TEMPORAL DYNAMICS OF ACTUAL WEED INFESTATION IN WINTER RAPE CANOPIES

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Abstract: *In the years 1994 – 2009 (15 years) was conducted weed survey on the farms in conventional farming system. The aim was to detect the most harmful weeds, as important biotic, environmental stress factor, on the farms in the canopies of winter rape in sugar beet production region of the Slovak Republic. The actual weed infestation was evaluated by standard methods common used by a counting method per square. The four randomly established sample quadrants were situated minimally 20 m from field margin and apart each other, respectively. In the winter rape 16 weed species were detected, the most problematic were: perennial weed (Cirsium arvense, Elytrigia repens), annual weeds (Chenopodium spp., Stellaria media, Viola spp., Avena fatua, Anthemis spp., Lamium spp., Papaver spp., Galium aparine, Apera spica-venti, Tripleurospermum perforatum, Matricaria spp., Descurainia sophia) and cultural crops winter wheat (Triticum aestivum L.) and spring barley (Hordeum vulgare L.). Temporal dynamics of actual weed infestation depend on climate conditions of production region, forecrop and canopy health condition. The efficacy of herbicides was assessed according changes of weed population before and after herbicides application. Present study assessed the actual weed infestation of dominant weed species in canopy of winter rape in 1994 – 2009. After herbicides control the significant changes in weed flora were noted in term of abundance and share of some weed species in weed community. Contamination of agrophytocenosis and herbicide costs lead us to idea to grow agricultural crops by using only cultural, preventive and mechanical weed regulation methods. The originality of result is in mapping weeds species in Central Europe (Slovak Republic).*

Key words**:** *temporal dynamics, actual weed infestation, mapping, winter rape.*

INTRODUCTION

Weed communities become more diverse in cropping systems, thus minimalizing the predominance of any one weed (LACKO-BARTOŠOVÁ, 2005) and long term research is required to understand weed community dynamics and the research must continue. Since the early nineties a considerable increase in weed infestation of arable land with both the perennial and annual weeds has been observed. This was caused by agricultural transformation, failure to carry out cultural practices and insufficient weed control (MIKULKA - CHODOVÁ, 2002). It started slowing down in the mid-nineties, but an increase in the occurrence of some weed species has continued until now. Changes in weed society are also caused by natural influences – for example floods (WINKLER, 2000).

Winter rape (*Brasica napus ssp. napus*) is the most important oil-bearing plant in the Slovak Republic at present time. Growing areas were increased cca 40 000 ha (1994) to 167 644 ha (2009). The enlargement of growing areas is caused by relative good yield stability and its good financial implementation (LÍŠKA, HUNKOVÁ, 2001; www.land.gov.sk, 2010).

Oilseed winter rape, we must cultivate respect for the proper rotation and thus achieve increase first harvest crops in the rotation cycle and achieve a good controls weed infestation.

Rape can be grown on most types of soils. Rape is particularly sensitive to low aerification and tillage of land. Reduces the robustness of soil where the acidity of the soil away from the optimal pH 6,0-7,5.

MATERIAL AND METHODS

The assessment of the five most dangerous weed species and their dynamic in canopy of sunflower was conducted at the Slovakia in 1994 - 2009. The fields of farm were selected in sugar beet production region. Common chemical weed practices were used. Present study assessed the actual weed infestation of weed species in canopy of sunflower and their dynamic during the years 1994 - 2009.

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 1). Received data from farm were computed to whole area of growing crop and statistically analyses.

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

Table 2

Characteristic of evaluated production region of the Slovak Republic

Characteristics	Sugar beat production region
Share of total arable land	16.2 %
Altitude	up to 350 m
Average year temperature	8-9°C
Average year precipitation	550-650 mm

RESULTS AND DISCUSSIONS

On the base of analyses data from evaluated (sugar beat) production region (Table 2) the most spread and harmful weeds were: *Cirsium arvense, Elytrigia repens, Chenopodium spp., Stellaria media, Viola spp., Avena fatua, Anthemis spp., Lamium spp., Papaver spp., Galium aparine, Apera spica-venti, Tripleurospermum perforatum, Matricaria spp., Descurainia sophia* and cultural crops

winter wheat *(Triticum aestivum L.)* and spring barley *(Hordeum vulgare L.)*. The weed infestation of sunflower in maize and sugar beet production region of Slovak Republic during 1994-2009 is documented on figures 1-16. Weed infestation of winter rape with *Galium aparine* was in the years 1994-2009 quite in the same level (Fig.9), infestation with *Lamium spp., Hordeum vulgare, Avena fatua, Stellaria media* and *Matricaria spp.* increased in last years of weed survey.

