EFFECT OF FORECROP ON WEED INFESTATION OF *HELIANTHUS ANNUUS* IN THE SLOVAK REPUBLIC

VPLYV PREDPLODINY NA ZABURINENOSŤ SLNEČNICE ROČNEJ V SLOVENSKEJ REPUBLIKE

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Abstract: *In the years 1997 – 2006 weed infestation of Helianthus annuus was evaluated at 12 farms in the maize and sugar beat growing region, after forecrops: Triticum aestivum, Hordeum vulgare, Zea mays for corn and for silage, Beta vulgaris convar. vulgaris and Nicotiana tabacum. Aim was to observe development of weed infestation and effect of forecrop on weed infestation of Helianthus annuus. The main weed species were: Cirsium arvense, Persicaria spp., Echinochloa crus-galli, Elytrigia repens, Chenopodium spp.. Weed infestation of sunflower was not significantly influenced by forecrops but forecrops influenced weed species diversity.*

Rezumat: *V rokoch 1997 – 2006 sa zisťovala na 12 podnikoch, kukuričnej a repnej výrobnej oblasti, zaburinenosť porastov slnečnice ročnej po predplodinách. Predplodinami boli: pšenica siata, jačmeň siaty, kukurica siata na zrno a na siláž, repa cukrová a tabak viržínsky. Cieľom bolo sledovať vývoj zaburinenosti porastov slnečnice a vplyv predplodiny na ňu. Hlavnými burinnými druhmi boli: Cirsium arvense, Persicaria spp., Echinochloa crus-galli, Elytrigia repens, Chenopodium spp.. Zaburinenosť porastov nebola preukazne ovplyvnená predplodinou. Tá však ovplyvňovala druhové zloženie burinného spoločenstva.*

Key words**:** *weed infestation, sunflower, forecrop*
Cuvinte cheie: *zaburinenosť, slnečnica ročná, predplodina*

INTRODUCTION

Weeds, as a very important harmful factor, occur every year in the fields in various species composition and amount. High degree of weed 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).

Weeds infestation of sunflower depends on many factors (e.g. weed seed bank, weather conditions, soil cultivation, forecrop, date and quality of sowing, canopy condition a.o.). In the canopy of sunflower can weeds germinate from early spring to early autumn. Main weed species are: *Sinapis arvensis*, *Raphanus raphanistrum*, *Fallopia convolvulus*, *Iva xanthifolia*, *Avena fatua*, *Tripleurospermum perforatum*, *Galium aparine*, *Viola arvensis*, *Stellaria media*, *Lamium* spp., *Thlaspi arvense*, *Capsella bursa-pastoris*, *Veronica* spp., *Chenopodium* spp., *Atriplex* spp., *Amaranthus retroflexus*, *Echinochloa crus-galli*, *Datura stramonium*, *Galinsoga parviflora*, *Cirsium arvense*, *Elytrigia repens*, *Convolvulus arvensis* (KOHOUT, 1993; RAPPARINI, 2006).

Weed management is an important component of successful sunflower production. The weed control benefits associated with crop rotations can best be realized if good weed management was practiced in the preceding crop. Because sunflower is usually planted at low densities and grows slowly during the first 2 weeks, weeds that emerge and establish during this time period can be very competitive and reduce sunflower yield potential tremendously. However, sunflower is a strong competitor with weeds that emerge 3 or more weeks after

sunflower emergence. Therefore, maintaining sunflower weed free for the first 3 to 4 weeks after planting will minimize yield losses from weeds (MEYER et al., 1999).

It is essential that sunflower seed be planted into a seedbed free of growing weeds. Weed control before planting can be accomplished with tillage, herbicides, or a combination of both. If tillage is predominate weed control method, implements such as the V-blade, tandem disk, or field cultivator may be used before planting sunflower. Soil that is warm and dry on the surface, and moist below, encourages rapid sunflower development and will delay weed seed germination. In double-cropped sunflower, good weed control also must be practiced in the small grain crop first. To the flush of new weed seedlings that usually follows tillage and rainfall, few weeds germinate following use of preplant burn down herbicides, because there is no tillage to bring a new supply of weed seed into germination position near the soil surface and weed seeds lying on the surface are not buried into moist soil. In crops such as sunflower, where there are few herbicide options, alternative techniques such as the seedbed method may be utilized. Alternatives may be utilized in any situation, but they gain in importance when traditional techniques (herbicides) are not available. Another alternative to tillage for weed control in double crop sunflower is to burn the small grain stubble ahead of sunflower planting (MEYER et al., 1999).

