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POSSIBILITY OF CHEMICAL WEED CONTROL IN SPRING RAPESEED

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Abstract

Possibility to chemically control, annual and perennial broad-leaf and narrow-leaf, weeds in spring rapeseed has been tested in the experimental station of Rimski Šančevi (locality: Novi Sad). The following herbicides (a.i.) were tested: trifluralin, clomazone, quizalofop-p-ethyl and clopyralid. Simultaneously we tested the effect of the herbicides on hectoliter weight of seed, as well as oil and protein content in seed. In Novi Sad, the location predominated by annual broadleaf weeds, the performance of these herbicides was much better. The tested herbicides differed significantly in their effect on the quantity and quality on yield parameters of spring rapeseed. Of all the tested herbicides only the application of Gamit (clomazone) showed phytotoxicity that was expressed on plants.
Key words: spring rapeseed, weeds, herbicides.

Introduction

Rapeseed (*Brassica napus* L.) belongs to family *Brassicaceae* and is an important oil-seed crop throughout world (Miri, 2007). In Europe, excluding Sweden, the acreage under spring rapeseed is small (Kondic et al., 2008). Winter rapeseed cultivars are dominant in European countries (Marinkovic et al., 2010), but selection and breeding of spring cultivars intensified in Europe in the second half of the 20th century (Mustapic et al., 1984). Canola seeds are not only a rich source of oil (40-45%), but also a source of good quality protein (25%) (Roshdy et al., 2008). Weeds are considered as one of the most important determinative factors in canola fields. They compete with crop plants for light, water, nutrients, space and may have some allelopathis effect.

The spring rapeseed is less competitive against weeds than the winter rapeseed, especially at the beginning of the growing season. The optimum time for spring rapeseed planting is from mid-March to mid-April, a period that coincides with the emergence of germination and spring weeds (Konstatinovic et al., 2007). If seedbed preparation is performed well and the spring rapeseed is planted at optimum date, the crop usually stays weed-free in the early stages of development. However, post-sowing emergence of weed species (15 to 20 days after sowing) can cause reductions in oil yield and quality (Klaaβen, 2006).

Chemical weed control is not a mandatory practice in winter rapeseed and it is performed as needed and not on the entire acreage. In our agricultural practice, the rapeseed is considered a competitive crop and herbicide use is not considered cost-effective (Mitrovic et al., 2009). However, questionnaires have shown that herbicides application is practiced both, in the fall and spring (Marisavljevic et al., 2007). The same author recommends that, in addition to chemical treatment before or after sowing and before crop emergence, an additional treatment with metazachlor should be performed after crop emergence, to eradicate the weed that emerged in the mean time. Davies (2005) recommends a similar weed control schedule for the spring rapeseed, the difference being the pre-sowing application of trifluralin instead of clomazone and the post–emergence application of metazachlor and clopyralid.

The objective of this study was to investigate the possibility of controlling weeds in rapeseed plots and to assess the impact of herbicides on quality parameters of spring rapeseed.

Material and Methods

This study was carried out in 2009 in the experimental station of Rimski Šančevi (locality: Novi Sad). Using the standard method for testing the efficiency of herbicides in rapeseed crops (Anon, 2004). Material for the experiment was spring rapeseed cv. *Jovana*, in property of Institute of Field and Vegetable Crops from Novi Sad, Serbia, registered for commercial use. The experiment was set up as a randomized block design with three replicates. Plot size was 30 m^2. Basic data for the experiment are shown in tables 1 and 2. Chemical treatment was performed by means of a backpack sprayer "Solo", with an extension tube fitted with eight Lurmark 03 F 110 nozzles. Herbicides were mixed with water, which was applied at a rate of 300 l/ha when rapeseed plants were 10 cm tall and weeds in stage of 2-6 pairs of leaves. In addition to the tested herbicides, the experiment included also two controls – one with and another without hoeing. Control 1 served for the evaluation of effectiveness of the tested herbicides, the other to determine whether the pesticides had a negative impact on grain yield, seed hectoliter weight, and oil and protein contents in seed. The effectiveness of the herbicides was assessed by counting weed plants per m^2 (weeds/m^2).
Herbicides phytotoxicity for rapeseed was estimated at the time of herbicide efficiency assessment, visually, on the EWRS scale 1-9: 1 - healthy plants with no symptoms, 2–slight phytotoxic symptoms, 3–medium, but clearly recognizable symptoms, 4–pronounced symptoms whose effect on yield is uncertain, 5–strong symptoms, growth disorder, chlorosis perceivable, etc., when yield reduction is expected to occur, 6, 7, 8, 9 –severe damage to complete destruction of plants (Anon, 1981). Foliar application of Lontrel and Globus was made on 20 May 2009, when rapeseed plants were about 10 cm tall and most of the weeds were at the stage of 2–6 developed leaves (at the time of treatment, weed infestation rate was not assessed). Basic statistical calculations of rapessed quality were done by the *t*-test (Mead et al., 1996). First assessments of weed infestation rate in the crop were done two months after planting, at both sites (Tab. 1).

