WEED INFESTATION DYNAMICS IN THE WINTER WHEAT (*TRITICUM AESTIVUM* L.) CANOPY

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Abstract: *The field trial was conducted at the experimental farm Kolíňany (south-west Slovakia) in 1999-2006. 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. 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 scale. 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 wheat field were as follows: Elytrigia repens, Galium aparine, Tripleurospermum perforatum, Cirsium arvense, Fallopia convolvulus, Lamium purpureum, Stellaria media, Capsella bursa pastoris, Thlaspi arvense and Viola arvense with low to medium infestation level. Total weed density was high. The different level of seasonal dynamics was evaluated. Generally in all species declination of infestation level and weed density was noted at the end of evaluation period. The increasing level of infestation was detected in 4 species Tripleurospermum perforatum, Fallopia convolvulus, Stellaria media and Capsella bursa pastoris. The highest actual weed infestation was noted in 2003 and 2004.*

Key words**:** *weed infestation, winter wheat, herbicides.*

INTRODUCTION

Weeds occur in almost every field. Cultivated crops together with weed species 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 (TYŠLER, HOLEC, 2004; 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 ten most dangerous weed species and their dynamic in canopy of winter wheat was conducted at the experimental farm Kolíňany (south-west Slovakia) in 1999-2006. 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 1999-2006.

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 on each replication (0.7 m by 1.5 m) 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
	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

RESULTS AND DISCUSSIONS

Results showed that the dominant weed species in winter wheat fields were: *Elytrigia repens (L.) DESV., Galium aparine (L.), Tripleurospermum perforatum (MÉRAT) M. LAÍNZ, Cirsium arvense (L.) SCOP., Fallopia convolvulus (L.) Á.LÖWE, Lamium purpureum (L.), Stellaria media (L.) VILL., Capsella bursa pastoris (L.) MEDIK., Thlaspi arvense (L.)* and *Viola arvense MURRAY* with low to medium infestation level.

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 (MIKULKA, CHODOVÁ, 2000; KOHOUT et al., 2003) and in Europe (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; 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, TÝR, VEREŠ, LACKO-BARTOŠOVÁ, 2009).

The increasing level of weed infestation was detected in 4 species *Tripleurospermum perforatum* (Fig.3), *Fallopia convolvulus* (Fig.5), *Stellaria media* (Fig.7) and *Capsella bursa pastoris* (Fig.8). The higher actual weed infestation was noted in 2003 and 2004.

Dynamic 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 2004. 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.

