WEED INFESTATION DYNAMICS OF WINTER WHEAT FILDS IN SOUTH-WESTERN SLOVAKIA

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Abstract: *The field trial was conducted at the experimental farm Kolíňany (south-western Slovakia) in 1999-2010. Experimental farm is situated in warm and moderate arid climatic region with altitude of field from 180 to 310 m. The average annual rainfall is 580.0 mm. The average annual rainfall during the growing season is 320.3 mm. The mean annual temperature is 9.6˚C. The mean temperature during growing season is 16.3˚C. The soil is Orthic Luvisol with loamy texture with different thickness of humus layer (from 0.23 to 0.45). Winter wheat was growing on minimum 10 large scale field range from 30 to 50 ha. An actual weed infestation was evaluated before application of post emergent herbicides and 3-4 week after application of herbicides and third evaluation just before harvest with concordance to International scales of EWRS. Screening of each field was made on the quadrant of 1 m^2 area by counting method with four replications. The four randomly established sample quadrants were situated minimally 20 m from field margin and apart each other, respectively. The dominant weed species in winter weeds field were as follows: Elytrigia repens, Tripleurospermum perforatum, Cirsium arvense, Galium aparine, Stellaria media, Lamium purpureum, Capsella bursa pastoris, Thlapsi arvense, Viola arvense and Fallopia convolvulus, with low to medium infestation level. Total weed density was high. The different level of seasonal dynamics was noted. Mostly in all species generally the declination of infestation level and weed density was noted at the end of evaluation period. The increasing level of infestation was determined by Tripleurospermum perforatum, Stellaria media, Lamium purpureum and Capsella bursa pastoris. The higher actual weed infestation was noted in 2003 and 2007. These evaluated years were characterised by wet condition with normal up to warm temperature and spring was characterised by normal precipitation and temperature condition. The changes of active ingredient of herbicides significantly influence the composition of weed flora for instance decreasing of trifluralín support the Stellaria media infestation and Lamium spp. The weed control under threshold level is important also for subsequent crops.*

Key words: *herbicides, weeds, weeds infestation, winter wheat*

INTRODUCTION

Weeds occur in almost every field. Cultivated crops together with weed species compose artificial plant associations – agrophytocenosis. The occurrence of specific 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 (TYŠER, HOLEC, 2004; MACÁK, 2006; MACÁK et al., 2008). Weeds, as a very important harmful factor, occur every year in the field in various species composition and density. High degree of infestation can cause significant lowering of quantity and quality of production. A well balance system of weed regulation within sustainable crop production system can eliminate the use of herbicides on ecologically acceptable level (KOHOUT, 1993). Linear relationships were observed between individual and total weed species, dry weight and reproductive structure per unit area (KORES, FROUD-WILIAMS, 2002).

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). The efficiency of post-emergence weed control is generally better than that of pre-emergence weed control, regardless of tillage intensity (STREIT, et al., 2003).

MATERIAL AND METHODS

The assessment of ten most dangerous weed species and their dynamic in canopy of winter wheat was conducted at the experimental farm Kolíňany (south-western Slovakia) in 1999-2010. The fields of farm were selected in maize production region. Common chemical weed practices were used. Present study assessed the actual weed infestation of weed species in canopy of winter wheat and their dynamic during the years 1999-2010. An actual weed infestation was evaluated before application of herbicides with concordance to modified International scales EWRS (ANONYMOUS, 1988). Screening of each field was made on the quadrant of 1 m^2 area with four replications. One quadrant on each replication covers rows and inter-rows cultivation. 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 1). Received data from farm were computed to whole area of growing crop and statistically analysed.

Table 1

Evaluation scale of actual weed infestation for excessively dangerous and less dangerous weeds

Group of weeds	**Actual weed infestation**				
	none	weak	low	medium	heavy
	Infestation level				
	0	1	2	3	4
Excessively dangerous +++	-	< 3	3-5	6-15	15 <
Less dangerous ++	-	< 5	5-8	9-20	20<
Less important +	-	<9	9-15	16-30	30 <

RESULTS AND DISCUSSIONS

Results showed that the dominant weed species in winter wheat fields were: *Elytrigia repens* (L.) DESV., *Tripleurospermum perforatum* (MÉRAT) M. LAÍNZ, *Cirsium arvense (L.)* SCOP., *Galium aparine* (L. Á.LÖWE, *Stellaria media* (L.) VILL., *Lamium purpureum (L.), Capsella bursa pastoris (L.)* MEDIK., *Thlaspi arvense* (L.) and *Viola arvense* MURRAY .), *Fallopia convolvulus* (L.) with low to medium infestation level. The results of TYŠER et al. (2003) showed in average, on the first position in both companies and also crops there was *Viola arvensis*, followed by *Galium aparine, Chenopodium album, Fallopia convolvulus* and *Elytrigia repens*.

