TOP 10 OF THE MOST DANGEROUS WEED SPECIES IN THE WINTER WHEAT CANOPIES DURING THE LAST DECADE IN THE SLOVAK REPUBLIC

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Abstract: *In the years 2000 - 2009 (10 years) was conducted weed survey on the farms in conventional farming system. The aim was to detected top 10 of the most harmful weeds, as important biotic stress factor, on the farms in the canopies of winter wheat in all production regions 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. Three most dangerous weeds in winter wheat stands in the maize production regions were: Anthemis spp., Tripleurospermum perforatum (Mérat) M. Lainz and Cirsium arvense (L.) Scop.. In sugar beet production region it was Galium aparine L., Stellaria media (L.) Vill. and Anthemis spp. and in potato production region it was the same as in maize production region Anthemis spp., Tripleurospermum perforatum (Mérat) M. Lainz and Cirsium arvense (L.) Scop.. Temporal dynamic of actual weed infestation depends on production region. In the last decade was detected the very significant increase of Cirsium arvense (L.) Scop., Galium aparine L. and Apera spica venti (L.) P. Beauv. in sugar beet production region and volunteer winter oilseed rape in potato production region. Significant increase was detected by Cirsium arvense (L.) Scop. and volunteer sunflower in maize production regio; Anthemis spp., Avena fatua L., volunteer winter oilseed rape and Tripleurospermum perforatum (Mérat) M. Lainz in sugar beet production region. Very significant decrease of Apera spica venti (L.) P. Beauv. was detected in potato production region and population of Avena fatua L. significant decrease in maize 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 The originality of result is in mapping the weed species in cultural crops.*

Key words**:** *temporal dynamics, weed infestation, winter wheat, Slovak Republic*

INTRODUCTION

Wheat is among the oldest cultivated plants: it is used by more than half of the globe's population in the making of "our daily bread". It has the most favourable carbohydrates: proteins ratio (6: 1). It is also used in industrial processing to get starch, dextrin's, alcohol, or animal feed, and it is important from an agro technical point of view (CULHAVI, MANEA 2010).

Weeds occur in every winter wheat field. Crops together with weeds compose so-called artificial plant associations – agrophytocenosis. The occurrence of concrete weed species in agrophytocenosis is affected by biological properties of crops, ecological factor of the localities, as well as by intensity of the used agro technology (MACÁK, 2006; MACÁK et al., 2008). Weeds belong to the factors that negatively affect crop production. As a part of crop stands, they cause yield loss, even though treatment measures are taken. Winter wheat yield depression could be as much as 30 % under medium high and high weed infestation. However, yield loss may reach as much as 90 % under very high weed infestation (TÓTH, 1999).

MATERIAL AND METHODS

The assessment of the most dangerous weed species and their dynamic in canopies of winter wheat was conducted at the Slovakia in the years 2000- 2009. The fields were selected in all production regions of Slovak Republic. 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 (Table 1). Obtained data from farms was statistically analysed 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

In the last decade the most dangerous weed species in the winter wheat canopies in maize production region were *Anthemis spp.*, *Tripleurospermum perforatum* (Mérat) M. Lainz. and *Cirsium arvense* (L.) Scop.. In sugar beet were the most dangerous weeds *Galium aparine* L., *Stellaria media* (L.) Vill. and *Anthemis spp.*. In potato production region three most dangerous weed species were the same as in maize production region *Anthemis spp.*, *Tripleurospermum perforatum* (Mérat) M. Lainz. and *Cirsium arvense* (L.) Scop..

The *Cirsium arvense* competitiveness is higher than the competitiveness of violets. The main factor increasing its spread is not only several years setting land aside but also other factors – as the increase of large-scale farming together with simple crop rotations, higher doses of fertilizers and decreasing intensity of soil treatment, and at last but not least financially expensive herbicide treatment (Tóth, 2008; Hintzche, Pallutt, 1995). Problems with *Galium aparine* can be successfully solved if herbicide treatments are done strictly in time. Their present high position in the weediness is related to the possibility of their occurrence and growing in all crops, dose of fertilizer – especially *Galium aparine* is a nitrophilic species, relatively tolerant towards many commonly used herbicides (Kohout, 1997; Tóth, 2008)

In the years 2000-2009 region significantly raised the infestation of winter wheat fields with *Cirsium arvense* (L.) Scop. and volunteer sunflower in the maize production. Very significant decrease of winter wheat weed infestation was detected by *Stellaria media* (L.) Vill. and significant decrease of infestation with *Avena fatua* L. (Table 3).

In the sugar beet production region very significantly increased the winter wheat weed infestation with *Galium aparine* L., *Cirsium arvense* (L.) Scop. and *Apera spica venti* (L.) P. Beauv., only significantly raised in the last decade the occurrence of *Anthemis spp.*, *Tripleurospermum perforatum* (Mérat) M. Lainz., *Papaver spp.*, *Avena fatua* L. and volunteer winter oilseed rape (Table 4).

In the last decade very significant raised only infestation of winter wheat with volunteer winter oilseed rape and very significant decreased only *Apera spica venti* (L.) P. Beauv. and Stellaria media (L.) Vill. (Table 3; Table 5).

