ACTUAL WEED INFESTATION OF MAIZE IN THE INTEGRATED AGRICULTURAL SYSTEM IN THE YEARS 1997-2006

AKTUÁLNA ZABURINENOSŤ KUKURICE V INTEGROVANOM SYSTÉME HOSPODÁRENIA ZA ROKY 1997-2006

ŠTEFAN TÝR

Slovak Agricultural University in Nitra, Slovak Republic

Abstract: *The aims of this study were to investigate the influence of an integrated farming system on development of actual weed infestation in the canopies of maize. The actual weed infestation was evaluated from 1997 till 2006 in the Slovak Republic, by standard methods common used by EWRS a numerous method per square meter. The results of the weed survey on arable land conducted in 1997-2006 were applied to assess the distribution and occurrence of weed species with respect to their importance and harmfulness in maize fields situated in general production region (south Slovakia). In integrated system as a weed regulation techniques were used chemical treatments and cultural methods. According to the achieved results it is evident, that the farming system showed higher influence on development of actual weed infestation and weed species diversity. In integrated agricultural dominant weed species were (according to the level of infestation): Ambrosia artemisiifolia, Amaranthus retroflexus, Chenopodium spp., Datura stramonium, Persicaria spp., Convolvulus arvensis, Cirsium arvense, etc.*

Súhrn: *Cieľom práce bolo zistiť vplyv integrovaného systému hospodárenia na vývoj aktuálnej zaburinenosti v porastoch kukurice siatej na zrno. Aktuálna zaburinenosť bola hodnotená v období 1997 až 2006 v Slovenskej Republike štandardnou metódou bežne používanou EWRS, početná metóda na m2. Výsledky z prieskumu zaburinenosti na ornej pôde z rokov 1997-2006 boli aplikované na stanovenie rozšírenia výskytu burinných druhov s rešpektovaním ich dôležitosti a škodlivosti na kukuričných poliach v hlavnej produkčnej oblasti (južné Slovensko). V integrovanom systéme boli na reguláciu zaburinenosti využívané chemické a kultúrne metódy regulácie. S prihliadnutím na výsledky je evidentné, že spôsob hospodárenia má vyšší vplyv na vývoj aktuálnej zaburinenosti a diverzity burinných druhov. V integrovanej sústave boli dominantné druhy (vzhľadom na stupeň zaburinenosti): Ambrosia artemisiifolia, Amaranthus retroflexus, Chenopodium spp., Datura stramonium, Persicaria spp., Convolvulus arvensis, Cirsium arvense, a iné.*

Key words**:** *weed, actual weed infestation, integrated farming system*
Cuvinte cheie: *buriny, aktuálna zaburinenosť, integrovaný systém hospodárenia*

INTRODUCTION

Maize is the most important crop growing at the most fertile land in Slovakia. Improved crop management systems, including herbicides, have resulted in good control of weeds in different cropping patterns and crops but biodiversity and harmfulness of weed in intensive agroecosystem is still maintain (MACÁK et al., 2005). In agrophytocenosis, the environmental driving factors considered include not only soil temperature and humidity but also management practices and crop rotation (TÝR AND BARTOŠOVÁ, 2006a; b; c). Sustainable agriculture is characterised by the introduction of more diverse crops and exclude monoculture cropping system (KOVÁČ AND MACÁK, 2007). The changes of cropping system have the great impact on abundance of some weed species and productivity (MACÁK, 2006; SMATANA et al.; 2006) and quality of growing crops (LACKO-BARTOŠOVÁ, 2008). This tendency has long term character and long term surveys are needed. The aim of this study was to evaluated tendency of the most harmful species in canopy of maize during 10 years period.

MATERIALS AND METHOD

The assessment of the most dangerous weed species in canopy of maize was conducted in frame of monitoring research conducted in Slovakia during 1997-2006. The large scale field of maize range from 30 to 70 ha. The fields of pilot farms were selected in maize growing region. One or two specific fields were selected in 15 farms in maize production region. Farms were selected with relation to crop rotation and tillage management. Common chemical weed control practices were used. Present study assessed the actual weed infestation of 11 the most dangerous weed species in canopy of maize in latest year of weed survey. The maize growing in monoculture is not included in present study.

An actual weed infestation was evaluated before application of herbicides with concordance to International scales of EWRS. Screening of each field was made on the quadrant of 1 m^2 area with four replications. One quadrant on each replication (0.7m by 1.5m) 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. After harvest of winter crops (winter wheat, winter barley, triticale, rye and winter rape) stubble cleaning followed by mouldboard ploughing and 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).

