

Evaluation of Utilization Potential for Methods of Georeference in the Management of Weed Contamination of Potato Cultures

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Abstract:

Combating crop contamination with harmful invasive species is one of the main themes of agricultural research. For the potato cultures, the weed contamination decreases not only the quality but also the quantity of the harvest. The most invasive contamination for this culture is represented by the *Agropyron repens* and *Sorgum halepense*, two invasive and very nocive species characterized by underground stems able to penetrate the potato's tubercle and decrease their storage and conservation potential.

We initially focused our research on testing the efficacy of georeferencing techniques for the management of invasive weeds in the potatoes cultures. Our ulterior goal was to differentially apply treatment methods based on the distribution map inside the geographic perimeter.

The results of our scientific work show that precise herbicide application is superior to the classical herbicide treatment based on significant reduction in the costs for weed management, while the harvest was maintained at a comparable level.

Key words: precision weed control, GPS, weed management, potato culture

Summary paper:

The annual damage due to harmful weed contamination is ranging between 20% of the production potential to complete loss of the crop. For potato culture the costs for weed management represent 15-20% of the total production costs.

The present research tests two different methods of weed control: the classical method, in which herbicide application was done uniformly on the whole surface (M1), versus the precision method, where the herbicides were applied only at the level of the central cores of weed growth for *Agropyron repens* and *Sorgum halepense* (M2).

For the weed mapping and for the construction of distribution maps for the above mentioned species we used a data aquisition unit SM 06, coupled to a GPS receptor containing an Antaris 4 processor.

The research has taken place in the agricultural year 2006-2007, in the southern area of the Romanian Plains, using cernoziomic soil that contained 6.9% humus and a bulk density of 1.35 g/cm³.

The potato variety chosen for our experiments was the Desire variant, which is very well adapted to the pedoclimate of our area and doesn't require

extensive irrigations. In the spring, after the potato culture emerged, we have completed the weed mapping and determined the weed contamination indicators.

The average number of weed contamination per square meter was defined as $a=S/N$, where S equals the total number of plants of a certain species found in all our testing points, and N is the number of testing points.

Participation (P) or the sum of all the averages determined for the invasive weeds was defined as $P\%=m*100/M$, where $M=\sum m$ represents the average number of invasive weeds per square meter.

Table 1. Indicators of weed contamination

Weed Species	a			Other species: <i>Fumaria</i> sp., <i>Poligonum</i> , <i>Convolvulus</i> , <i>Chenopodium album</i>
	P%	K%		
<i>Amaranthus retroflexus</i>	3.6	6.70	98	
<i>Solanum nigrum</i>	2.4	4.47	90	
<i>Galinsoga parviflora</i>	3.6	6.70	70	
Annual Dicot	11.2	20.86		
<i>Convolvulus arvensis</i>	0.3	0.56	46	
<i>Cirsium arvensis</i>	4.2	7.82	58	
Perennial Dicot	4.5	8.38		
<i>Setaria</i> sp.	3.9	7.26	90	
<i>Echinochloa crus-galli</i>	11.2	20.86	84	
Annual Monocot	15.1	28.12		
<i>Agropyron repens</i>	9.3	17.32	46	
<i>Sorghum halepense</i>	13.6	25.33	42	
Perennial Monocot	22.9	42.64		
Total	53.7			

We have identified twelve different species of invasive weed at the time the potato plants emerged but before applying the herbicide. For controlling the dicot species, we have used a uniform treatment with Sencor 70 WP (metribuzin 70%, dosed at 0.5 kg/ha). Because the monocot species have a participation of 42% from the total weed contamination, and the presence of perennial monocot species is estimated at under 50%, we have chosen to apply the herbicide Fusilade Forte (fluazifop-P-butyl 150 g/l, dosed at 1.51 kg/ha) at the central cores of weed growth. To identify these central cores, we have used a GPS Garmin 72 and the corresponding coordinates from the distribution map for the weed contamination. We have determined the effectiveness of treatment by measuring the degree of weed kill at three weeks after applying the herbicide. For this study the degree of weed kill was determined to be 97.8%.

Our research proves that, by using the precision method to apply focused herbicide treatments in order to combat the perennial monocot species present in the potato cultures, we have decreased the amount of Fusilade Forte used by 67%. The production costs were also reduced with 11.6%. In the same time, the quality of our production was excellent, as we measure only 0.5% contamination on the potato tubercles by the *Agropyron repens* stems.

Our final conclusions are that the precise application of herbicides in the potato cultures leads to decreasing the quantity of herbicides used, reducing the environmental pollution, and diminishing the production costs while increasing the quality of the crops which results in superior selling prices.

References:

1. Precision agriculture, 2007, Paper presented at the 6th European Conference on Precision Agriculture, Skiathos, Greece, 3-6 June 2007.
2. Evaluation of Utilization Potential for Methods of Georeference in the Management of Weed Contamination of Potato Cultures. Research Presentation, University of Agricultural Sciences and Veterinary Medicine Bucharest.