In Romania is one of the most problematic weed *Convolvulus arvensis* L.. It grows everywhere, on all soils, and particularly on warm, drier soils, aerated and permeable, in vegetable gardens, where it suffocates the young seedlings, in nurseries and on plantations, where it clings on the shrubs (CULHAVI, MANEA 2010).

Table 3

Temporal dynamic of the ten most dangerous weed species in the winter wheat canopies in maize production region

	Weed	Correlation coefficient of winter wheat weed infestation temporal dynamic in maize production region
1.	*Anthemis spp*	-0.0574 NS
2.	*Tripleurospermum perforatum* (Mérat) M. Lainz	-0.1004 NS
3.	*Cirsium arvense* (L.) SCOP	0.6125 S
4.	*Galium aparine* L.	-0.0410 NS
5.	*Stellaria media* (L.) Vill.	-0.7608 VS
6.	*Avena fatua* L.	-0.5095 S
7.	*Elytrigia repens* (L.) DESV	0.4463 NS
8.	Volunteer sunflower	0.5639 S
9.	*Apera spica venti* (L.) P. Beauv.	-0.1632 NS
10.	Volunteer winter oilseed rape	0.2987 NS

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

Table 4

Temporal dynamic of the ten most dangerous weed species in the winter wheat canopies in sugar beet production region

	Weed	Correlation coefficient of winter wheat weed infestation temporal dynamic in sugar beet production region
1.	*Galium aparine* L.	0.8089 VS
2.	*Stellaria media* (L.) Vill.	-0.1270 NS
3.	*Anthemis spp*	0.5983 S
4.	*Tripleurospermum perforatum* (Mérat) M. Lainz	0.5244 S
5.	*Cirsium arvense* (L.) SCOP	0.7676 VS
6.	*Papaver spp.*	0.5204 S
7.	*Thlaspi arvense* L.	0.1923 NS
8.	*Avena fatua* L.	0.5928 S
9.	*Apera spica venti* (L.) P. Beauv.	0.8229 VS
10.	Volunteer winter oilseed rape	0.5124 S

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

Table 5

Temporal dynamic of the ten most dangerous weed species in the winter wheat canopies in potato production region

	Weed	Correlation coefficient of winter wheat weed infestation temporal dynamic in potato production region
1.	*Anthemis spp*	0.3514 NS
2.	*Tripleurospermum perforatum* (Mérat) M. Lainz	-0.0741 NS
3.	*Cirsium arvense* (L.) SCOP	0.1639 NS
4.	*Elytrigia repens* (L.) DESV	0.3814 NS
5.	*Galium aparine* L.	-0.3167 NS
6.	*Apera spica venti* (L.) P. Beauv.	-0.6542 VS
7.	Volunteer winter oilseed rape	0.6959 VS
8.	*Persicaria spp.*	0.1999 NS
9.	*Stellaria media* (L.) Vill.	-0.4190 NS
10.	*Lamium spp.*	-0.4454 NS

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

CONCLUSIONS

The most harmful weeds of the last decade in winter wheat stands were *Anthemis spp,, Tripleurospermum perforatum* (Mérat) M. Lainz, *Cirsium arvense* (L.) SCOP, *Galium aparine* L., *Stellaria media* (L.) Vill., *Avena fatua* L., *Elytrigia repens* (L.) DESV, Volunteer sunflower, *Apera spica venti* (L.) P. Beauv. and Volunteer winter oilseed rape in the maize production region.

In the sugar beet production region were the most spread following weeds: *Galium aparine* L., *Stellaria media* (L.) Vill., *Anthemis spp., Tripleurospermum perforatum* (Mérat) M. Lainz, *Cirsium arvense* (L.) SCOP, *Papaver spp., Thlaspi arvense* L., *Avena fatua* L., Apera spica venti (L.) P. Beauv., Volunteer winter oilseed rape.

In the potato production region were the most troublesome following weeds: *Anthemis spp, Tripleurospermum perforatum* (Mérat) M. Lainz, *Cirsium arvense* (L.) SCOP, *Elytrigia repens* (L.) DESV, *Galium aparine* L., *Apera spica venti* (L.) P. Beauv., Volunteer winter oilseed rape, *Persicaria spp., Stellaria media* (L.) Vill. and *Lamium spp.*.

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BIBLIOGRAFY

1. CULHAVI C., MANEA D., 2010 Controlling the perennial species *Convolvulus arvensis* L. a problem weed in winter wheat. Research Journal of Agricultural Science, vol. 42, no. 4,.pp.32-37.
2. HINTZSCHE E., PALLUT P., 1995 Zunehmendes Auftreten der Ackerkratzdistel. Sonderteil Pflanzenschutz-Praxis-Der Pflanzenartzt, pp 23-25.
3. KOHOUT V., 1997 Plevele polí a zahrad. Praha: Agrospoj.
4. MACÁK M., 2006 Agroenvironmentálne indikátory hodnotenia udržateľnosti poľnohospodárstva. Nitra: SPU, Ochrana biodiversity, 118 pp., ISBN 80-8069-651-9.
5. 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.
6. TÓTH Š., 1999 Vplyv diferencovaného hnojenia na zaburinenosť ozimnej pšenice a zníženie úrod zrna. Rostlinná výroba, vol. 45, no. 5, pp. 213-217.
7. TÓTH Š., 2008 Weed occurrence under the field conditions of Slovakia. Acta fytotechnica et zootechnica, vol. 11, no. 4, pp. 89-95.