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THE DIFFERENTIATED WEED CONTROL METHODS IN ONION CROPS ON THE CAMBIC CHERNOZEM IN SOUTH ROMANIA

MIHAI GIDEA

University of Agronomic Sciences and Veterinary Medicine in Bucharest
Corresponding author: Mihai GIDEA, E-mail: gideam@yahoo.com

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By limiting the access to vegetation factors, weeds determine significant losses in all agricultural crops, and, depending on the weed coverage they can result in crop failure. That's why there can be no crop technologies that don't take into account weed control methods. This research aimed to compare the large-scale weed control methods used on the entire surface with the precise application of herbicides according to the local weed species. The findings were that the precise application of weed control methods determined a significant reduction in weed coverage as well as a reduction of production costs in comparison with the uniform application of herbicides on the entire surface.

Key words: onion, weed management, weed mapping, weed control.

INTRODUCTION

During the first weeks of vegetation the crops pass through a critical period during which they have a low capacity to compete with weeds, fact that confers to weeds an advantage in using vegetation factors[2, 6, 9]. The losses caused by weeds to the agricultural production are significant, depending on the weeding level, their level might compromise the crop, thus controlling weeds represents a technological element found in all crop technologies.

The conventional system of weed control supposes the applying evenly on the entire cultivated area, of one or more herbicides, but the weeding spectrum and the distribution of weed population is not even, leading to a needless pollution of the soil[17].

The agricultural precision system, the most efficient sustainable agricultural system supposes applying technological measures dependig on the particularities of each soil tipe[7, 10].

The objective of researches was the assessment of the potential of decreasing the herbicide consumption for onion crops, reducing expenses for weed control and optimizing technological inputs by using precision herbicides compared to the classical method of uniform coverage of the entire area. In the case of onion crops, during the critical period, during which weeds –through their rapaciousness- access the water reserves and nutritive elements in the disadvantage of crop plants, depending on the weeding level are used one or more herbicide treatments. Although the recommended herbicides for the onion crop are selective, in draught conditions they manifest a slight inhibitory effect on the growth of plants[11, 21].

The researches started from the consideration that the weeding of a crop is not uniform from the point pf view of the weeding spectrum and the distribution of weed populations in the ground, and the soil coverage with weeds is under 100% [18, 20].

In order to assess comparatively the potential of the two methods, the research began with mapping the weeds, determing the weeding spectrum, and subsequently by using the georefrence data with the help of a GIS system, were charted the maps with the distribution of the weed population.

MATERIALS AND METHODS

In order to properly assess the effectiveness of a weed control method, it's necessary to determine weed coverage before and after applying the respective method.

Weed control in the precise agricultural system is based on the differentiated application of weed control methods according to weed mapping and not on measures applied uniformly on the entire surface.

The research was carried out in a monofactorial experiment, on the cambic chernozem in South Romania. (Coordinates Stereo 70).

The experimental variants were V1 uniformly applied with herbicides for controlling dicotyledonous and monocotyledonous weeds; V2 applied with herbicides according to the weed species locally identified.

In order to control the dicotyledonous species Lontrel 300 0.3/ha (clopyralid 300g/l) was used, and Fusilade Super 1,5l/ha (fluazifop-P-butil 150 g/l) was used to control monocotyledonous species.

The surface of the experimental lots was of approximately 1000 sqm, in 3 repetitions.

The coordinates of the experimental lots were determined with a GPS RTK Trimble Ag 262 in a WGS 84 system. The field data were processed in Autocad and correlated with the zone map. TopoLT was used to generate a point network of 2mx2m. Then the coordinates of the network points were loaded in a GPS. The measurements for the weed mapping were performed only in the network knots by using the 0,25sqm(50x50cm) frame.

The average weed occurence, prevalence and persistence were calculated for each of the two experimental variants, before and after herbicide application.

The average a=S/N, where S is the total number of plant individuals belonging to a certain species found in all measurement points, and N is the number of measurement points and "a" is the mean number of weed plants belonging to a certain species per sqm.

The participation (prevalence) P[%]=m×100/M, where M= $\sum m$ is the mean number of weed plants/sqm, the sum of all averages of weed species identified.