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

The received data from pilot farms were computed to whole area of growing crop in maize production region on the base of acreage of evaluated fields and share of maize in structure of growing crops and acreage of maize in particular production region. In 2007 the acreage of maize growing in maize production region was 724 950 ha. For characteristic of production region see table 2.

Table 2

Characteristic of evaluated production region of the Slovak Republic

Characteristics	Maize production region
Share of total arable land	50,7 %
Altitude	up to 250 m
Average year temperature	Above 9°C
Average year precipitation	Below 600mm

The data of *Ambrosia artemisiifolia* (AMBEL), *Datura stramonium* (DATST), *Persicaria spp.* (PERXX), *Echinochloa crus-galli* (ECHCG), *Amaranthus retroflexus* (AMARE), *Cirsium arvense* (CIRAR), *Chenopodium album* (CHEAL), *Abutilon theophrasti* (ABUTE), *Convolvulus arvensis* (CONAR), *Elytrigia repens* (ELYRE) and *Panicum mileaceum* (PANMI) were computed as a separate group and expressed in graphs for one production region.

RESULTS AND DISCUSSION

The weed infestation of maize growing in maize production region of Slovak Republic during 1997-2006 is documented on Figures 1-11. Four infestation levels are in different columns.

The data of weeds infestation revealed as follows: *Convolvulus arvensis* (CONAR) and *Datura stramonium* (DATST) are in strong declination. *Persicaria* spp. (PERXX), *Chenopodium album* (CHEAL), *Panicum mileaceum* (PANMI) and *Ambrosia artemisiifolia* (AMBEL) are rather stable, *Echinochloa crus-galli* (ECHCG) and *Amaranthus retroflexus* (AMARE) have a weak decreasing tendency. Infestation of maize by *Cirsium arvense* (CIRAR, *Abutilon theophrasti* (ABUTE), *Elytrigia repens* (ELYRE) have increasing tendency during 10 years period.

