TOP 10 OF THE MOST DANGERUS WEED SPECIES IN SUGAR BEET STANDS IN THE SLOVAK REPUBLIC

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***Abstract**: In the years 2000 – 2011 (12 years) was conducted weed survey on the farms in conventional farming system. The goal was to detect the most harmful weeds, as important biotic, environmental stress factor, on the farms in the canopies of sugar beet in maize and sugar beet production regions of the Slovak Republic. The fields were selected in maize and sugar beet 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 sugar beet stands 26 weed species were detected, the most problematic were: perennial weeds Cirsium arvense* (L.)Scop. and *Elytrigia repens (L.)DESV and annual weeds Atriplex spp., Amaranthus spp., Chenopodium spp., Echinochloa crus galli* (L.)P.Beauv, *Persicaria spp. and Datura stramonium* (L.). *Temporal dynamic of actual weed infestation depends on 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 maize and sugar beet production region, fore crop and canopy health condition. Weeds are always a problem in sugar beet stands, because sugar beet plants are not so competitive, but control may be considered necessary to safeguard crop quality and yield. In spite of herbicides application, good timing of its application an actual weed infestation of sugar beet stands is high. The originality of result is in mapping the weed species and its actual weed infestation in cultural crops (sugar beet stands).*

Key words*: *sugar beet, weed infestation, mapping

INTRODUCTION

Whenever a crop is seeded, weeds will also appear. Weeds compete with crops for moisture, light and nutrients and uncontrolled weeds can stunt crop growth. If only a few weeds are present, yield looses may be small, but heavy weed infestations can cause complete crop failure. The level of yield loss depends not only on the infestation, but also the composition of weed flora (ZOSCHKE, QUADRANTI, 2002).

Sugar beet is not very competitive crop, until it has at least 8 true leaves (HEMBREE, NORRIS, 2010; MAY, 2001). The total potential losses from weeds would be between 26 and 100% of the potential sugar beet yield (SCHWEIZER, DEXTER, 1987; MAY, 2001). Broadleaf weeds often grow to a height two to three times that of sugar beet by mid-summer. Annual broad-leaved weeds are usually more competitive than annual grasses (SCHWEIZER, MAY, 1993).

Because of this weed infestation of sugar beet fields should be monitored. Ideally, sugar beet fields should be monitored for weeds in the winter, spring, summer and fall. If it is not feasible, monitor fields at least twice per year: in late winter to determine the cool season weed population and in late summer to determine the warm season weed population. While

monitoring, it is particularly critical to note any weeds that have escaped control in the previous crops and were able to set seed. Because seeds can remain viable in soil for years, monitoring done over a period of years, can provide the means to predict which species are likely to be present (HEMBREE, NORRIS, 2010).

MATERIAL AND METHODS

The assessment of the most dangerous weed species in the canopy of sugar beet was conducted at the Slovak fields in 2000 - 2011. The fields were selected in maize and sugar beet production region (Table 2). Common chemical weed practices were used. Present study assessed the actual weed infestation of weed species in canopy of sugar beet during the years 2000 - 2011.

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 of each replication was (1.0m x 1.0m). 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 I). Received dates from farms were computed to whole area of growing crop and 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 checklist Hron-Vodák, 1959, modified by authors Smatana-Týr, 2011.

Table 2

Characteristic of evaluated production region of the Slovak Republic

Characteristics	Maize production region (MPR)	Sugar beat production region (SBPR)
Share of total arable land	24%	16.2%
Altitude	up to 200 m	up to 350 m
Average year temperature	9.5-10.5°C	8-9°C
Average year precipitation	550-600 mm	550-650 mm

RESULTS AND DISCUSSIONS

Weed survey at the Slovak fields in the years 2000-2011 showed that in maize and sugar beet production region were at the sugar beet stands presented following weeds: *Abutilon Theophrasti* Medik., *Amaranthus spp.*, *Atriplex spp.*, *Avena fatua* (L.), *Chenopodium spp.*, *Cirsium arvense* (L.) Scop., *Convolvulus arvensis* (L.), *Datura stramonium* L., *Echinochloa crus galli* (L.)P.Beauv, *Elytrigia repens* (L.)P.Beauv, *Galium aparine* L., *Iva xanthiifolia* Nutt., *Panicum capillare* (L.), *Persicaria spp.*, *Polygonum aviculare* (L.), *Setaria spp.*,

