

RESEARCHES CONCERNING WEED CONTROL ON POTATO

SĂLCEANU C., OLARU L.

University of Craiova, Faculty of Agronomy

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ABSTRACT

*Potato is a very important crop in Romania, after corn and wheat and this is why this crop must be attractive for farmers through financial advantages and high yields that should feed the people. The using of herbicides is a compulsory measure for efficacy of this crop. In order to test some herbicides used for potato crop we have tested some herbicides at the Botanic Garden of University of Craiova, in 2017. There were used the following substances and rates: V1 – Stomp 5 l/ha; V2 – Stomp 6 l/ha; V3- Stomp 5 l/ha + 1 l/ha Roundup (tank mix); V4 – Stomp 5 l/ha + 1 l/ha Roundup (tank mix) and 3 l/ha Roundup, selective treatment on spots; V5- Roundup 1 l/ha, (two treatments) without any preemergent herbicide; V6 – Goal 4F 0,5 l/ha; V7 – Goal 4F 0,7 l/ha; V8- untreated control. The best results have been given by V1, 2 and 6 treatments, where there are not perennial dicots. Where *Convolvulus arvensis* and *Cirsium arvense* are present there must be applied a 3.5 liters per hectare Roundup before potato emergence.*

INTRODUCTION

The using of herbicides was a real revolution in soil cropping due to the fact that it get free human labor of destroying weeds. On the other hand, there were disposed workers for other purposes and human activities. During millennia man changed the vegetation around him by cultivating very few plant species for consumption. After several years, he selected the most productive varieties and has created crop kinds.

Worldwide there are about 5.000 varieties of potatoes. Three thousand of them belong are in Andes, especially Peru, Bolivia, Ecuador, Chile and Colombia. They belong to 8 species. Apart of those 5.000 varieties there are other 200 species and subspecies that are wild and there were used for pollination for creating new varieties, more resistant to pests and diseases. The GM potato varieties have encountered serious problems from consumers, especially in Europe.

The main potato species that is cropped around the world is *Solanum tuberosum* (tetraploid, with 48 chromosomes). There are, also 4 diploid species: *S. stenotomum*, *S. phureja*, *S. goniocalyx*, and *S. ajanhuiri*. There are two triploid species, with 36 chromosomes: *S. chaucha* and *S. Juzepczukii*. There is one pentaploid species, with 60 chromosomes: *S. curtilobum*.

MATERIAL AND METHOD

The experiment was located at the Botanic Garden of University of Craiova, in 2017. It had 8 treatments, as follows:

- V1 – Stomp 5 l/ha;
- V2 – Stomp 6 l/ha;
- V3- Stomp 5 l/ha + 1 l/ha Roundup (tank mix);
- V4 – Stomp 5 l/ha + 1 l/ha Roundup (tank mix) and 3 l/ha Roundup, selective treatment on spots;
- V5- Roundup 1 l/ha, (two treatments) with no preemergent herbicide;
- V6 – Goal 4F 0,5 l/ha;
- V7 – Goal 4F 0,7 l/ha;
- V8- untreated control.

The herbicides have the following active ingredients:

Stomp = 420 g/l pendimethalin. It is an herbicide which controls weeds from seeds and have a secondary effect on perennial dicots as *Cirsium arvense* and *Convolvulus arvensis*; it controls monocots from seeds and the most harmful dicots from seeds.

Roundup = 360 g/l glyphosate. It is the only total and systemic herbicide. It affects the protein synthesis. The concentration of application is crucial as regard the effect on weeds. For perennial weeds there are needed 3-4 liters per hectare in 150 liter of water while against *Convolvulus arvensis* there is need of 6 liters in 150 liters of water. It has no effect on soil.

Goal 4F = 480 g/l oxyfluorfen. Oxyfluorfen is an active ingredient with double action. It can be used as preemergent and postemergent herbicide. When it is applied on the top soil layer it acts like a barrier against most weed seeds, except the large ones forming a pellicle of herbicide. Once this pellicle is destroyed by tillage or planting the effect of herbicide is nil. This is the phenomenon used when this herbicide is used before planting tomato or other vegetable. On the other hand, it can be used on vegetation because it burns the leaves tissue in function of concentration of applying. This action is, also, influenced by the leaves coverage by wax. When applied in very high concentrations this herbicide burns all weed leaves.

The experiment has had 6 rows of potato grouped in 3 strips of two. An experimental plot was considered a strip of two rows on a length of 5 m, resulting 40 m². Each replication had 8 plots and there were three replications.

There were made determinations of the weeding degree after numerical method and the efficacy and the selectivity of herbicides have been appreciated after EWRS (European Weed Research Society) scale .

Table 1.

European Weed Research Society scale for herbicide efficacy on weeds

Mark	Control (%)	Description
1	100	Total control
2	99.0-96.5	Very good control
3	96.5-93.0	Good control
4	93.0-87.5	Fair control
5	87.5-80.0	Poor control
6	80.0-70.0	Very poor control
7	70.0-50.0	Very poor control
8	50.0-1.0	Very poor control
9	1.0-0.0	Lack of control

Table 2.