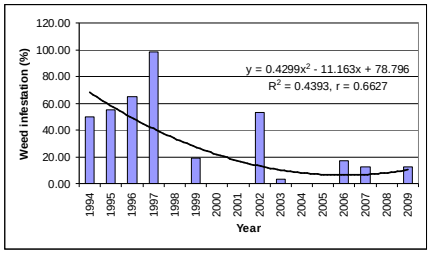

Fig. 1: Winter rape infestation with *Viola spp.*

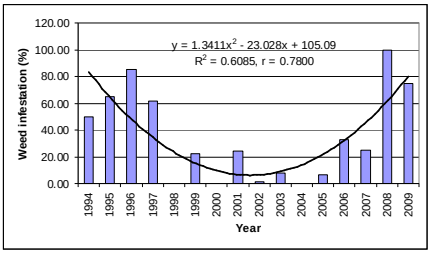

Fig. 2: Winter rape infestation with *Papaver spp.*

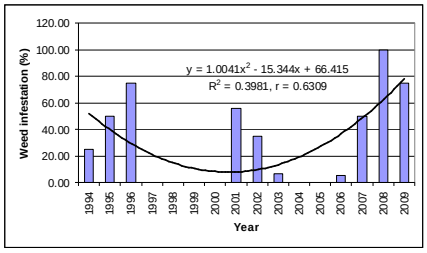

Fig. 3: Winter rape infestation with *Lamium spp.*

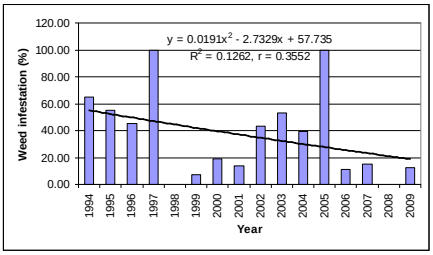

Fig. 4: Winter rape infestation with *Apera spica venti*

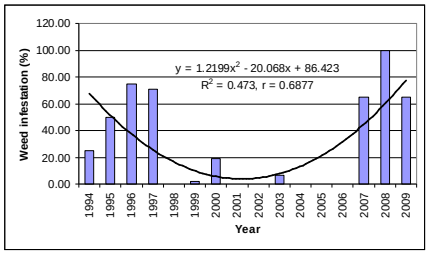

Fig. 5: Winter rape infestation with *Stellaria media*

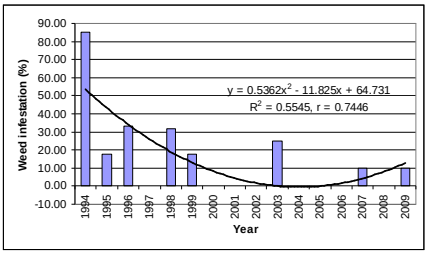

Fig. 6: Winter rape infestation with *Chenopodium spp*

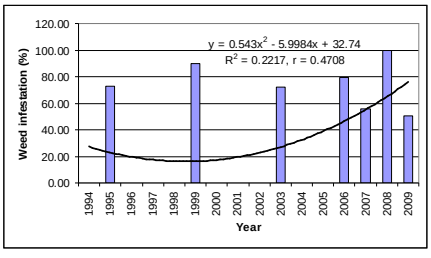

Fig. 7: Winter rape infestation with *Hordeum vulgare*

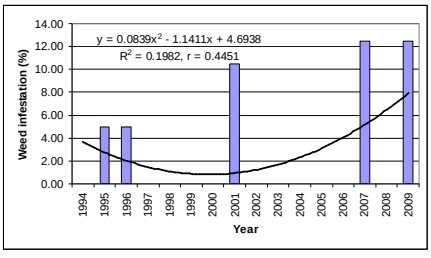

Fig. 8: Winter rape infestation with *Avena fatua*

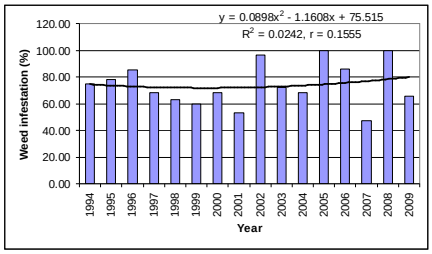

Fig. 9: Winter rape infestation with *Galium aparine*

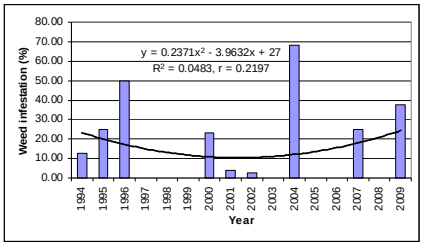

Fig. 10: Winter rape infestation with *Tripleurospermum perforatum*

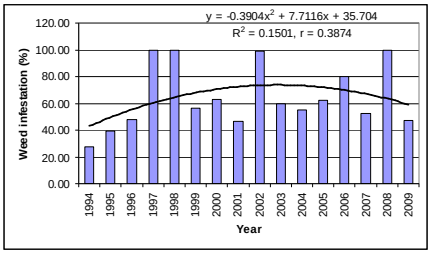

Fig. 11: Winter rape infestation with *Cirsium arvense*

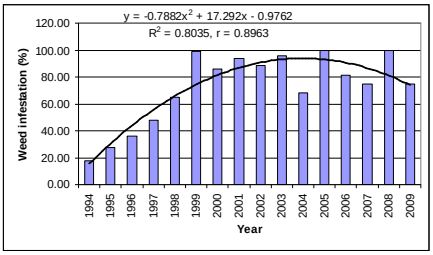

Fig. 12: Winter rape infestation *with Anthemis spp*

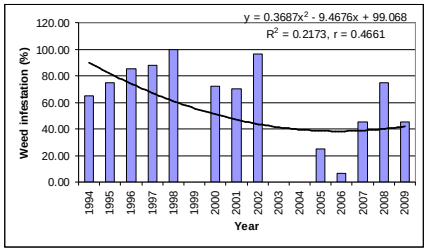

Fig. 13: Winter rape infestation with *Triticum aestivum*

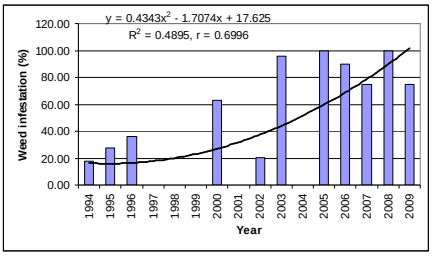

Fig. 14: Winter rape infestation with *Matricaria spp*

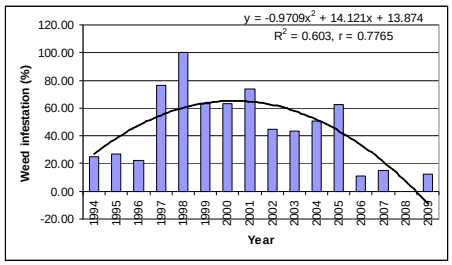

Fig. 15: Winter rape infestation with *Elytrigia repens*

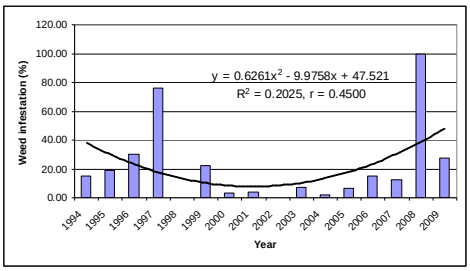

Fig. 16: Winter rape infestation with *Descurainia sophia*

Weeds in a total of 450 field of winter oilseed rape in nine areas of central England were surveyed, just prior to harvest during summer 1985, to identify those that had survived herbicide treatment or had not been sprayed and, thus were capable of re-infestation or

contamination of the harvested crop. Sixty-two species were identified; the ire levels of infestation were scored and distribution within the field noted. The most frequent species was *Galium aparine*, which occurred in 57% of fields. Mayweeds (*Tripleurospermum inodorum*, *Matricaria recutita* and *Anthemis cotula*) occurred in 23% of fields and *Papaver