The occurrence of couch-grass can reflect *Elytrigia repens* can reflect the lower level of agronomical practices, as well as unsuitable crop rotations. *Viola* spp. was always neglected weed genus, but the countries with well-development agriculture show higher interest in this genus now days. The violets were found mainly in winter cereals with similar life cycle, influential impact was determined in spring cereals, too (TÓTH, 2008). The

increasing occurrence of violets was noticed in Czech Republic (KOHOUT et al., 2003) and in Europe (SALONEN, HYVONEN 2000; KLAASSEN, FREITAG, 2004). 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;). 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, TÝR, VEREŠ, LACKO-BARTOŠOVÁ, 2009).

The increasing level of weed infestation was detected in 4 species *Tripleurospermum perforatum* (Fig.2), *Stellaria media* (Fig.5) *Lamium purpureum* (L.), (Fig.6), and *Capsella bursa pastoris* (Fig.7). The higher actual weed infestation was noted in 2003 and 2007 – number of weeds per m^2 was 40.77 or 46.29 – that's mean heavy weed infestation The less total weed density was noted in 2006 (27.8 weeds per m^2) and 2009 (29.8 weeds per m^2) during dry or could whether condition which negatively influenced the germination of weeds.

Dynamism of weed infestation was influenced mainly by weather conditions and herbicides application. The best weather conditions for weed development were in the years 2003 and 2007. These years were characterized by wet condition with normal up to warm temperature and spring was characterized by normal precipitation and temperature condition. Also changes of active ingredient of herbicides significantly influence the weed flora composition for instance decreasing of trifluralin support the *Stellaria media* infestation and *Lamium* spp. The weed control under threshold level is important also for subsequent crops.

Figure 1 Couch grass – *Elytrigia repens* (L.) DESV.

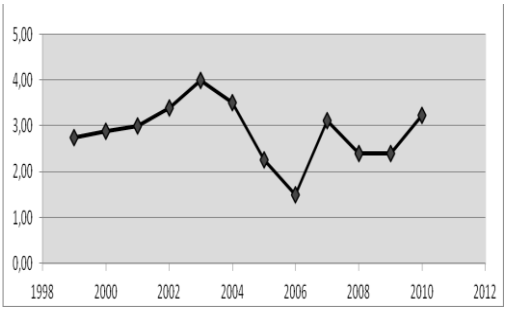


Figure 2 Scentless mayweed – *Tripleurospermum perforatum* (MÉRAT) M. LAÍNZ

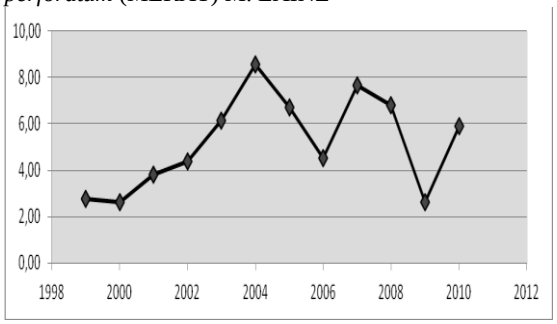


Figure 3 Canada thistle– *Cirsium arvense* (L.) SCOP.

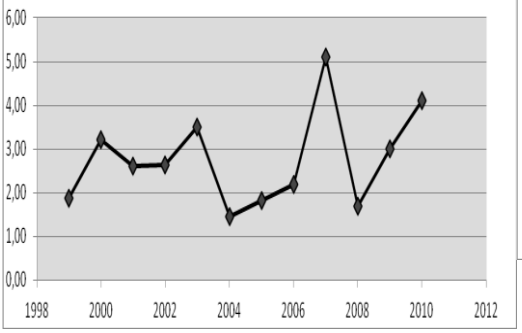


Figure 4 Cleavers catchweed – *Galium aparine* L.

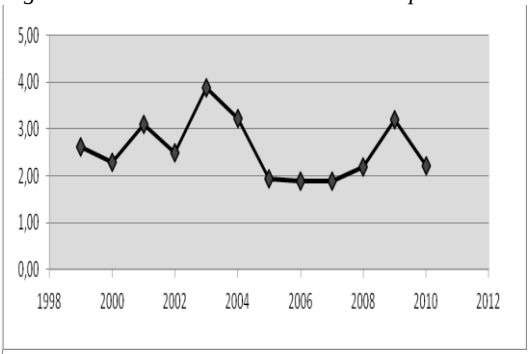


Figure 5 Chickweed – *Stellaria media* (L.) VILL.