Tripleurospermum perforatum (Mérat) M. Lainz, *Xanthium strumarium* (L.), Volunteer winter oilseed rape and volunteer sugar beet. Only in maize production region were detected: *Anthemis arvensis* (L.), *Conium maculatum* (L.), *Fallopia convolvulus* (L.)A. Loeve, *Fumaria officinalis* L., *Mercurialis annua* (L.), Volunteer sunflower.

The main weeds found in sugar beet in Europe include the perennial species *Elytrigia repens* (L.)P.Beauv and *Cirsium arvense* (L.)Scop., whilst common annual weeds include *Chenopodium album* L., *Polygonum aviculare* L., *Matricaria chamomilla* (L.), *Fallopia convolvulus* (L.)A. Loeve, *Sinapis arvensis* (L.), *Stellaria media* L.Vill., *Viola arvensis* Murray, *Lamium purpureum* L. and *Veronica arvensis* L.. Crop volunteers of potatoes and oilseed rape are present in many countries. Weed beet is a problem of many countries but particularly the UK where it is present in approximately 60 % of sugar beet fields (May, 2001; Deveikyte, Seibutis, 2006).

The ten most dangerous weed species at the sugar beet fields are presented according to production region in the Table 3. The highest level of weed infestation in the maize production region achieved: *Chenopodium spp., Atriplex spp., Amaranthus spp. and Persicaria spp.*, which infested sugar beet with more than 16 plants per m^2 and caused serious yield and quality losses and problems with sugar beet harvest. The most troublesome weeds at sugar beet fields in sugar beet production region were *Echinochloa crus galli* (L.) P.Beauv., *Chenopodium spp.* and *Atriplex spp.*, which infested every field with more than 16 plants per m^2.

Table 3

Top 10 of most dangerous weed species in the Slovak sugar beet fields

No.	Maize production region	Sugar beet production region
1.	*Chenopodium spp.*	*Echinochloa crus galli* (L.)P.Beauv
2.	*Atriplex spp.*	*Chenopodium spp.*
3.	*Amaranthus spp.*	*Atriplex spp.*
4.	*Persicaria spp.*	*Amaranthus spp.*
5.	*Datura stramonium* (L.)	*Cirsium arvense* (L.)Scop.
6.	*Cirsium arvense* (L.)Scop	*Elytrigia repens* (L.)P.Beauv
7.	*Echinochloa crus galli* (L.)P.Beauv	*Persicaria spp.*
8.	*Panicum capillare* (L.)	*Datura stramonium* (L.)
9.	*Iva xanthiifolia* Nutt..	*Convolvulus arvensis* (L.)
10.	*Mercurialis annua* (L.)	Volunteer winter oilseed rape

Weed like *Amaranthus spp., Echinochloa crus galli* (L.) P. Beauv, *Mercurialis annua* (L.) and *Chenopodium spp.* can produce high amount of seed which are presented in the soil seed bank for long time. It could be reason why they increased their infestation of sugar beet canopies. Another reason of increasing weed infestation by these weed species is an unsuitable choice of herbicides, wrong term of application or bad establishment of sugar beet canopy (JURSÍK et al., 2004; JURSÍK et al., 2008; MESBAH, 1993; STORKEY, 2004; WELLMANN, 1999)

CONCLUSIONS

The most troublesome weeds in sugar beet stands were perennial *weeds Cirsium arvense* (L.) Scop. and *Elytrigia repens* (L.) DESV. and annual weeds *Atriplex spp.*,

Amaranthus spp., Chenopodium spp., Echinochloa crus galli (L.)P.Beauv, *Persicaria spp. and Datura stramonium* (L.).

All kind of weeds in the sugar beet stands could be controlled by herbicides application. In spite of herbicides application, good timing of its application an actual weed infestation of sugar beet stands is high but the solutions should be find in better cropping practices of farmers.

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