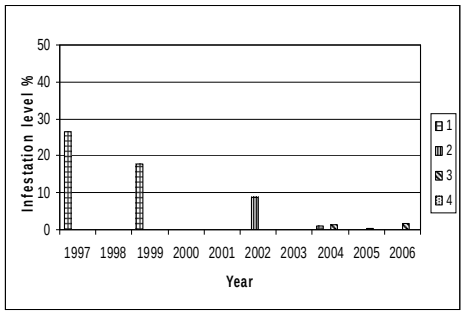

Figure 1. Weed infestation of maize with AMBEL

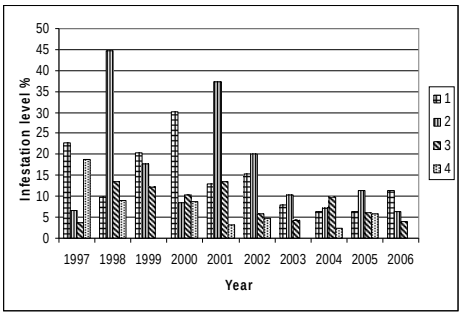

Figure 2. Weed infestation of maize with DATST

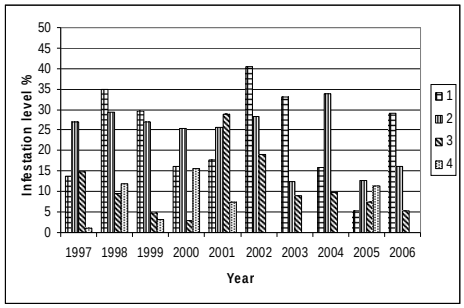

Figure 3. Weed infestation of maize with PERXX

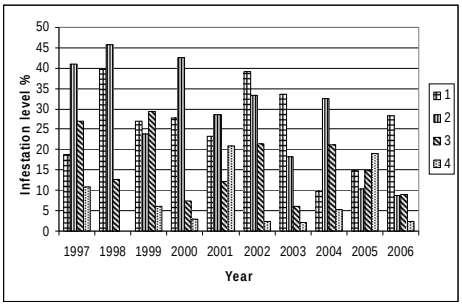

Figure 4. Weed infestation of maize with ECHCG

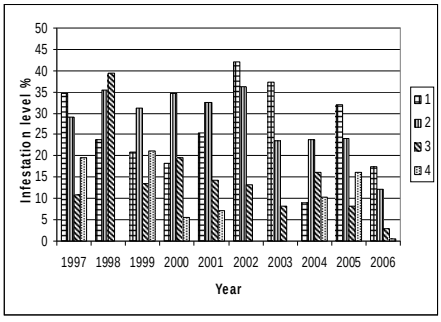

Figure 5. Weed infestation of maize with AMARE

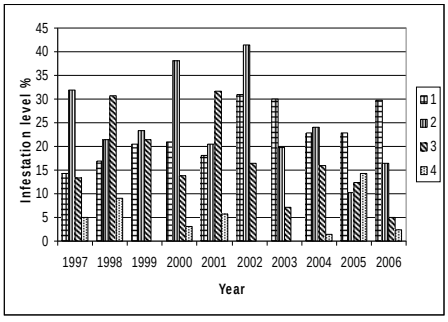

Figure 6. Weed infestation of maize with CIRAR

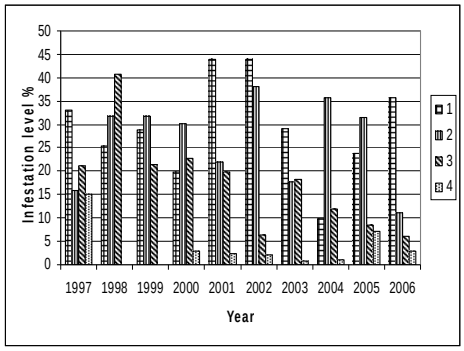

Figure 7. Weed infestation of maize with CHEAL

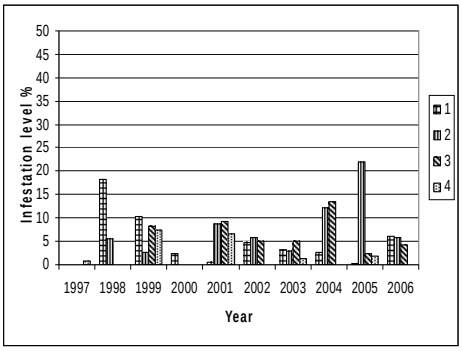

Figure 8. Weed infestation of maize with ABUTE

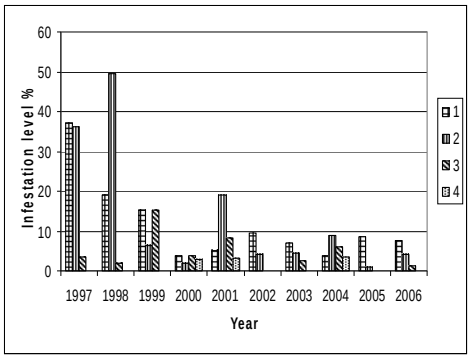

Figure 9. Weed infestation of maize with CONAR

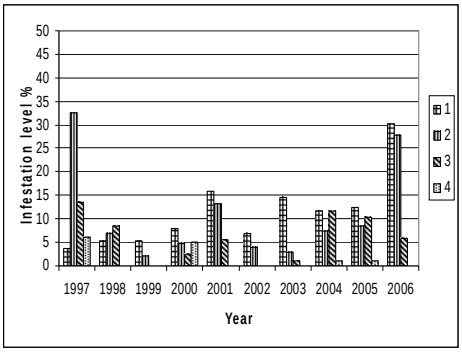

Figure 10. Weed infestation of maize with ELYRE

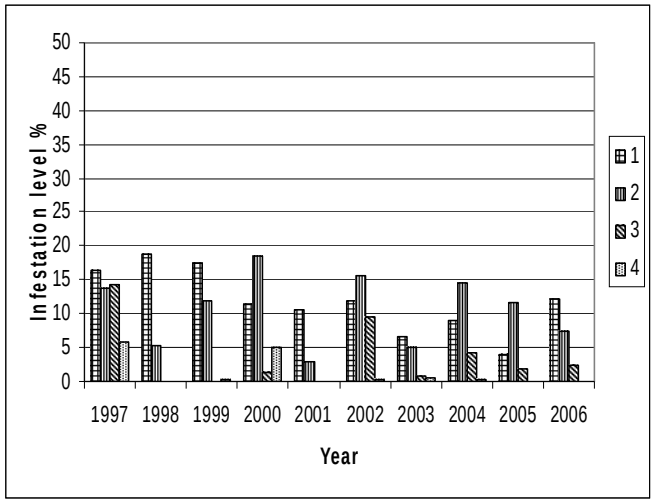

Figure 11. Weed infestation of maize with PANMI

Changes of weed flora are influenced by lowering cropping intensity in Slovakia in last decades. This is supported by significant increased of abundance of *Cirsium arvense* noted by MACÁK et al. (2008). At the regional level, weed diversity has been related to various factors such as area, altitude, productivity, landscape heterogeneity, disturbance (PYŠEK et al., 2005).