Aspects of a rotation may favour some weed species more or less than others but the chances of any one species becoming dominant are minimised as crops and associated cultural practices vary. It is possible to actively discourage the growth and reproduction of a particular weed species by introducing unfavourable conditions and practices into a rotation (KARLEN et al., 1994). In the past, 'cleaning' crops such as potatoes (root crops) were used to reduce weed problems in the year before sowing a less competitive crop. The benefit to succeeding has to be balanced against any yield loss in the cleaning crop due to frequent cultivations (MOURSI, 1955).

MATERIALS AND METHODS

The assessment of the most dangerous weed species in canopy of sunflower was conducted in farm of monitoring research conducted in Slovakia during 1997-2006. The fields of pilot farms were selected in 12 farms in maize and sugar beat production region. Farms were selected with relation to crop rotation and tillage management. Common chemical weed practices were used. Present study assessed the actual weed infestation of weed species in canopy of sunflower in latest year of weed survey after three types of forecrop. First forecrop was *Triticum aestivum*, second one *Hordeum vulgare* and third group of forecrops were row crops (*Zea mays* for corn and for silage, *Beta vulgaris convar. vulgaris* and *Nicotiana tabacum*).

An actual weed infestation was evaluated before application of herbicides with concordance to 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 (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).

The received data from pilot farms were computed to whole area of growing crop in maize and sugar beat production region on the base of acreage of evaluated fields and share of sunflower in structure of growing crops and acreage of sunflower in particular production region. In 2006 the acreage of sunflower in the Slovak Republic was 108 816 ha. For characteristic of production region see table 2.

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

Table 2

Characteristic of evaluated production region of the Slovak Republic

Characteristics	Maize production region	Sugar beat production region
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 DISCUSSION

On the base of analysed data from evaluated production regions (Table 3) the most spread and harmful weeds after all three forecrops were *Chenopodium* spp., *Echinochloa crus-galli*, *Cirsium arvense* and *Persicaria* spp.. There were not significant effects of forecrop on weed infestation of sunflower.

Table 3

Actual weed infestation of sunflower (individuals per m^2, weed infestation level) after three types of forecrops

Weeds		Forecrops					
		Triticum aestivum		*Hordeum vulgare*		Row crops	
		ind. per m^2	level	ind. per m^2	level	ind. per m^2	level
Spring early weeds	SINAR	0.6	1	0.8	1	1.3	1
	IVAXA	0.1	1	0.6	1	0.1	1
	POLCO	0.1	1	0.3	1	0.7	1
	AVEFA	0.8	1	1.0	1	0.9	1
	Together	1.6	1	1.7	1	3.0	2
Spring late weeds	DATST	0.7	1	0.3	1	0.8	1
	Persicaria spp.	1.6	1	4.0	2	1.6	2
	AMARE	1.3	1	1.0	1	1.1	1
	Chenopodium spp.	2.3	2	1.6	1	2.0	2
	GASPA	0.7	1	0.4	1	0.5	1
	ECHCG	2.2	2	2.4	2	2.9	2
	Together	8.8	3	9.7	3	8.9	3
Winter weeds	GALPA	1.0	1	0.9	1	0.4	1
	MATIN	1.1	1	0.5	1	0.9	1
	Together	2.1	2	1.4	1	1.3	1
Perennial weeds	CIRAR	4.3	2	2.4	2	2.9	2
	CONAR	0.5	1	0.7	1	1.0	1
	AGRRE	1.6	1	1.7	1	0.4	1
	Together	6.4	3	4.8	2	4.3	2
Total		18.9	4	17.6	4	17.5	4

The most dangerous weed in the canopy of sunflower in the Slovak Republic is *Cirsium arvense*. Infestation with this weed was after *Triticum aestivum* twice as high as after

Hordeum vulgare. Another dangerous weed *Elytrigia repens* had twice smaller population after root crops than after *Triticum aestivum* or *Hordeum vulgare.*

Other weeds which occurred in sunflower were: *Abutilon theophrasti, Ambrosia artemisiifolia, Thlaspi arvense, Capsella bursa-pastoris, Stellaria media, Anagallis arvensis, Veronica* spp., *Viola arvensis, Panicum miliaceum, Atriplex* spp., *Lamium* spp., *Setaria* spp. and *Triticum aestivum, Brassica napus convar. napus*. Occurrences of these weeds were only weak or local.

CIGĽAR et al. (2000) mentioned the main weed species in the canopy of sunflower as follows: *Chenopodium* spp., *Echnochloa crus-galli*, *Persicaria* spp., *Datura stramonium, Amaranthus retroflexus*. These results were in concordance with our observation.

CONCLUSIONS

There were not significant effect of forecrops on weed infestation of sunflower in maize and sugar beat production region of Slovak Republic.

The most troublesome weeds in sunflower were: *Cirsium arvense, Persicaria* spp., *Echinochloa crus-galli, Chenopodium* spp. and *Elytrigia repens.*

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