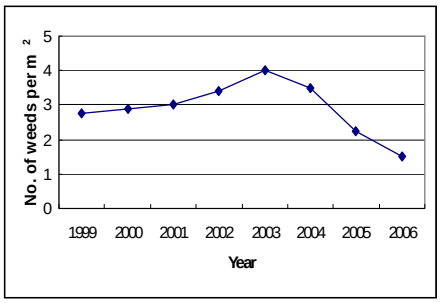

Figure 1: Couch grass - *Elytrigia repens (L.) DESV.*

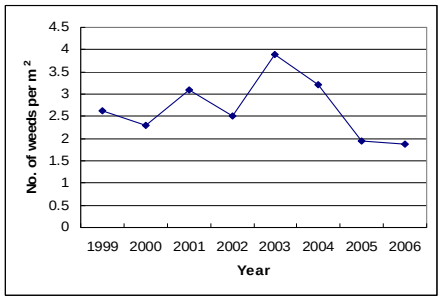

Figure 2: Cleavers, catchweed - *Galium aparine L.*

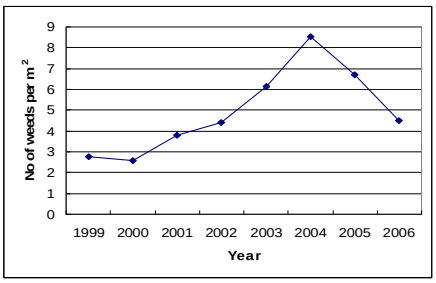

Figure 3: Scentless mayweed - *Tripleurospermum perforatum (MÉRAT) M.LAÍNZ*

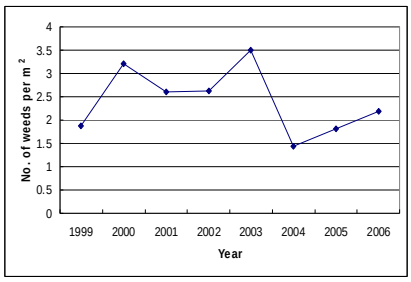

Figure 4: Canada thistle - *Cirsium arvense (L.) SCOP*

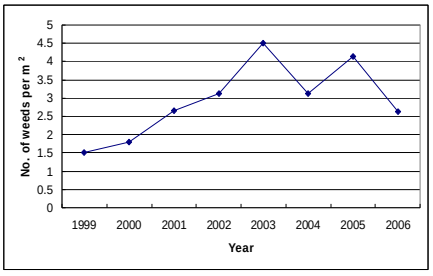

Figure 5: Buckwheat - *Fallopia convolvulus (L.) Á.LÖWE*

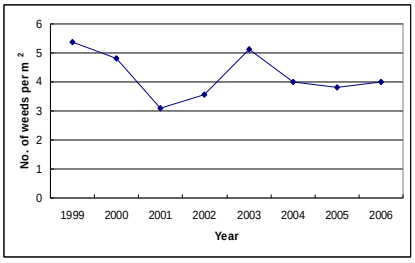

Figure 6: Red dead nettle - *Lamium purpureum L.*

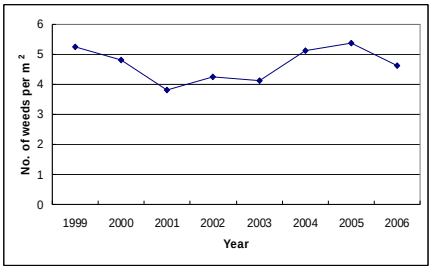

Figure 7: Chickweed - *Stellaria media (L.) VILL.*

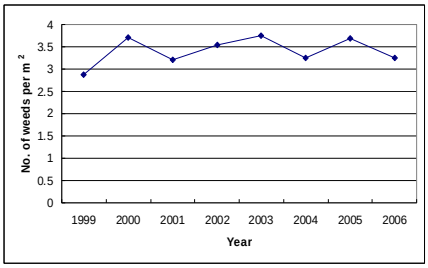

Figure 8: Shepherd`s purse - *Capsella bursa pastoris (L.) MEDIK.*

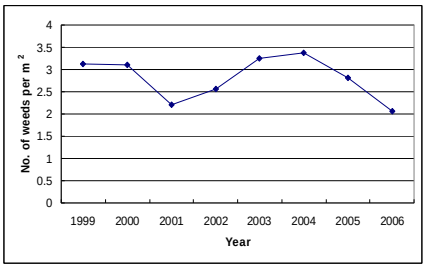

Figure 9: Field pennycress - *Thlaspi arvense L.*

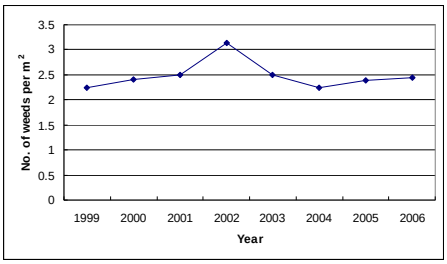

Figure 10: Field pansy - *Viola arvensis MURRAY*

CONCLUSIONS

On the base of long term assessment we can conclude: The highest actual weed infestation was noted in the years 2003 and 2004. 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, *Fallopia convolvulus* (L.) Á.LÖWE, *Stellaria media* (L.) VILL.and *Capsella bursa pastoris* (L.) MEDIK..

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