

RESEARCH ON REDUCTION OF HERBICIDE RATES IN FIELD CROPS ECO-MEDIUM

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Abstract

We are in a time when herbicide application must take into account both environmental and economic aspects [2]. The first step in expressing the maximum effectiveness of the herbicide is the correlation between the level of weed encrachment and the applied rates, then reverse to try to optimize rates of herbicides. The success of reducing herbicide rates will be provided only by applying integrated weed management (IWM). In this case several issues should be kept in mind: appropriate crop rotation, cultural practices, specific flora inventory, choosing herbicides. Herbicides in rates: 0-25-50-75-100% of normal were applied in winter wheat, maize, sunflower and soybean crops. The results highlighted specific situations, with important agricultural practice. Thus, in the winter wheat crop with a high degree of competition, herbicides can be reduced by 25%, while the multi-row hoe (maize, sunflower and soybean) to reduce specific herbicides will be made with caution, with maximum 25% of the normal rates.

INTRODUCTION

The practical application of herbicides is aimed for the best, not necessary total [1] of weeds from each field crop. To achieve this control, farmers use the recommended rates, sometimes over the legal limits. It guarantees the removal of weeds in the crop. In addition, the company shall include recommendations on rates of herbicide for the most difficult situations of infestation with weeds that will be in control. Reducing the normal rate of herbicides appeared in the last decade [9] mainly for total environmental protection, but also for economic reasons and lower costs. In the conditions we agreed, it is necessary that weeds be controlled on a whole complex of measures called integrated [3]. Integrated weed management (IWM) is already successfully applied since the beginning of the phases [5], namely: using crop rotations, cultural practices, weed mapping, the correct choice and dosage of herbicide application. At present, there are practical solutions for the implementation of crop rotations, cultural methods, proper herbicides and their best suitability to reduce weeds encroachment degrees [4, 7]. It remains to be seen to what extent herbicides can be applied in smaller rates, reduced, considering the integrated control. Of course, each particular herbicide chosen for weed control would need to follow practical performance. The factors that directly influence the

effectiveness of a herbicide [6, 8] are: the structure of weed flora, their stage of development, soil type, climate conditions, crop type and competitiveness. In the present research common herbicides, known by farmers were used, in several rates, both compared with the untreated control and normal rates. The results encourage the promotion in conjunction with the IWM in which specific crop conditions could promote adequate rates of herbicides to crop plants.

MATERIAL AND METHODS

In 2008 many experiments were carried out with such subdivided parcels, with two factors, in: winter wheat, maize, sunflower and soybean. The A Factor was herbicide - were applied by two items for each crop, and rate of herbicides factor B: 0% (untreated control plot and no-hoed), 25%, 50%, 75% and 100% of normal rate recommended for each herbicide and plant separately. Each variants area was 25 m² in four replications. Soil surveys were conducted on the type of clay podzolic (luvosoil), pH 5.14, humus content of 2.02% and 29% clay, all arable horizon. The four plants were grown after station technology and application of herbicides was made with manual pump type Solo 456, with 1100 nozzle type Teejet dispersion angle. The amount of water was 300 l.ha⁻¹, both applied in preemergence and post emergence periods. Herbicide active ingredients are used both as a different action spectrum as well as control (Table 1).

Table 1
Herbicides applied in differing rates for weeds control in field crops

Crop	Herbicides, a.i.	Rates		Application
		CP g.l.ha ⁻¹	a.i. g.kg.ha ⁻¹	
Winter wheat	Chlorsulfuron	20	15	Postem.
	2.4 D acid	1.0	0.66	Postem.
Maize	Acetochlor	2.0	1.68	Preem.
	Acetochlor+ atrazine	2.0 +2.0	1.68 +1.0	Preem.
Sunflower	Acetochlor	1.75	1.51	Preem.
	Acetochlor+ oxyfluorfen	1.75 +1.0	1.51 +0.24	Preem.
Soybean	Acetochlor	2.0	1.68	Preem.
	Imazethapyr	0.75	75	Postem.

During plant vegetation, observations were made on the degree of weed control. Of these, effectiveness control was expressed in covered degrees (CD) of weeds remaining uncontrolled, as well as weed biomass formed and grain yields (grains) as a result of reduced rates of the herbicides. The mean values obtained were statistically processed by the Anova test (analysis version) and the Excel program.

RESULTS AND DISCUSSION

Influence of climatic factors on the evolution of plant vegetation. As known, both crop plants and weeds need favorable climate evolution, starting from the first moments of come out to maturity. For the crop year 2008, values were found both temperatures and rainfall and favorable enough for the entire cover namely vegetable crops (Figure 1). The data are part of the period between April and August. Minimum and maximum temperature evolutions followed relatively close to normal growth. Sporadic fluctuations were recorded as generally favorable.

