TEMPORAL DYNAMICS OF WEED INFESTATION IN THE POTATO CANOPIES IN THE YEARS 2000-2010

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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 potato in potato production region of the Slovak Republic. The fields were selected in potato 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). Obtained data from farms was statistically analyzed by correlation analysis in Statistica 7.0. In the potato stands 25 weed species were detected, the most problematic were: perennial weed Elytrigia repens (L.)DESV and annual weeds Anthemis spp., Chenopodium spp., Tripleurospermum perforatum (Mérat) M. Lainz, Amaranthus spp, Persicaria spp. and Galium aparine L.. Temporral dynamic of actual weed infestation depends on production region. In the last decade was detected the significant increase of Amaranthus spp. (A. retroflexus, A. powelli), Fallopia convolvulus (L.) A. Love, Veronica spp. and very significant increase of Avena fatua L.. in potato 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. Temporal dynamics of actual weed infestation depend on climate conditions of potato production region, forecrop and canopy health condition. Weeds are not always a problem in potato stands but control may be considered necessary to safeguard crop quality and yield. The originality of result is in mapping the weed species and its actual weed infestation in cultural crops (potato stands).*

Key words**:** *temporal dynamics, actual weed infestation, mapping, potato*

INTRODUCTION

The competitive threshold of weeds has been defined as the weed density above which crop yield is reduced beyond an acceptable amount. Weed surveys are useful for determining the occurrence and relative importance of weed species in crop production systems (FRICK, TOMAS, 1992). Determination of important weed species can help to establish priorities and strategies of weed control in maize field. The data about weed density and time of emergence are also use to predict loss of yields (COUSENS et al., 1987). In agrophytocenosis, the environmental driving factors considered include not only soil and ambient temperature and humidity but also soil properties (WALER et al., 2002), management practices and crop rotation (TÝR, BARTOŠOVÁ, 2006). At the regional level, weed diversity has been related to various factors such as area, altitude, productivity, landscape heterogeneity, successional status and disturbance (SWIFT, ANDERSON, 1994; PYŠEK et al. 2005). These factors do not act separately but are to some extent mutually correlated, which makes it difficult to assess the role each plays in determining species richness (PYŠEK et al., 2002).

MATERIAL AND METHODS

The assessment of the most dangerous weed species and their dynamic in canopies of potato was conducted at the Slovakia in the years 2000- 2010. The fields were selected in potato 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 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	Potato production region (PPR)
Share of total arable land	18.9%
Altitude	350-500 m
Average year temperature	6.5-8°C
Average year precipitation	700-800 mm

RESULTS AND DISCUSSIONS

On the base of weed survey, which was conducted in the years 2000 – 2010, there were detected 25 weed species, which infested potato stands in potato production region of the Slovak Republic. The most problematic were: perennial weed *Elytrigia repens* (L.) DESV. and annual weeds *Amaranthus spp.*, *Avena fatua* L., *Fallopia convolvulus* (L) A. Love, *Veronica spp*., *Anthemis spp*., *Amarantus spp*., *Persicaria spp*., *Galium aparine* L., *Chenopodium spp.* and *Tripleurospermum perforatum* (Mérat) M. Lainz.

As for temporal dynamics of actual weed infestation in potato stands the most powerfull weed in potato production region were *Avena fatua* L.., which increased very significantly its population in the potato canopies. Three weed species increased their populations in the potatoes significantly. They were *Amaranthus spp.*, *Fallopia convolvulus* (L.) A. Love and *Veronica spp*. (Table 3).

Weeds reduce crop yield by an average of around 36% but losses can be anything from 14 to 80%. Weeds are not always a problem in potato but control may be considered necessary to safeguard crop quality and yield. Perennial broad-leaved weeds including creeping thistle, field bindweed, the docks, and the perennial grass weeds, common couch and black

bent are particular problems in potatos. Among the annual weeds, taller species such as fat-hen are the most problematic (BOND, TURNER, 2005).

Characteristics for the weed populations of potato field in Serbia are annual weeds like for example: *Amaranthus* spp., *Chenopodium album*, *Echinochloa crus–galli*, *Stellaria* spp., *Ambrosia artemisiifolia* L. and many other weeds (JANJIĆ et al., 2006). From among perennial plants *Cirsium arvense* L. Scop. and *Convolvulus arvensis* L. can cause problems (MIŠOVIĆ et al., 1996).

Table 3

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

Weed	Potato production region
Amaranthus spp.	0.6336 S
Anthemis spp.	0.2805 NS
Atriplex spp.	0.0014 NS
Avena fatua L.	0.8095 VS
Capsella bursa-pastoris (L.) Med.	-0.1653 NS
Chenopodium spp.	0.0314 NS
Cirsium arvense (L.) SCOP	0.2250 NS
Convolvulus arvensis L.	0.2655 NS
Echinochloa crus galli L.	0.2772 NS
Elytrigia repens (L.) DESV	0.0119 NS
Equisetum arvense L.	-0.3390 NS
Fallopia convolvulus (L.) A. Love	0.6065 S
Fumaria officinalis L.	0.3094 NS
Galeopsis tetrahit L.	-0.0812 NS
Galium aparine L.	-0.2481 NS
Lamium spp.	0.4433 NS
Matricaria spp.	0.3580 NS
Persicaria spp.	-0.3123 NS
Raphanus raphanistrum L.	0.3858 NS
Sinapis arvensis L.	0.3100 NS
Sonchus spp.	0.3325 NS
Stellaria media (L.) Vill.	-0.0419 NS
Thlaspi arvense L.	0.0323 NS
Tripleurospermum perforatum (Mérat) M. Lainz	0.5221 NS
Veronica spp.	0.6488 S
Fallopia convolvulus (L.) A. Love	0,6065 S

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

CONCLUSIONS

The most troublesome weeds of potato stands were perennial *weed Elytrigia repens (L.)DESV* and annual weeds *Anthemis spp., Chenopodium spp., Tripleurospermum perforatum* (Mérat) M. Lainz, *Amaranthus spp, Persicaria spp. and Galium aparine L.*.

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

In potato production region the most powerful weed was *Avena fatua* L., which increased its population in potato stands very significantly during the years 2000 – 2010. *Fallopia convolvulus* (L.) A. Love, *Veronica spp.*, and *Amaranthus spp*. increased their population in potatoes stands significantly.

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