-operative Sebechleby in conventional farming system where found differences i.e. highest number of seeds in the depth of 0,0-0,05 m.

Actual weed infestation and number of weeds per m^2 was the highest in the spring at co-operative farm Dačov Lom. At agricultural co-operative Sebechleby, only rare degree of weed infestation was determined in both system (table 3). Before the harvest of winter wheat, the degree of weed infestation was almost equal in ecological systems at all co-operative farms. A common characteristics of ecological systems was occurrence of perennial species *Cirsium arvense* and *Convolvulus arvensis L. Cirsium arvense* was the most dangerous weed species, with higher propagation before harvest of winter wheat than during the spring. In the summer aspect of observation the share of *Cirsium arvense* was 38,5 % at Sebechleby, 31,8 % at Plavé Vozokany and at Dačov Lom the share of both perennial weed species represented 38,4 %. In accordance with our expectation, higher degree of weed infestation was determined in ecological system. Only at co-operative farm Plavé Vozokany, higher degree of weed infestation was found out in conventional than ecological system in spring (before chemical or mechanical treatments), where dominant weed species where *Viola arvensis, Stellaria media, Lamium purpureum L., Anthemis arvensis L.*, all winter weed species with high competitive ability in winter cereals at the initial growth stages. Comparing two terms of observation, ecological farming system had better influence on competitive ability of wheat stand at co-operative Plavé Vozokany and Dačov Lom. Before harvest, at the co-operative Sebechleby was significantly higher level of weed infestation because of lower crop-weed competition in the spring.

Table 2 Number of weed seeds per m^2 in 1998 at co-operative farms

Weed species	***SEBECHLEBY***		***PLAVÉ VOZOKANY***		*Dačov Lom*	
	Eco. system(1)	*Con. system(2)*	*Eco. system*	*Con. system*	*Eco. system*	*Con. system*
AMARE	2300	1000	8100	20800	2300	10800
ATRPA	300	900	1200	1700	600	1400
CAPBP	-	-	200	-	-	100
CIRAR	-	-	500	-	600	-
CONAR	-	-	-	100	-	-
GALAP	-	-	-	-	-	100
CHEAL	10400	4100	13600	13200	9500	8600
PERMA	200	-	-	-	-	-
PLALA	600	400	-	-	600	100
RUMCR	100	100	6900	2600	4800	2000
SETPU	8800	-	-	-	-	-
STEME	-	-	4600	300	2400	400
TAROF	-	-	-	-	-	300
THLAR	100	100	200	200	400	300
Total	22800	6600	35300	38900	21200	24100

(1) ecological farming system, (2) conventional farming system

Table 3 Average number of weeds per m^2 in winter wheat in 1998 and 1999

Weed species	***Spring aspect***						***Summer aspect***					
	SEBECHLEBY		***PLAVÉ VOZOKANY***		***Dačov Lom***		***SEBECHLEBY***		***PLAVÉ VOZOKANY***		***Dačov Lom***	
	Eco.(1)	*Con.(2)*	*Eco.*	*Con.*	*Eco.*	*Con.*	*Eco.*	*Con.*	*Eco.*	*Con.*	*Eco.*	*Con.*
AMARE	-	-	-	-	-	0,5	-	-	-	-	-	-
ANTAR	-	-	2,0	3,7	18,2	4,9	13,1	-	-	1,4	4,3	2,2
APESV	-	-	-	-	-	-	1,4	-	-	-	2,2	0,8
ATRPA	-	-	-	-	1,2	-	-	-	-	-	0,3	-
AVEFA	-	-	-	-	2,1	0,6	-	-	-	-	-	-
BRAOL	-	1,6	-	-	-	-	-	-	-	-	-	-
CAPBP	-	-	0,3	0,7	0,3	0,1	-	-	-	-	0,6	0,2
CARDR	-	-	-	1,4	0,6	1,6	-	-	-	-	-	-
CICHI	-	-	-	-	0,1	0,2	-	-	-	-	-	-
CIRAR	4,7	-	3,0	3,4	0,1	0,2	11,2	0,2	4,2	3,4	4,9	1,5
CONAR	-	-	-	-	14,0	1,4	3,3	0,1	-	-	2,6	0,3
EROCI	-	-	-	-	0,2	-	-	-	-	-	-	-
EQUAR	-	-	-	-	-	-	-	-	-	-	0,1	0,4
FALCO	-	-	-	-	0,7	0,3	-	-	3,1	-	1,7	0,1
GAETE	-	-	-	-	-	0,1	-	-	-	-	-	-
GALAP	0,1	-	0,2	-	0,3	2,0	-	-	-	-	0,4	0,2
CHEAL	-	-	0,5	-	19,7	5,9	-	-	-	-	-	-
LAMPU	-	-	-	4,1	-	-	-	-	-	-	-	-
PAPRH	-	-	0,2	0,1	-	-	-	-	-	-	-	-
PERMA	-	-	-	-	13,6	0,6	-	-	-	-	-	-
POLAV	-	-	3,0	-	2,8	1,1	0,1	0,6	5,4	-	1,9	1,4
RAPRA	-	-	-	-	0,4	-	-	-	-	-	-	-
RUMCR	-	-	-	-	0,1	-	-	-	-	-	-	-
STEME	-	-	-	8,6	-	0,1	-	-	0,1	2,9	0,1	0,5
TAROF	0,1	-	-	0,2	-	-	-	-	-	-	-	-
VERAR	0,2	-	3,3	0,4	3,4	7,7	-	0,5	-	0,8	-	1,4
VIOAR	-	-	-	11,3	0,3	0,4	-	0,3	0,4	4,4	0,4	1,6
Total	5,1	1,6	12,5	33,9	78,1	27,7	29,1	1,7	13,2	12,9	19,5	10,6

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SUSTAINABLE CEREAL PRODUCTION IN HUNGARY

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Strongly simplifying we could distingues two agricultural models nowadays: conventional and alternative (sustainable). In the alternative agriculture we could reach the sustainability (from ecological, agronomical and economical aspects) by taking greater roles and advantages of the biological interactions and natural cycles that are already at work or available to work on the farm. Beacuse of the differences of ecological and economical circumstances there is no intrinsically correct way to proceed, so alternative (sustainable) agriculture requires different practices, methods, cropping systems etc.
The different agricultural models could be adequate individually from different aspects (agronomical, environmental, economical, social etc aspects). Although many production systems may pass the rigors of environmental protection, economic security and social acceptibility individually, few are satisfying all the facets necessary for a successful agriculture. Sustainable agriculture could be such an agricultural system.