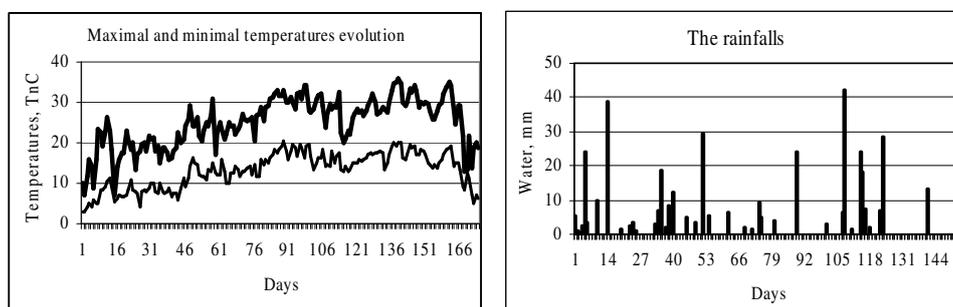


Fig. 1. Evolution of temperatures and rainfalls for plant vegetation

In winter wheat, the first 90 days of continuous graphic shows increasing values. April-May to June is the most important vegetation growth because there is intense (straw elongation), flowering and deposition of nutrients in the grains. Spring crops (sunflower, maize and soybeans), starting with the 40-day (May) and autumn temperatures have been favorable to growth and development. Precipitations, except that they were periodically heavy (30-40 mm each), provided this factor in the entire range of vegetation, both in the early and intensive period of plant growth. In general, the state created favorable climate and good conditions to express the effectiveness of the herbicide rates tested.

Weed natural encroachment of four crop plants. In the plot the weeds sprang up, grew and produced specific biomass at various levels, depending on the crop plants (Figure 2). The dominant species were part of three groups of weeds. Thus, winter wheat dominated the annual dycots (AD), less perennial dycots (PD) and almost no annual monocots (AM). Their average amount stood at 6.1 t.ha^{-1} -a total biomass. In the maize crop AM were dominant, followed by AD and PD. In sunflower and soybeans this structure remained approximately in the same proportions. Generally, maize occurred 16.6 t.ha^{-1} - total biomass, in sunflower 11.6 t.ha^{-1} total biomass and in soybean crop 17.6 t.ha^{-1} total vegetation mass. The values obtained are similar to the multi-media driven and characterized in this regard by the specific levels of weed encroachment from our station eco-medium.

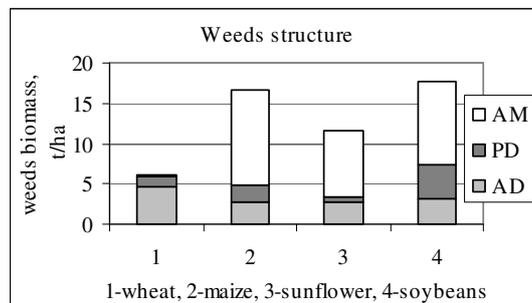


Fig. 2. Weeds species structure in control plot

Effectiveness of different herbicides on weed control. By reducing the rate of herbicides we created conditions that decrease their effectiveness. The extent in which the weed flora was not controlled demonstrates practical situations. In winter wheat (Figure 3) chlorsulfuron inhibited ALS enzyme, while 2,4 D acid was a hormone herbicide. Effectiveness depending on the rate was completely different. Fighting the good was obtained between 75 and 100% for chlorsulfuron and 100% for 2,4 D acid. According to these results and grain followed the same features. It is also noticeable that the control had uncontrolled CD between 80 and 90% and grain production stood at 3.2 t.ha⁻¹. Rates lower than less than 5.1 t.ha⁻¹ ensured the formation of wheat grain.

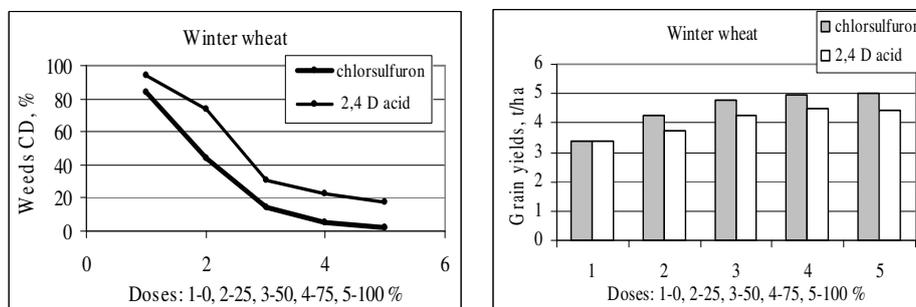


Fig. 3. Efficacy of herbicide rates in wheat crop

Maize was treated with acetochlor, an inhibitor of cell division and by its combination with atrazine, an inhibitor of PS II (photosynthesis), efficiency was increased (Figure 4). Acetochlor cannot reduce the normal rate, and by complexation with atrazine may be a 25% reduction in rate, but with restrictions. Grain production by herbicide saved was between 2.2 t.ha⁻¹ in the check plot and 7.1 t.ha⁻¹ in normal rates.