Weed communities become more diverse in diverse cropping system, thus minimizing the predominance of any one weed (MACÁK, 2005) and long term research is required to fully understand weed community dynamics and this research will continue.

CONCLUSIONS

Long term survey revealed the tendency of the 11 weed species in canopy of maize under cease of cropping intensity.

Increasing tendency of infestation was noted by *Cirsium arvense* (CIRAR), *Abutilon theophrasti* (ABUTE) and *Elytrigia repens* (ELYRE). Weak decreasing tendency have *Echinochloa crus-galli* (ECHCG) and *Amaranthus retroflexus* (AMARE).

Two weed species *Convolvulus arvensis* (CONAR), *Datura stramonium* (DATST) are getting down in strong declination.

Persicaria spp. (PERXX), *Chenopodium album* (CHEAL), *Panicum mileaceum* (PANMI) and *Ambrosia artemisiifolia* (AMBEL) maintain on the stable density in canopy of maize.

ACKNOWLEDGEMENT

The work has been supported by VEGA Project 1/4441/07 "Ecologization of Agricultural Practices and the Environmental Function of Agriculture on the Intensive Farmland".

LITERATURE

1. KOVAC, K., MACAK, M., Ekologické pestovanie rastlín. 2nd.Ed., Slovak University of Agriculture in Nitra, Slovak Republic, 2007.
2. LACKO-BARTOŠOVA. Winter wheat productivity and quality in sustainable farming systems. Scientifical papers faculty of Agriculture, Vol XL. 2008, pg. 1-6. In press
3. MACÁK, M. Hodnotenie trvalej udržateľnosti poľnohospodárskych systémov. pg. 189-231. In: LACKO-BARTOŠOVÁ et al., Udržateľné a ekologické poľnohospodárstvo. Slovak University of Agriculture in Nitra, 2005.
4. MACÁK, M. Agroenvironmentálne indikátory hodnotenia udržateľného poľnohospodárstva, 1st Ed. Slovak University of Agriculture in Nitra, 2006.
5. MACÁK, M., DEMJANOVÁ, E., KOVÁČ, K. Accompanying biodiversity of intensive agroekosystem. In: Proc. Threatened Weedy Plant Species, Slovak University of Agriculture, Slovak Republic, 2005, pg. 83-86.
6. MACÁK M., ŽÁK, Š., DJALOVIC, I., SZOMBATHOVÁ, N. The influence of ecological and low input system on weed diversity and weed competition in spring barley. Journal of Plant Diseases and Protection, Sp. Issue XXI, 2008, pg. 425-430.
7. PYŠEK, P., JAROŠÍK, V., KROPÁČ, Z., CHYTRÝ, M., WILD, J., TICHÝ, L. Effects of abiotic factors on species richness and cover in Central European weed communities. Agric. Ecosyst. Environ. 1-2/2005, pg. 1-8.
8. SMATANA, J., MACÁK, M., DEMJANOVÁ, E. Aktuálna zaburinenosť v porastoch repy cukrovej na VVP v Kolíňanoch. Proceedings, Topical tasks solved in agro-food sector, Slovak University of Agriculture, Nitra, Slovak Republic, 2006, pg. 202-206.
9. TÝR, Š., LACKO-BARTOŠOVÁ, M. Weed infestation and weed management in different post harvest residues management cropping systems. Acta herbologica. 2/2006, pg. 101-108.
10. TÝR, Š., LACKO-BARTOŠOVÁ, M. Weeds infestation and weed management crops in integrated and

ecological agricultural crop systems. Lucrari stiintifice, Seria agriculturá. Timisoara, Red. Revistelor Agricole, Vol XXXVIII, 2006, pg. 383-388.
11. TÝR, Š., LACKO-BARTOŠOVÁ, M. Weed infestation and weed management in integrated and ecological agricultural crop systems. Herbologia. An international journal on weed research and control. Sarajevo, 2/ 2006, pg. 1-8.