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Herbicides effectiveness on the weed control in *Allium cepa* culture

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Abstract The purpose of this paper is to determine the control degree of weeds from *Allium cepa* culture when are used chemical treatments with herbicides and agro-technique measures. The experience was set up in an experimental field in Becicherecul mic, near Timisoara, on a Chernozem (Cz). Herbicide used were Goal 2XL - 1 l/ha, Dual Gold - 1,5 l/ha and Stomp 330EC (6 l/ha) and the onion variety used in experimental field was De Stuttgart. The research was organized as a single factorial experience and experimental plots were: V1 – without application of herbicides and hoeing; V2 – Dual Gold (1,5 l/ha) + 2 hand hoeing; V3 – Goal 2 x (1 l/ha) pre-emergence application + 2 hand hoeing; V4 – Goal 2 x (1 l/ha) post-emergence application + 2 hand hoeing, V5 – Stomp 330EC (pre-emergence application) 6 l/ha; and V6 – 3 hand hoeing. In order to determine the degree of weeds present in experimental plots before and after herbicide application, was used *weed mapping method.* Values recorded were statistically interpreting using analysis of variance. Predominant weeds present in onion culture field, were: Echinochloa crus-galli (25.74%), Amaranthus retroflexus (21.12%), Chenopodium album (17.24%) and Hibiscus trionum (14.57%). Perennial weeds present in the experimental field were: Convolvulus arvensis 4.84%, Chenopodium hybridum 2.98 % and Cirsium arvense 0.05 %. According to the weed control method, used in onion culture field, the number of the controlled weeds range between 90.87 weeds/m^2 (V6) to 96.45 weeds/m^2 (V2), so were registered very significant negative difference between control variant V1, and all other variants V2 - V6.

Key words

onion culture, herbicides, weed control

Spontaneous plants that grow and develop in a crop, causing damage to it are called weeds [3]. Over time weeds have adapted to grow along with crops that hinder their growth and development and have negative effect on crop quality and quantity [5]. So, agricultural producers use agro-technique measures to combat these weeds. The most effective method is to use herbicides to combat them. Predominant weeds in onion culture are dicotyledonous annual: Amaranthus retroflexus, Chenopodium album, Hibiscus trionum, Solanum nigrum [10].

Alliums were used extensively by ancient Egyptians, and eventually arrived in Rome. Onion derives its name from the Latin word 'unio', which means large pearl. In Middle English, it became 'unyon'. The onion is a biennial plant, which means that it grows vegetative one year and produces its seeds the second [14]. Onions has a special significance which is due to the diversified use in food, consumer opportunities throughout the year, and his use in food and pharmaceutical industries [13].

Onion food value is given by the carbohydrate content (7-11%); protides (1.2 to 1.9%), vitamin C (8-16 mg/100 g sp). Besides food value, onions ensure good hygiene and nutrition, due to antibiotic action. Has effectiveness in treatment of some disease such as: fatigue, gallstones, atherosclerosis, and diabetes. [8].

Most effective herbicides in weed control of onion culture are: Goal 2XL - 1 l/ha, Dual Gold - 1,5 l/ha and Stomp 330EC. Goal 2XL has as active substance oxyfluorfen 240 g/l and is a selective herbicide for the control of weeds in onions culture [17].

The herbicide oxyfluorfen (Goal 2XL) is registered for use on onion, but only after onion seedlings have reached the 2-leaf stage. Even though Goal is primarily applied post-emergence on onions, it has pre-emergence soil residual activity for weed control in other labeled crops [7].

The results presented indicate strong cytotoxic and genotixic irreversible effects of very low concentrations of Stomp 330 EC herbicide. So, even accidental contamination of drinking water or food

with residual amounts of this may pose a health hazard to all consumers including humans [9].
Dual Gold has S - metolachlor (chloro-acetanilide) 915 g/l, active substance, is absorbed by the roots and young leaves (coleoptile) of all germinating plants. It requires moist soil and rainfall to wash it into the top few centimeters of soil to be effective. It moves mainly in an upward direction and inhibits plant growth. The primary biochemical mechanism is unknown [20].
Stomp 330EC is a emulsion concentrate (EC) and has as active ingredient pendimethalin 33%.[19] Is systemic herbicides that act in plant growth areas, interfering in division processes and cellular growth, after herbicide absorption, the product inhibits growth of roots and vegetative burgeon.

Material and Method

The experience was set up in an experimental field in Becicherecul mic, near Timisoara, on a Chernozem (Cz). The texture is medium and granular stable structure provides good aeration and good water and air permeability [4]. The onion variety used in experimental field was *De Stuttgart* and the used herbicides were Goal 2XL - 1 l/ha, Dual Gold - 1,5 l/ha and Stomp 330EC (6 l/ha). The research was organized as a single factorial experience and experimental plots were:
V1 – without application of herbicides and hoeing
V2 – Dual Gold (1,5 l/ha) + 2 hand hoeing
V3 – Goal 2 x (1 l/ha) pre-emergence application + 2 hand hoeing
V4 – Goal 2 x (1 l/ha) post-emergence application + 2 hand hoeing
V5 – Stomp 330EC (pre-emergence application) 6 l/ha
V6 – 3 hand hoeing
Herbicides application in experimental plots was done to 1-2 days after the weed mapping, when most of weeds were in the stage of seedlings or plants without reproductive organs [1].
Weed mapping was done to determine the quantity and quality of weeding degree of studied plots before and after herbicide application. Data were obtained using quantitative numerical method, which represent the counting of the weeds species in the studied area (0.33 m^2), is an accurate method [11]. Weed mapping was not only helping to plan weed control strategy, but was allow to evaluate the effectiveness of control methods. Mapping also helps land managers track the spread of noxious weeds and measure changes in weed abundance. Weed maps allow land owners and land managers to see the big picture of a noxious weed infestation.[16].
Besides the actual number of weed species found within the metric frame, was noted the weed development phase that was found to each species using the following scale of assessment: A – seedlings or plant without reproductive organs, B - plant with blossoms or in the case of grass plants, the skin stage, C – plant with flower, D – plant with fruit, E – plant with seeds or fruits which were spread [12]. Data processing was done with the help of weed sheets. Values recorded were statistically interpreting using analysis of variance. For difference calculation were based on methodological indication found in literature [2].