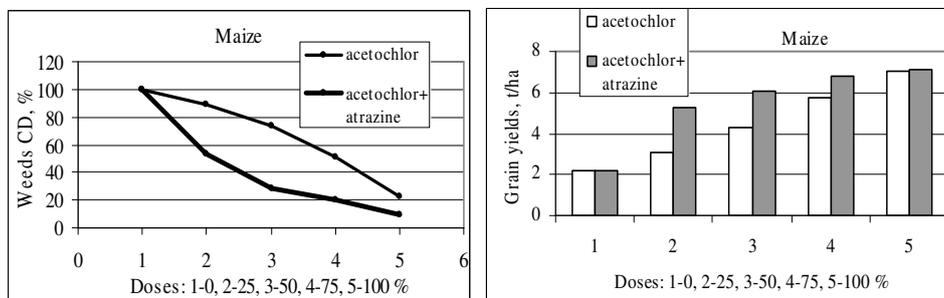


Fig. 4. The efficacy of herbicides rates from maize crop

In the sunflower crop acetochlor was used, as well as a combination of this with oxyfluorfen, a Prottox herbicide inhibitor. This combination of two herbicides had a better efficacy. Weeds were well controlled both rate reduced by 25% and the normal rate (Figure 5). Formed grains were located between 1.2 t.ha⁻¹ in the untreated control and 2.9 t.ha⁻¹ in a culture without weeds.

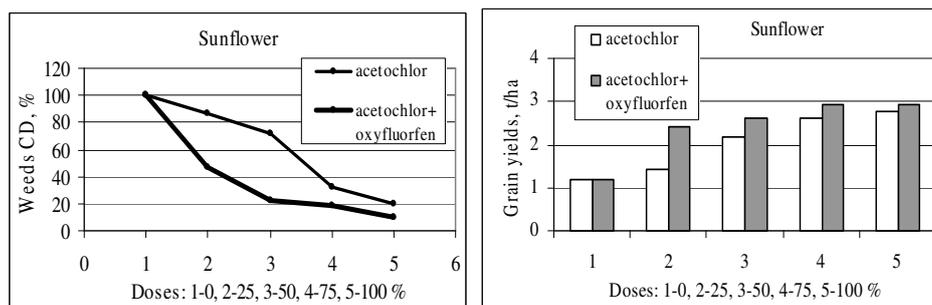


Fig. 5. Efficacy of herbicides rates in sunflower crop

Soybean had high levels of weeds encroachment and herbicide used posed a major problem: to keep a clean culture. The experiment used acetochlor and imazethapyr.

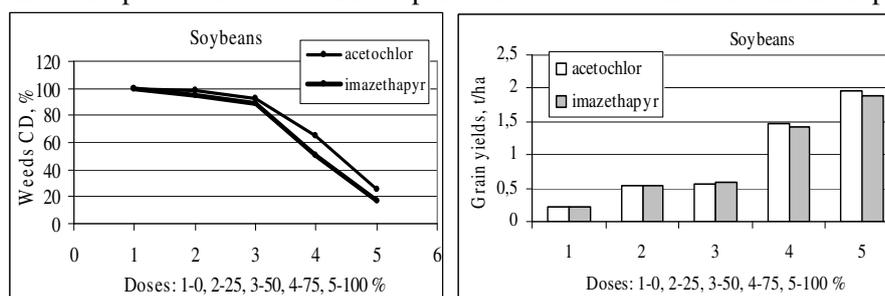


Fig. 6. Efficacy of herbicides rates in soybean crop

The latter is a known inhibitor of ALS enzyme. Their small rates did not achieve control in good conditions (Figure 6) so that soybean was only recommended rates

to normal concentrations. Grain production was fluctuated between 0.2 t.ha⁻¹ in the control plot and 2.0 t.ha⁻¹ in the variants treated properly.

CONCLUSIONS

1. The weed encroachment levels in this area is very high, regardless of the culture year. Under natural conditions the yield recorded 6.1 t.ha⁻¹ weeds in wheat, 16.6 t.ha⁻¹ in maize, 11.6 t.ha⁻¹ in sunflower and 17.6 t.ha⁻¹ in soybean.
2. Rate reduction, regardless of herbicide use, should be made very carefully. Positive control was obtained under conditions favorable rate reduced by 25% of normal in case of chlorsulfuron in wheat crop, and combined products without reducing rates for maize, sunflower and soybean.
3. As appropriate control off all species of weeds and application of a suitable IWM, will be switched to the herbicide rate adjustments should be based on levels of specific weed encroachment.

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