TEMPORAL DYNAMICS OF WEED INFESTATION IN THE FORAGE CROPS IN THE YEARS 2000-2010

Štefan TÝR - Tomáš VEREŠ

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: Stefan.Tyr@uniag.sk

Abstract: *In the years 2000 - 2010 (11 years) was conducted weed survey on the farms in conventional farming system. The aim was to detected the most harmful weeds, as important biotic, environmental stress factor, on the farms in the canopies of forage crops (alfalfa, clover) in maize, sugar beet and potato production region of the Slovak Republic. The actual weed infestation was evaluated by standard methods common used by a counting method per square. The four randomly established sample quadrants were situated minimally 20 m from field margin and apart each other, respectively. In the forage crops 23 weed species were detected, the most problematic were: perennial weed Cirsium arvense (L.) Scop., Elytrigia repens (L.)DESV, Taraxacum officinale Web. and annual weeds Chenopodium spp., Capsella bursa pastoris (L.) Med., Thlaspi arvense L., Plantago spp., Polygonum spp., Veronica spp. and Datura stramonium L.. As for temporal dynamics of actual weed infestation in forages the most powerfull weeds in maize production region were Lamium spp., Datura stramonium L., which increased very significantly their populations. Temporal dynamic of actual weed infestation depends on production region. In the last decade was detected the decrease of Rumex spp. in all production region. On the other side were Polygonum spp., Veronica spp. and Chenopodium spp. which increased their populations in the forage stands. Finally in potato production region was detected very significant increase by 6 weed species: Melandrium album (Mill.) Garcke, Plantago spp., Polygonum spp., Veronica spp., Atriplex spp. and Chenopodium spp.. "Only" significant increase was detected by two weed species. Elytrigia repens L. significantly increased population densities in maize production region and Apera spica venti (L.) P. Beauv. in potato production region. Significant decrease was detected by two weeds species Cuscuta spp. in maize production region and Rumex spp. in potato production region. The originality of result is in mapping the weed species in cultural crops.*

Key words**:** *temporal dynamics, actual weed infestation, mapping, forage crop, alfalfa*

INTRODUCTION

Weed communities become more diverse in cropping systems, thus minimalizing the predominance of any one weed (LACKO-BARTOŠOVÁ, 2005; MACÁK 2008) and long term research is required to understand weed community dynamics and the research must continue. Since the early nineties a considerable increase in weed infestation of arable land with both the perennial and annual weeds has been observed. This was caused by agricultural transformation, failure to carry out cultural practices and insufficient weed control (MIKULKA, CHODOVÁ, 2002). It started slowing down in the mid-nineties, but an increase in the occurrence of some weed species has continued until now. Changes in weed society are also caused by natural influences – for example floods (WINKLER, 2000).

The importance of weed control in forage production should not be overlooked, especially when you consider the high investment associated with alfalfa and other legume forages. Weeds reduce forage yield by competing for water, sunlight, and nutrients. For example, yield obtained from the first cutting of alfalfa can be significantly reduced by a heavy

infestation of common chickweed. In addition to yield losses, weeds can also lower forage quality, increase the incidence of disease and insect problems, cause premature stand loss, and create harvesting problems. Some weeds are unpalatable to livestock or, in some cases, may be poisonous (GREEN et al., 2003).

MATERIAL AND METHODS

The assessment of the most dangerous weed species and their dynamic in canopies of forage crops (alfalfa, clover) was conducted at the Slovakia in the years 2000- 2010. The fields were selected in all production regions of Slovak Republic. An actual weed infestation was evaluated in the second year of forage crop (alfalfa, clover) before the first mowing. 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 (Table 1). Obtained data from farms was 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 according to checklist Hron, Vodák, 1959, modified by authors

Table 2

Characteristic of evaluated production region of the Slovak Republic

Characteristics	Maize production region (MPR)	Sugar beet 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

On the base of weed survey, which was conducted in the years 2000 – 2010, there were detected 23 weed species, which infested forage crops (alfalfa and clover) in all production regions of the Slovak Republic. The most problematic were: perennial weed *Cirsium arvense* (L.) Scop., *Elytrigia repens* (L.)DESV, *Taraxacum officinale* Web. and annual weeds *Chenopodium spp.*, *Capsella bursa pastoris* (L.) Med., *Thlaspi arvense* L., *Plantago spp.*, *Polygonum spp*., *Veronica spp*. and *Datura stramonium* L..

As for temporal dynamics of actual weed infestation in forages the most powerfull weeds in maize production region were *Lamium spp*., *Datura stramonium* L., which increased very significantly their populations. In sugar beet production region the most harmfull weeds were in alfalfa stands *Thlaspi arvense* L. and *Polygonum spp*.. Finally in potato production region was detected very significant increase by 6 weed species: *Melandrium album* (Mill.) Garcke, *Plantago spp*., Polygonum spp., *Veronica spp*., *Atriplex spp*. and *Chenopodium spp*.. ”Only” significant increase was detected by two weed species. *Elytrigia repens* L. significantly increased population densities in maize production region and *Apera spica venti* (L.) P. Beauv.

in potato production region. (Table 3)

In the last decade was detected also significant decrease of weeds population by two weed species. In maize production region it was parasitic weed *Cuscuta spp.* and in the potato production region it was *Rumex spp*., which decreased its population in all production regions of the Slovak Republic.