Fig. 1. Aspects from experimental field.

Results and Discussions

The experimental results on the used herbicides effectiveness in weed control of *Allium ceapa* culture are presented in Tables 1-2.
Onion (Allium cepa) culture was stationary set up on a Chernozem, in Becicherecul mic, near Timisoara. Predominant weeds present in onion culture field, were: Echinochloa crus-galli (25.74%), Amaranthus retroflexus (21.12%), Chenopodium album (17.24%) and Hibiscus trionum (14.57%). Perennial weeds present in the experimental field were: Convolvulus arvensis 4.84%, Chenopodium hybridum 2.98 % and Cirsium arvense 0.05 % (Table 1).

Table 1

Natural state of the weeds present in experimental field, to the onion culture.

No.	Weed species	Vegetation phase	Botanical class	Weed number /m^2	Percentage of participation %
1	Echinochloa crus-galli	A-B	M.a. *	27.36	25.74
2	Amaranthus retroflexus	A-C	D.a. *	22.45	21.12
3	Chenopodium album	B-C	D.a. *	18.32	17.24
4	Hibiscus trionum	A-C	D.a. *	15.48	14.57
5	Solanum nigrum	A-C	D.a. *	10.05	9.46
6	Convolvulus arvensis	B-C	D.p. *	5.14	4.84
7	Chenopodium hybridum	B-C	D.p. *	3.16	2.98
8	Polygonum convolvulus	A-B	D.a. *	2.03	1.91
9	Xantium strumarium	B-C	D.a. *	1.12	1.04
10	Polygonum aviculare	B-C	D.a. *	0.72	0.67
11	Portulaca olaracea	A-C	D.a. *	0.25	0.24
12	Lamium aplexicale	A-B	D.a. *	0.12	0.11
13	Cirsium arvense	A-C	D.p. *	0.06	0.05
14	Agropyron repens	A-B	M.p. *	0.04	0.03
TOTAL		B-C		**100,00**	**106.30**

Species rapport number (D.a./D.p./M.a./M.p.): 9/3/1/1=14;

*D.a. - Dicotyledonous annual; D.p. - Dicotyledonous perennial; M.a. - Annual monocotyledon; M.p. - Monocotyledonous perennial [18].

Table 2

Influence of agro-technique measures on the degree of weed participation, to onion culture.

Experimental plot	Number of uncontrolled weeds/m2	Degree of weed control (%)	Number of controlled weeds /m^2	Difference significance*
V2	9.85	90.73	96.45	000
V5	11.19	89.47	95.11	000
V4	11.43	89.25	94.87	000
V3	13.44	87.36	92.86	000
V6	15.43	85.48	90.87	000
V1	**106.3**	0,00	Martor	-

$DL_{5\%}$= 2,80 weed/m^2 ; $DL_{1\%}$= 3,75 weed/m^2 ; $DL_{0,1\%}$= 5,09 weed/m^2

*DL - Difference Limit: significance of differences of values - xxx – real and very significant; xx – real distinct significant; x – real significant; - difference neither significant or real, 0 – difference is negative; 00 – distinct significant negative difference; 000 – very significant negative difference .

The highest number of uncontrolled weeds in onion culture was registered in V1 – 106.3 weeds/m^2 (without herbicide application and hoeing) and the smallest number was registered in V2 (*Dual Gold* (1,5 l/ha) +2 hand hoeing) 9.85 weeds/m^2. The experimental plots: V3, V4, V5 and V6 registered following number of uncontrolled weeds/m^2 : 13.44; 11.43; 11.19; respectively 15.43 weeds/m^2 (table 2).

Conclusions

The most effective control was provided by *Dual Gold* (1,5 l/ha) combined with *2 hand hoeing* in variant V2, control rates being 90.73 %, (table 2). Next plot which recorded a high weed control as follow of herbicide application was V5 with Stomp 330EC (pre-emergence application) 6 l/ha, with a degree of weed control of 89.47 % (table 2).

Variant with 3 hand hoeing (V6), provides a control percentage of 85.48%, due to the large amount of precipitation fallen in this year, which lead again, to an infection with weeds, of onion experimental field (table 2).

According to the weed control method, used in onion culture field, the number of the controlled weeds range between 90.87 weeds/m^2 (V6) to 96.45 weeds/m^2 (V2), so were registered very significant negative difference between control variant V1, and all other variants V2 - V6, (table 2).

The obtained experimental results complete previous studies made by Carciu Gh., and all., in 2009, [5] regarding weed control and fertilizers influence on vegetables, indicating a good efficiency of herbicide

Dual Gold in vegetables culture, both regarding weeds species and the weed controlled number [5].

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