THE MOST PROBLEMATIC WEEDS IN THE PEA FOR GRAIN (*PISUM SATIVUM* L.) IN ECOLOGICAL FARMING

NAJPROBLEMATICKEJŠIE BURINY V HRACHU SIATOM NA ZRNO (*PISUM SATIVUM* L.) V EKOLOGICKOM HOSPODÁRENÍ

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Abstract: *In the years 2005-2007 was conducted weed survey on the farms in conversion to ecological farming system. The aim was to detect the most harmful weeds, as important biotic, environmental stress factor, on the farms in the canopies of pea for grain in all production region of the Slovak Republic. The actual weed infestation was evaluated by standard methods common used by EWRS a numerous method per square. In the pea for grain 6 weed species were detected, the most problematic were: perennial weed (Cirsium arvense), annual weeds (Persicaria spp., Tripleurospermum perforatum, Avena fatua, Chenopodium spp., Atriplex spp.).*

Rezumat: *V rokoch 2005-2007 bol realizovaný prieskum zaburinenosti na farmách v konverzií na ekologické poľnohospodárstvo. Cieľom bolo zistiť najškodlivejšie burinné druhy ako dôležité environmentálne stresové factory na farmách v porastoch hrachu siateho na zrno vo všetkých produkčných oblastiach Slovenskej republiky. Aktuálna zaburinenosť bola hodnotená štandardnou početnou metódou na meter štvorcový bežne používanými EWRS. V porastoch hrachu siateho na zrno bolo zistených 6 burinných druhov: trváce buriny (Cirsium arvense), jednoročné buriny (Persicaria spp., Tripleurospermum perforatum, Avena fatua, Chenopodium spp., Atriplex spp.).*

***Key words*:** weed infestation, conversion, ecological farming system, pea for grain
***Cuvinte cheie*:** zaburinenosť, konverzia, ekologický system hospodárenia, hrach siary na zrno

INTRODUCTION

Weeds are a major problem in conversion to ecological farming systems. Besides nutrients, weed management is regarded as the main technical problem that affects yield and economic viability (LACKO-BARTOŠOVÁ, MACENKOVÁ, 2006; SMATANA, et al., 2006).

The development of environmentally and economically sound production systems is an important aim in agricultural research (HOFFMANN et al., 2007; HORNOK et al., 2007). Competition by weeds is more important in ecological systems than in conventional systems, where weeds can be controlled by herbicides (BÀRBERI, 2002). The development of integrated weed management strategies requires knowledge of the mechanism that influences the compositional changes in weed flora (SHRESTHA et al., 2002). Diversifying rotation patterns to include both spring and winter crops has helped producers to control weeds (BLACKSHAW et al., 1994; BUZSÁKI, BÉRES, 2007). Preventive weed management approaches the targeting of weeds throughout the rotation and attempts to maintain weed seed bank populations at a level where direct control actions within the crop have a greater chance of success. This is critical in organic production, but is also of importance in conventional systems where herbicide choice is becoming increasingly limited (DAVIES, BALLINGALL, 2008)

MATERIAL AND METHODS

In 2005-2007, a weed survey on farms in conversion to ecological agriculture was conducted in the west and central part of the Slovak Republic, with weed infestations in pea for

grain was evaluated on nine farms. Sampling was carried out in spring, before mechanical regulation of weeds. Pre-crops of pea for grain were cereals and maize. For evaluation, the modified international scale recommended by EWRS (Anonymous, 1988) was used to measure weed density (Table 1). Weed infestation in each field was estimated by measuring a 1 m^2 area. Number of replicates varied according to field size, minimum was four (Anonymous, 1988). Randomly distributed quadrates were situated at least 20 m from field margins and each other. The total area of pea for grain fields evaluated was 425 ha. The weeds were arranged in the following groups, where T means *Therophyta* (annual) and G means *Geophyta* (perennials, which over winter in the soil): T1; emerges in autumn, over winters and develops vegetative parts in early spring (e.g. *Stellaria media*), and T2; emerges mainly in autumn or sometimes in springtime (e.g. *Avena sterilis*), T3; emerges in spring and seeds in early summer (e.g. *Cyperus* spp.), T4; emerges in spring or early summer and seeds at the end of summer (e.g. *Chenopodium album*), and G1; grows from rhizome (e.g. *Agropyron repens*).

