TEMPORAL DYNAMICS OF WEED INFESTATION IN THE PEA FOR GRAIN CANOPIES IN THE YEARS 2000-2010

T. VEREŠ, Š. TÝR

Slovak Agricultural University in Nitra, Slovak Republic
Faculty of Agrobiology and Food Resources,
Slovak Agricultural University in Nitra,
Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic,
E-mail:Tomas.Veres@uniag.sk

Abstract: *In the years 2000 – 2011 (12 years) was conducted weed survey on the farms in conventional farming system. The goal was to detect the most harmful weeds, as important biotic, environmental stress factor, on the farms in the canopies of pea for grain in maize, sugar beet and potato production regions of the Slovak Republic. The fields were selected in all production regions of Slovakia. An actual weed infestation was evaluated before preemergence application of herbicides. Screening of each field was made on 1 m^2 area with four replications. The four randomly established sample quadrants were situated minimally 20 m from field margin and apart from each other, respectively. The level of infestation was evaluated according to average density of weeds per square meter. Obtained data from farms was statistically analyzed by correlation analysis in Statistica 7.0. In the pea for grain canopies 10 most dangerous weed species were detected, the most problematic were: perennial weeds Cirsium arvense (L.) Scop. and Elytrigia repens (L.) DESV and annual weeds Atriplex spp., Avena fatua L., Amaranthus spp., Anthemis spp., Chenopodium spp., Tripleurospermum perforatum* (Mérat) M. Lainz, *Echinochloa crus galli (L.) P. Beauv and Datura stramonium (L.). Temporal dynamic of actual weed infestation depends on production region. After herbicides control the significant changes in weed flora were noted in term of abundance and share of some weed species on total weed community. Temporal dynamics of actual weed infestation depend on climate conditions of maize, sugar beet and potato production region, forecrop and pea stand health condition. Spring and perennial weeds are always a problem in pea for grain stands, because pea plants are not so competitive, but control may be considered necessary to safeguard crop quality and yield. The originality of result is in mapping the weed species and its actual weed infestation in cultural crops (pea for grain stands).*

Key words**:** *words: pea for grain, weed infestation, mapping*

INTRODUCTION

Weeds are a major problem in all types of farming system. 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).

Spring – sown field peas (*Pisum sativum* L.) grown as a row crop in temperate zones, require relatively high optimal growth temperatures and are therefore disadvantaged relative to weeds (PROCTOR, 1972), particularly the semi – leafless varieties commonly used (WALL et al., 1991). Therefore, post – emergence weed control is required, which relies on a narrow time frame of suitable weather and soil conditions. Delays caused by weather of a few days in applying weed control can lead to weed competition, technical obstacles at harvest, significant yield losses and even entire crop failures (SAUCKE, ACKERMANN, 2006).

MATERIAL AND METHODS

The assessment of the ten most dangerous weed species in canopy of pea for grain was conducted at the Slovak fields in 2000 – 2011. The fields were selected in maize, sugar

beet and potato production region (Table 2). Common chemical weed practices were used. Present study assessed the actual weed infestation of weed species in canopy of pea for grain during the years 2000 – 2011.

An actual weed infestation was evaluated before application of herbicides with concordance to modified international scale. Screening of each field was made on the quadrant of 1 m^2 area with four replications. One quadrant of each replication was (1.0m x 1.0m). The four randomly established sample quadrants were situated minimally 20 m from field margin and apart each other, respectively. The fields with same history were selected. Standard mechanical and chemical weed control have been used. The level of infestation was evaluated according to average density of weeds per square meter (Table I). Received dates from farms were computed to whole area of growing crop and statistically analyzed by correlation analysis in Statistica 7.0.

Table 1

Evaluation scale of actual weed infestation

Group of weeds*	Actual weed infestation				
	none	weak	low	medium	heavy
	Infestation level				
	0	1	2	3	4
	Number of weeds per m^2				
Excessively dangerous	-	≤ 2	3-5	6-15	≥ 16
Less dangerous	-	≤ 4	5-8	9-20	≥ 21
Less important	-	≤ 8	9-15	16-30	≥ 31

*- weed species checklist Hron – Vodák, 1959, modified by authors Smatana – Týr, 2011.

Table 2

Characteristic of evaluated production region of the Slovak Republic

Characteristics	Maize production region (MPR)	Sugar beat production region (SBPR)	Potato production region (PPR)
Share of total arable land	24%	16.2%	18.9%
Altitude	up to 200 m	up to 350 m	350-500 m
Average year temperature	9.5-10.5°C	8-9°C	6.5-8°C
Average year precipitation	550-600 mm	550-650 mm	700-800 mm

RESULTS AND DISCUSSIONS

The ten most dangerous weed species at the pea for grain fields are presented according to production region in the Table 3. The highest level of weed infestation in the maize production region achieved: *Chenopodium spp.*, *Atriplex spp.*, *Avena fatua* L. and *Sinapis arvensis* L.; in sugar beet production region the most power full weeds were *Avena fatua* L., *Atriplex spp.*, *Chenopodium spp.* and *Elytrigia repens* (L.) P. Beauv.; in potato production region the highest infestation was reached by *Chenopodium spp.*, *Tripleurospermum perforatum* (Mérat) M. Lainz and *Avena fatua* L. (Table 3).

According to TÓTH (2008) the most offensive weeds in the crop stands in Slovakia at present are *Cirsium arvense* (L.) Scop., *Chenopodium* spp. and *Elytrigia repens* (L.) P. Beauv.. Occurrence of couch-grass *Elytrigia repens* (L.) P. Beauv. can reflect the lower level of agronomical practices, as well as unsuitable crop rotations.