rhoeas* in 21%. All other species occurred in less than 20% of fields, the most prevalent being *Sonchus asper* (18%). Grass weeds were relatively infrequent, reflecting the widespread use of effective graminicides; the most prevalent was *Avena* spp., found in 9% fields. Although most species were distributed throughout the field, *Geranium dissection* (13%) and *Sisymbrium officinale* (7%) were virtually confined to field margins (extending 1m in to the crop) and headlands (10m into the crop), respectively. Several species exhibited a well-defined region distribution, *Silene alba* was virtually restricted to the most southern countries surveyed, whilst *Papaver rhoeas* and *Viola arvensis* were conspicuously absent from the eastern area (FROUD-WILLIAMS, CHANCELLOR, 2006).

The most offensive weeds in the crop stands in Slovakia at present are creeping thistle *Cirsium arvense* (L.) SCOP., followed by *Anthemis spp.*, *Chenopodium spp.*, couch-grass *Elytrigia repens* (L.) DESV. and cleavers *Galium aparine* L. (Tóth, 2008). The most dangerous weeds in the canopies of winter rape were: *Stellaria media, Galium aparine, Capsella bursa pastoris, Lamium spp., Thlaspi arvense, Viola spp., Poa annua, Elytrigia repens, Alopecurus myosuroides, Cirsium arvense, Polygonum spp., Chenopodium spp., Myosotis arvensis, Avena fatua, Convolvulus arvensis* (Schroeder, et al. 1993, Jehlík, 1998). According to SMATANA et al. (2008) *Stellaria media* and *Lamium spp,* were also important weed species, which occurred and caused yield loss in the canopies of sunflower.

CONCLUSIONS

The most troublesome weeds in winter rape canopies in sugar beat production region of Slovak republic were: *Cirsium arvense, Tripleurospermum perforatum, Galium aparine, Descurainia sophia, Matricaria spp., Papaver spp., Hordeum vulgare, Lamium spp.* and *Stellaria media.*

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

The efficacy of herbicides was assessed according changes of weed population before and after herbicides application. Present study assessed the actual weed infestation of dominant weed species in canopy of winter rape in 1994 – 2009.

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