Different situation is in Czech Republic, where the most problematic weed of forage crops are from the group annual weeds *Rumex spp*.. Their regulation is not so easy, it take a long time to control weeds like *Rumex crispus* or *Rumex obtusifolius*. From group perennial weed species it is *Cirsium arvense* (L.) Scop. and *Taraxacum officinale* Web. (MIKULKA et al., 2009; GAISLER et al., 2010).

Table 3

Correlations between the occurrence of the most important weed species and production region during the last 11 years (2000-2010)

Weed	Maize production region	Sugar beet production region	Potato production region
Anthemis spp.	-0.4917 NS	0.1729 NS	0.0798 NS
Capsella bursa-pastoris (L.) Med.	-0.4524 NS	0.5664 NS	0.0831 NS
Cirsium arvense (L.) SCOP	-0.3772 NS	0.2756 NS	-0.0807 NS
Conium maculatum L.	0.0177 NS	-0.1967 NS	0.1458 NS
Cuscuta spp.	-0.6014 S	0.0688 NS	-0.0688 NS
Elytrigia repens (L.) DESV	0.6464 S	-0.5263 NS	-0.7928 VS
Lamium spp.	0.7631 VS	0.3282 NS	-0.2663 NS
Melandrium album (L.)Garcke	-0.3018 NS	0.1058 NS	0.9174 VS
Papaver spp.	0.4860 NS	0.1454 NS	0.1545 NS
Plantago spp.	0.5848 NS	0.0776 NS	0.8147 VS
Polygonum spp.	0.1570 NS	0.8227 VS	0.7726 VS
Rumex spp.	-0.5307 NS	-0.3450 NS	-0.6195 S
Taraxacum officinale Web.	-0.5557 NS	0.1360 NS	-0.5528 NS
Thlaspi arvense L.	0.4702 NS	0.8205 VS	0.3208 NS
Tripleurospermum perforatum (Mérat) M. Lainz	-0.3979 NS	0.3897 NS	-0.3068 NS
Apera spica venti (L.) P. Beauv.	0.5739 NS	-	0.6648 NS
Atriplex spp.	0.1279 NS	-	0.8759 VS
Chenopodium spp.	-0.4548 NS	-	0.9106 VS
Stellaria media (L.) Vill.	0.3965 NS	0.5477 NS	-
Veronica spp.	0.1279 NS	-	0.8699 VS
Convolvulus arvensis L.	-	0.4969 NS	-
Datura stramonium L.	0.7323 VS	-	-
Fallopia convolvulus (L.) A. Love	-	-	0.4259 NS

Legend: VS-very significant, S-significant, NS-non significant

CONCLUSIONS

The most troublesome weeds in forage crops were *Capsella bursa pastoris* (L.) Med., *Cirsium arvense* (L.) Scop., *Elytrigia repens* (L.)DESV, *Taraxacum officinale* Web., *Chenopodium spp*., *Thlaspi arvense* L., *Plantago spp*., *Polygonum spp*., *Veronica spp*. and *Datura stramonium* L..

Temporal dynamics of actual weed infestation depend on climate conditions of production region, forecrop and canopy health condition.

In the maize production region were *Lamium spp*. and *Datura stramonium* L. the dominant weeds, which increased very significantly their populations. In sugar beet production region it was *Thlaspi arvense* L. and *Polygonum spp*. and in potato production region it was: *Melandrium album* (Mill.) Garcke, *Plantago spp*., Polygonum spp., *Veronica spp*., *Atriplex spp*. and *Chenopodium spp*.. Significant increase was detected by two weed species. *Elytrigia*

repens L. in maize production region and *Apera spica venti* (L.) P. Beauv. in potato production region.

Significant decrease was detected by two weeds species *Cuscuta spp*. in maize production region and *Rumex spp.* in potato production region.

Acknowledgements: This paper was supported by VEGA project 1/0466/10 "Adaptation of sustainable agriculture and mitigation of impact of climate change".

BIBLIOGRAFY

1. LACKO-BARTOŠOVÁ M., et al. 2005. Udržateľné a ekologické poľnohospodárstvo, SUA in Nitra, 575 p., ISSN 80-8069-556-3
2. GAISLER J., PAVLU V., PAVLU L., MIKULKA J. 2010. Extenzivní obhospodařování trvalých travních popostu. VÚRV Praha 6 – Ruzyně, 24 p., ISBN 978-80-7427-049-9.
3. GREEN J.D., MARSHALL M.V., MARTIN J.R., 2003. Weed Control of Alfalfa and Other Forage Legume Crops. University of Kentucky, US, Cooperative Extension Service, AGR-148, online: http://www.ca.uky.edu/agc/pubs/agr/agr148/agr148.pdf.
4. MACÁK M., ŽÁK Š., DJALOVIC I., SZOMBATHOVÁ N., 2008 The influence of an ecological and low input systems on weed density, weed diversity and weed competition on spring barley. Journal of Plant Diseases and Protenction, sp. Issue XXI, pp. 425-430, ISSN 1861-4051.
5. MIKULKA J., CHODOVÁ D., 2000. Changes in weed societies in Czech Republic. XV. Czech and Slovak Plant Protection Conference in Brno, Sept. 12.-14. 2000, no. 15, p.287-288.
7. MIKULKA J., PAVLU V., SKUHROVEC J., KOPRDOVÁ S., 2009. Metody regulace plevelu na trvalých travních porostech. VÚRV Praha 6 – Ruzyně, 40 p., ISBN 978-80-7427-011-6.
8. WINKLER J., 2000. The changes of species structure of weed communities influenced by flood. XV. Czech and Slovak Plant Protection Conference in Brno, Sept. 12.-14. 2000, no. 15, pp. 315-316.