According to the obtained data and results of weed survey the most troublesome weeds with the heaviest weed infestation level of pea for grain stands were *Avena fatua* L.,

Chenopodium spp. and *Atriplex* spp. in all production regions of Slovak Republic.

Table 3

Top 10 of most dangerous weed species in the Slovak pea for grain fields

No.	Maize production region	Sugar beet production region	Potato production region
1.	*Chenopodium spp.*	*Avena fatua* L.	*Chenopodium spp.*
2.	*Atriplex spp.*	*Atriplex spp.*	*Tripleurospermum perforatum* (Mérat) M. Lainz
3.	*Avena fatua* L.	*Chenopodium spp.*	*Avena fatua* L.
4.	*Sinapis arvensis* L.	*Elytrigia repens* (L.) P. Beauv	*Cirsium arvense* (L.)Scop.
5.	*Capsella bursa pastoris* (L.) Medik.	*Datura stramonium* (L.)	*Elytrigia repens* (L.) P. Beauv
6.	*Cirsium arvense* (L.)Scop	*Tripleurospermum perforatum* (Mérat) M. Lainz	*Anthemis spp.*
7.	*Tripleurospermum perforatum* (Mérat) M. Lainz	*Anthemis spp.*	*Veronica arvensis* L.
8.	*Polygonum spp.*	*Cirsium arvense* (L.)Scop.	*Echinochloa crus galli* (L.)P.Beauv
9.	*Datura stramonium* (L.)	*Fallopia convolvulus* (L.) Á.Löve	*Persicaria spp.*
10.	*Galium aparine* L.	*Sinapis arvensis* L.	*Amaranthus spp.*

Weed growth in field peas utilizes an available ecological niche, which is related to four factors: (i) the slow initial growth rate of pea seedlings, (ii) wide-spaced rows, (iii) the late development of a competitive canopy and (iv) poor weed suppressive traits in semi-leafless pea varieties. Suppressive traits for grain legumes are intensive axial development (branching) (DAVIS et al., 1984), reduced light transmission (KIMPEL-FREUND et al., 1998), increased seed weight (REMISON, 1978) and dense sowings (LAWSON, 1983).

CONCLUSIONS

Weed infestation is an important factor due to competition for resources (e.g. water, nutrients and space)

- The most competitive weeds in pea stands were *Chenopodium spp.*, *Atriplex spp.*, *Avena fatua* L. and *Tripleurospermum perforatum* (Mérat) M. Lainz.
- Perennial species *Cirsium arvense* (L.)Scop. and *Elytrigia repens* (L.) P. Beauv is very problematic plants for conventional production fields of peas for grain.
- These weeds have similar life cycles as the crops in which they were growing.
- Grain legumes, particularly peas, do not offer strong competition to weeds.

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BIBLIOGRAFY

1. DAVIS, J.H.C.; VAN BREUNINGEN, L.; ORTIZ, M.V.; PINO, C.: Effect of growth habit of beans on tolerance to competition from maize when intercropped. In: Crop Science, vol. 24,

1984, pp. 751-755.
2. KIMPEL-FREUND, H.; SCHMIDTKE, K.; RAUBER, R.: Effect of field pea (*Pisum sativum* L.) with different morphological features monocropped and intercropped with oat (*Avena sativa* L.) on competition to weeds. In: Pflanzenbauwissenschaften, vol. 2, 1998, pp. 25–36.
3. LACKO-BARTOŠOVÁ, M.; MACENKOVÁ, K.: Produkčné parameter v udržateľných systémoch hospodárenia na ornej pôde. Aktuálne problémy riešené v Agrokomplexe, SPU Nitra, 2006, pp. 45-48. ISBN 80-8069-799-X.
4. LAWSON, H.M.: Competition between annual weeds and vining peas grown at a range of population densities: effects on the crop. In: Weed Research, vol. 23, 1983, pp. 27–38.
5. PROCTOR, D.E.: Inter-competition between *Agropyron repens* and peas. In: Weed Research, vol. 12, 1972, pp. 107–111.
6. REMISON, S.U.: The performance of cowpea (*Vigna unguicula*) (L.) Walp.) as influenced by weed competition. In: Journal of Agricultural Science, Cambridge, vol. 90, 1978, pp. 523–530.
7. SAUCKE, H.; ACKERMANN, K.: Weed suppression in mixed cropped grain peas and false flax (*Camelina sativa*). In: Weed Research, vol. 46, 2006, pp. 453–461.
8. SMATANA, J.; MACÁK, M.; DEMJANOVÁ, E.: The influence of soil tillage on soil moisture parameters under cropping of common peas. In: Lucrari Stiintifice, vol. 38, 2006, pp. 19-24.
9. SMATANA, J.; TÝR, Š.: Základy herbológie. 1. vyd. Nitra : Slovenská poľnohospodárska univerzita, 2011. 125 s. ISBN 978-80-552-0579-3.
10. TÓTH, Š.: Weed occurrence uder the field conditions of Slovakia. In: Acta fytotechnica et zootechnica, vol. 11, 2008, no. 4, pp. 89-95.
11. WALL, D.A.; FRIESEN, G.H.; BHATI, T.H.: Wild mustard interference in traditional and semi-leafless field peas. In: Canadian Journal of Plant Science, vol. 71, 1991, pp. 473–480.