Table 1.

Modified EWRS evaluation scale of weed infestation.

Classification of weeds	Infestation level				
	None	Weak	Low	Medium	High
	Number of weeds per m^2				
Very competitive	-	≤ 2	3-5	6-15	≥ 16
Less competitive	-	≤ 4	5-8	9-20	≥ 21
Less important	-	≤ 8	9-15	16-30	≥ 31

RESULTS AND DISCUSSIONS

The weed survey indicated that, in pea for grain fields, there were 6 weed species (table 2), one from the group G1 (perennials), one from the group T2, one from the group T3 and three from the T4 group. *Tripleurospermum perforatum*, *Persicaria spp.*, *Chenopodium spp.*, *Atriplex spp.* are considered very competitive. These species, even at low weed densities, may lower the yields of crops by about 1-2 t/ha due to intense competition for resources (Týr, 2008). The highest infestation level was for *Cirsium arvense* with more than 16 weed plants per m^2. The last indicated weed was *Avena fatua*. It is an annual species with a similar growth and development pattern as pea, suggesting that weeds have co-evolved to suit prevailing agricultural practices and the resulting environmental conditions (MARTÍNEZ-GHERSA et al., 2000).

Table 2.

Weed infestation of pea for grain, classified by weed type and infestation level.

Species	Weed type	Weed infestation (% of area)				
		none	rare	low	medium	high
Tripleurospermum perforatum Sch. Bip	T2		47.1	52.9		
Avena fatua L.	T3	5.8	47.1	47.1		
Atriplex spp. L.	T4		94.1		5.9	
Chenopodium spp. L.	T4	47.1	47.1	5.8		
Persicaria spp. S.F.Gray	T4	47.1	47.1	5.8		
Cirsium arvense L. Scop.	G1		5.9	5.9	41.1	47.1

MACÁK et al. (2008) also report a significant increase in weed diversity in ecological farms, but with weed species occurring at lower infestation levels. Enhancement of weed diversity in low-input systems is commonly caused by specific management effects (e.g. crop rotations, tillage, and fertilizer use) and the absence of broad spectrum, systemic herbicides (KNEŽEVIĆ et al. 2008). In the integrated farming system the weed species richness by higher as well as lower fertilization level was equal (5 species). Before harvest the species richness

was by all crops lower (4 species) than before the first weeds treatment (6 species). The weed species richness before the first weed treatment was in the spring barley the highest, followed by pea, winter wheat and maize for grain. Before harvest highest species richness of weeds was in winter wheat, followed by spring barley, pea and maize for grain (ŽÁK, et al., 2006).

CONCLUSIONS

Weed infestation is an important factor due to competition for resources (e.g. water and nutrients), particularly in conversion to ecological systems.

- In pea for grain were identified 6 weed species. Very competitive weeds in pea were *Tripleurospermum perforatum*, *Persicaria spp.*, *Chenopodium spp.*, *Atriplex spp.* and *Avena fatua*.
- Perennial species *Cirsium arvense* is very problematic plant for production fields of peas.
- These weeds have similar life cycles as the crops in which they were growing.
- Weed diversity increased in the ecological system, but infestation levels were lower compared to conventional system.
- Grain legumes, particularly peas, do not offer strong competition to weeds.
- Good weed management should be maintained throughout the rotation.
- Weed control can be undertaken before sowing the crop and within vegetation period of the crop by physical methods.

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ACKNOWLEDGEMENTS

This paper has been supported by VEGA Project No. 1/0457/08 "Research and Development of Technologies for Sustainable Agricultural Systems".