The persistence, K[%]=n×100/N, where n is the number of points where a certain species occurred.

By using the gathered data the distribution maps for the monocotyledonous and dicotyledonous species were drawn for all 6 lots (2 variants × 3 repetitions). By using these maps the herbicides from the second variant were applied differently according to the distribution zones of the identified weed species.

RESULTS

The weed mapping before applying herbicides revealed the occurrence of 8 annual dicotyledonous species: *Amaranthus retroflexus, Xanthium strumarium, Sinapis arvensis, Poligonum convolvulus, Chenopodium album, Galinsoga parviflora, Vicia angustifolia* and 2 perennial dicotyledonous species *Convolvulus arvense, Cirsium arvense;* 2 annual monocotyledonous species *Setaria sp., Echinochloa cruss galli* and a perennial monocotyledonous species *Sorgum halepense.*

The data regarding the average weed occurrence, prevalence and persistence before herbicide application are gathered in Table 1.

The analysis of the data regarding the mean number of weed plants reveals that: the mean number of weed plants per sqm varied from 58.5 and 57.6; the number of annual dicotyledonous

Table 1

Weed mapping of experimental lots before herbicide application

	Variant 1			Variant 2		
species	M	**P**	**C**	**M**	**P**	**C**
Amaranthus retroflexus	5.5	9.4	48.3	5.8	10.1	54
Xanthium strumarium	2.6	4.4	36,2	2.8	4.9	50.4
Vicia angustifolia	3.8	6.5	18,7	3.3	5.7	12,8
Solanum nigrum	2.8	4.8	43,1	2.7	4.7	48
Poligonum convolvulus	3.8	6.5	36.7	4.1	7.1	49.7
Chenopodium album	1.1	1.9	34.9	1.4	2.4	57.9
Sinapis arvensis	2.8	4.8	22,9	2.3	4.0	19,7
Galinsoga parviflora	3.6	6.2	61.2	3.8	6.6	60
Annual dicotyledonous	26	44.4		26.2	45.5	
Convolvulus arvense	0.5	0.9	20.6	0.3	0.5	37.7
Cirsium arvense	1.2	2.1	26.7	1.3	2.3	32
Perennial dicotyledonous	1.7	2.9		1.6	2.8	
Setaria sp.	16.9	28.9	41.1	17.2	29.9	42.3
Echinochloa cruss galli	12.6	21.5	37.4	11.2	19.4	60.2
Annual monocotylenous	29.5	50.4		28.4	49.3	
Sorgum halepense	1.3	2.2	11.3	1.4	2.4	20.2
Perennial monocotylenous	1.3	2.2		1.4	2.4	
Total	58.5	100		57.6	100	

weed plants was between 26 and 26.2 plants/sqm; and the number of annual monocotyledonous weed plants was between 29.5 and 28.4 plants/sqm.

As far as the weed species prevalence is concerned, the highest percentage was of annual monocotyledonous species, with over 50.4%, and lowest percentage was of perennial monocotyledonous species, with less than 1.3%.

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The persistence of weed species in the measurement points was lower than 61.2%.

The comparative analysis between the data recorded in the two experimental variants, before applying the postemergent treatments, showed there were no significant differences regarding the number of weed species, the mean number of weed plants per sqm, the prevalence and the persistence.

According to these data the distribution maps with the monocotyledonous and dicotyledonous weed populations were drawn. In variant no. 1 the lots were uniformly applied with the two herbicides Lontrel 300 and Fusilade Super, and in variant no. 2 the treatments were applied differently, according to the distribution zones of the monocotyledonous and dicotyledonous populations.

The analysis of the mean data regarding weed coverage shows that, after applying herbicides in both studied variants, the average number of weed plants in each biological group was lower. The weed control extent was 89.9% when applying the two herbicides uniformly on the entire surface and 86.8% when applying the two herbicides locally, only where weed plants occured.