Table 1. Basic data for the experiment

Location	**Novi Sad**	
Soil type	Degraded chernozem	
Previous crop	Seed pea	
Planting date	25 Mar 2009	
Application date	23 Mar 2009 Trefgal and Gamit	Incorporated in soil
	18 May 2009 Lontrel and Globus	
Assessment dates	1st assessment: 26 May 2009	
Harvest	04 Aug 2009	

For foliar treatment, assessments were done 30 days after planting. The reason for a rather late performance of the assessments were poor weather conditions (a spell of extreme drought). In Novi Sad, a total rainfall from the beginning of April till mid-May was 15 l/m^2, with temperatures soaring up to 30ºC in the first half of May. The experiment in Novi Sad was sprinkler irrigated on 10 April to provoke the emergence of rapeseed plants and weeds.

Results and Discussion

Tables 2, show the results of the first assessments of weed infestation (number of weeds/m^2) performed in the locations of Novi Sad.

Table 2. Weed infestation rate (No. of weed plants/m^2) in rapeseed crop, Novi Sad location, [1st assessment on 26 May 2009]

Weeds	Treatments							
	1	2	3	4	5	6	7	8
Ambrosia arthemisiifolia	-			1				1
Bromus molis	1							-
Capsela bursa pastoris	-							-
Capsela bursa pastoris	-	-		-				0.5
Cirsium arvense	1							-
Convolvulus arvensis	1.5	1	1		1	3.5		-
Conyza canadienses	-	1	1*		1	1	1	-
Euphorbia helioscopia	-				1			-
Fumaria officinalia	-			1				1
Lactuca seriola	1	1	1		0.5	3	1	-
Sinapsis arvensis	-			0.5				2
Solanum nigrum	2	1	1	1	2	2.5		1
Sonchus arvensis	1	0.5						-
Stachis annua	-				1			1
Xanthium strumarium			1					
Phytotoxicity		2	2	2-3	2-3	3-4	2	2

* plants with arrested growth but not destroyed

Table 3. Statistical significance of differences in rapeseed quality parameters between the treated variants and the untreated control variants

Locality: Rimski Šančevi (Novi Sad)		Treatments						
		2	3	4	5	6	7	8
Hectoliter weight (g)	KBK	ns	ns	ns	ns	ns	ns	ns
	KSK	ns	ns	ns	ns	ns	ns	0.039*
Oil content (%)	KBK	ns	ns	ns	ns	ns	ns	ns
	KSK	ns	ns	ns	ns	ns	ns	0.032*
Protein content (%)	KBK	ns	ns	ns	ns	ns	ns	ns
	KSK	ns	ns	ns	ns	ns	ns	ns

P < 0.01**; P < 0.05*; NS-not significant
KBK–control; KSK–control with manuall hoeing

The herbicide Gamit, in the combination Gamit + Trefgal, exhibited phytotoxicity to the rapeseed crops in locality of R. Šančevi (Fig. 1).

Figure 1. Phytotoxic effect of herbicide Gamit (clomazone) on oilseed rape

The rapeseed plants treated with the combination Trefgal and Gamit in the amounts of 1.5 l/ha + 0.2 l/ha exhibited low phytotoxicity which was manifested as etiolation of individual leaves totalling about 10% of the plant foliage at the stage of 1-3 true leaves. The plants treated with Gamit alone, in the amount of 0.2 l/ha, exhibited similar symptoms. Gamit applied in the quantity 0.3 l/ha caused some what more pronounced symptoms, etiolating about 18–22% of the plants at the stage of 1–3 true leaves. These symptoms are known to occur in response to the application of clomazone-based herbicides, and they are temporary and disappear in the course of further plant growth. The phenomenon was discussed by Davies (2005).

In the experimental plots of Rimski Šančevi (Novi Sad), 15 weed species were registered, one grassy (perennial) and 14 broadleaf weeds (2 perennials and 12 annuals). In this experiment, the combinations Trefgal + Gamit (1.5 l/ha + 0.2 l/ha) and Trefgal + Lontrel (1.5 l/ha + 1.0 l/ha) were most effective in weed control. In this experiment too, certain weeds were unevenly distributed (in patches or as individual plants). The effective performance of pre-emergence application timings of herbicide was observed on reduced growth and population of weeds from the very beginning, which increased seed yield in rapeseed significantly. Similar result has been reported by Khan & Mumtaz (1995), Yadav et al. (1999). and Singh et al. (2001). Application of herbicides decreased the weed density over control. Effectiveness of herbicides in controlling weeds has been reported by Yadav et al. (1999). Bagherani & Shimi (2002) have also reported that among five herbicides (trifluralin, ethalfluralin, cyanazine, alachlor and propyzamide), the most efficient treatment was trifluralin.

Conclusions

The tested herbicides showed higher efficiency in the location of Novi Sad. Best effects were demonstrated by the combinations Trefgal + Gamit (1.5 l/ha + 0.2 l/ha) and Trefgal + Lontrel (1.5 l/ha + 1.0 l/ha). Trefgal (2.5 l/ha) and Globus (2 l/ha) exhibited a negative effect on protein content in the location of Novi Sad.

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