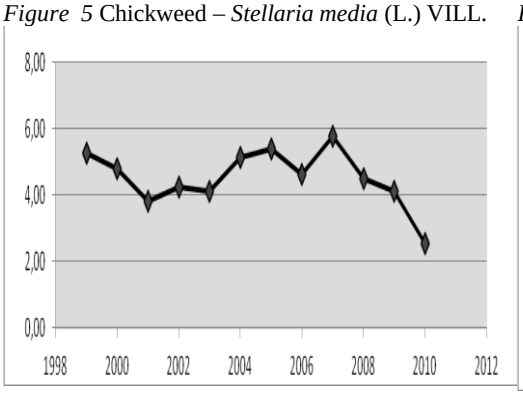


Figure 6 Red dead nettle – *Lamium purpureum* L.

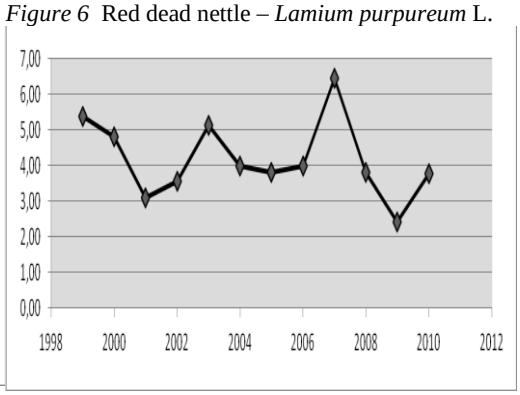


Figure 8 Field pennyocress – *Thlapsi arvense* L.

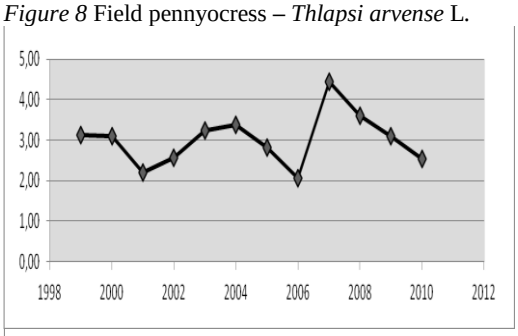


Figure 7 Shepherds purse - *Capsella bursa pastoris* (L.) MEDIK.

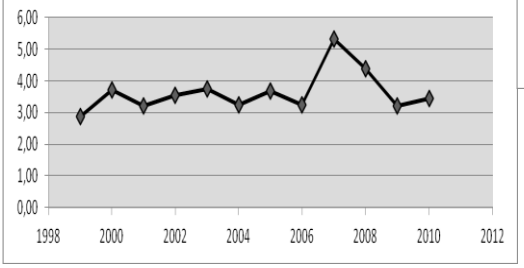


Figure 9. Field pansy – *Viola arvensis* MURRAY

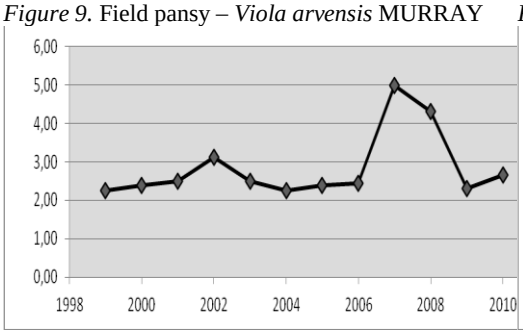
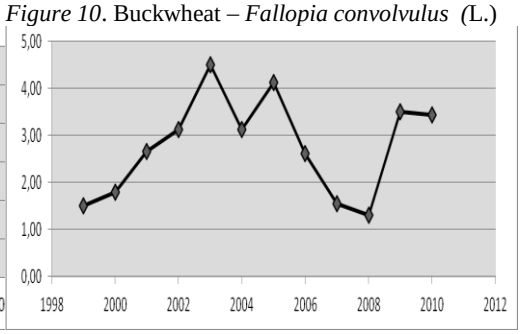


Figure 10. Buckwheat – *Fallopia convolvulus (*L.)



CONCLUSIONS

On the base of long term assessment we can conclude: The highest actual weed infestation was noted in the years 2003 and 2007. That was influenced mainly by weather conditions. Second dominant factor, which cause significant changes in weed flora and in share of some weed species in agrophytocenosis was herbicide weed control. Infestation level was low to medium. The increasing level of weed infestation was detected in 4 species

Tripleurospermum perforatum (MÉRAT) M.LAINZ, *Lamium purpureum* (L.), *Stellaria media* (L.) VILL. and *Capsella bursa pastoris* (L.) MEDIK.. Excessively dangerous weeds were as follows: *Tripleurospermum perforatum* (MÉRAT) M.LAINZ, *Elytrigia repens* (L.) DESV., *Fallopia convolvulus* (L.) *Cirsium arvense* (L.) SCOP and *Galium aparine* (L. Á.LÖWE).

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