Table 2

Comparative evaluation of weednes level before and after treatment aplication

	Variant 1				**Variant 2**			
	Average				**Average**			
Biological group	**Before**	**After**	**Prevalence**	**Control extent**	**Before**	**After**	**Prevalence**	**Control extent**
Annual dicotyledonous	**26**	2.9	49.2	88.8	26.2	3.1	52.9	88.2
Perennial dicotyledonous	**1.7**	1.4	23.7	17.6	1.6	1.4	9.8	12.5
Annual monocotyledonous	**29.5**	1.0	16.9	96.6	28.4	2.2	19.6	92.3
Perennial monocotyledonous	**1.3**	0.6	10.2	53.8	1.4	0.9	17.6	35.7
Total	58.5	5.9	100.0	89.9	57.6	7.6	100.0	**86.8**

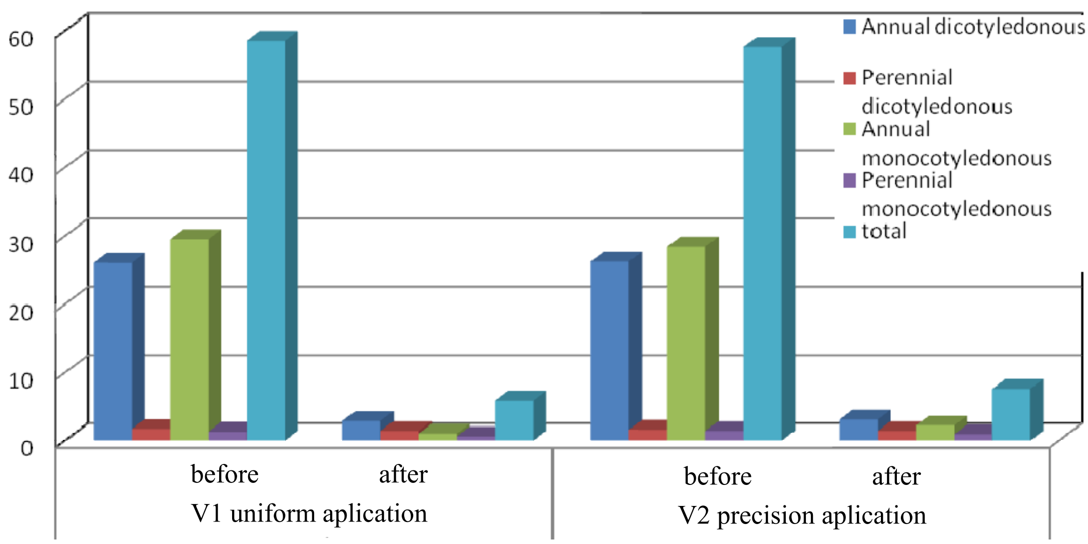

Figure 1. Biological group distribution before and after treatment.

Before applying herbicide treatments (see fig 1), the assessed spectrum of weeding by average number of weeds, participation and constant, did not show significant differences.

In variant 1 in which were applied uniform the two herbicides on the entire area, it can be noticed a significant decrease of the number of weeds for all the 4 biological groups (Table 2).

In variant 2 in which treatments were applied differently, only on the areas where were identified weeds, in the sense that in the case of the monocots species was used Fusilade Super, and in the case of dicotyledonous species Lontrel 300, was noticed that the level of weeding decreased significantly. The average level of controlling the weeds was of 86,8%. Although the area herbicided with Fusilade Super was of 73.7%, and the area herbicided with Lontrel 300 of 62.9%, the differentiated herbicide achieved the efficient control of present weeds.

Uding this method in experimented conditions, lead to decreasing the amounts of used herbicide with 26.3% for Fusilade Super and 37.1% for Lontrel 300.

CONCLUSIONS AND FUTURE PROSPECTS

Before applying the herbicide treatments, the weed occurrence, expressed through the mean number number of weed plants, the prevalence of weed species and their persistence weren't significantly different for the two experimental variants.

The application of herbicides resulted in a reduction of the total number of weed plants in both experimental variants.

The weed control extent were lower in the precise local application of herbicides than in the uniform application of the two herbicides on the entire surface.

The surface treated with herbicides reduced with 31.7% in the case of the precise local application, resulting in a corresponding reduction, of 31.7%, of the amount of herbicides used.

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