European Weed Research Society scale for herbicide phytotoxicity on crops

Mark	Crop phytotoxicity (%)	Description
1	0	No symptom
2	1.0-3.5	Light discoloration
3	3.5-7.0	More evident symptoms but not lasting
4	7.0-12.5	More severe effect but with low duration
5	12.5-20.0	Middle effects as severity and duration
6	20.0-30.0	Grave effects
7	30.0-50.0	Very grave effects
8	50.0-99.0	Almost destroyed crop
9	100	Crop destroyed

RESULTS AND DISCUSSIONS

Potato is a crop that emerges slowly, after a month, while the land can quickly be covered by weeds and the crop can be compromised. The untreated plots with soil herbicides had more weeds, especially the control variant where no herbicide was used. This plot has been, in fact, compromised because of annual dicots like *Onopordon acanthium* (biantual), *Chenopodium album* and *Stellaria media*.

With the plot where only Roundup was applied two times before potato emergence, after 10 days from planting and before emergence of the crop the weed control was better than control but the weeds emerge after potato emergence, too and they can affect the crop growth very much, bringing about damages of about 50%.

The efficacy of herbicides applied on soil was good with both substances and rates. We recommend the usage of one of these two substances to the potato crop before emergence of the crop.

A very important thing is that potato, once emerged, irrigated and very well fertilized, on a deep and loosened soil is a very powerful competitor for most weeds, including perennial ones. Such way, *Sorghum halepense*, *Cynodon dactylon*, *Convolvulus arvensis* or *Cirsium arvense* could seriously be asphyxiated and damaged by potato stems that are very vigorous. After potato harvesting these weeds should be destroyed by glyphosate, otherwise they will recover till autumn.

In the table below we present the efficacy and the selectivity of the applied treatments, by EWRS marks

Table 3

The efficacy and selectivity of herbicides applied to potato crop in 2017, by EWRS marks

Weed species	Biological category	V1	V2	V3	V4	V5	V6	V7
<i>Cirsium arvense</i>	d.p.	4	3	4	2	9	9	9
<i>Convolvulus arvensis</i>	d.p.	4	3	4	2	9	9	9
<i>Chenopodium album</i>	d.a.	3	2	1	1	6	1	1
<i>Stellaria media</i>	d.a.	1	1	1	1	4	1	1
<i>Amaranthus retroflexus</i>	d.a.	2	1	1	1	9	1	1
<i>Portulaca oleracea</i>	d.a.	2	1	1	1	9	1	1
<i>Galinsoga parviflora</i>	d.a.	2	1	1	1	9	1	1
<i>Abutilon theophrasti</i>	d.a.	10	10	2	1	6	10	8
<i>Ambrosia artemisiifolia</i>	d.a.	1	0,5	0,5	0,5	3	0,5	0,5
<i>Xanthium italicum</i>	d.a.	10	10	3	3	3	9	9
<i>Xanthium spinosum</i>	d.a.	9	9	3	3	3	9	9
<i>Sorghum halepense</i>	m.p.	10	10	8	4	4	10	10
<i>Cynodon dactylon</i>	m.p.	10	10	8	4	4	10	10
<i>Setaria glauca</i>	m.a.	1	0,5	0,5	0,5	4	3	3
<i>Digitaria sanguinalis</i>	m.a.	1	0,5	0,5	0,5	4	3	3
Selectivitate		0.5	1	1	1	2	1	2

d.a. – dicot annual; d.p. – dicot perennial; m.a. – monocot annual; m.p. – monocot perennial.



Figure 1. Aspect of the experiment

In the table below we present the yield of potato obtained in function of herbicide treatments, in 2017.

Table 4

The potato yield obtained in 2017, in function of herbicide treatments

Treatment	Yield, q/ha	Relative yield, %	Difference, q/ha	Signification
V1 – Stomp 5 l/ha	21.5	212	11.4	XXX
V2 – Stomp 6 l/ha	23.0	226	12.8	XXX
V3- Stomp 5 l/ha + 1 l/ha Roundup (tank mix)	18.4	181	8.2	XX
V4 – Stomp 5 l/ha + 1 l/ha Roundup (tank mix) and 3 l/ha Roundup, selective treatment on spots	28.2	278	18.0	XXX
V5- Roundup 1 l/ha, (two treatments) with no preemergent herbicide	24.7	243	14.5	XXX
V6 – Goal 4F 0,5 l/ha.	24.9	245	14.7	XXX
V7 – Goal 4F 0,7 l/ha	22.5	221	12.4	XXX
V8- untreated control	10.1	100.0	Mt	-

DL 5% = 6.0 q/ha; DL 1%=8.2 q/ha; DL 0,1%=11.3 q/ha

CONCLUSIONS

After analyzing the experimental results, on the surfaces where no perennial dicots are present, we recommend the applying of one of the two soil erbicides, Stomp 330 EC (pendimethalin) or Goal 4F (oxyfluorfen) in rates of 5l/ha or 0.5l/ha;

- On surfaces where perennial dicots like *Convolvulus arvensis* and *Cirsium arvense* are present we recommend the fourth treatment where a selective Roundup

(glyphosate) 3,5 l/ha treatment was applied on spots. The water used for this treatment must be 150 liters per hectare.

- The treatment by Roundup 1l/ha two times before potato emerging gave poor results because the weeds emerge after potato emergence, too.

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