

Research regarding the impact of weed control on grain maize yield in 2011

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Abstract Research was carried out in 2011 and aimed at mapping weeds in maize in the control variant, the impact of weed control measures on weeds, and the efficacy of weed control measures on grain maize yield. The total number of weeds was 155.59 weeds/m² with predominance of the weed species *Setaria glauca* (48.98 weeds/m², i.e. 31.48%). The variant treated with Adengo (0.4 l/ha) + Equip (1 l/ha) controlled 139.36 weeds m² (88.56%). The lowest control degree was in the variant treated with Gardoprim (4 l/ha) + Bucril Universal (1 l/ha) (78.80%). In the variant treated with Adengo (0.4 l/ha) + Equip (1 l/ha), maize yielded 75 q/ha. In the control variant (not weeded, not treated), maize yielded only 7.70 q/ha.

Key words

maize, weeds, control, herbicide, yield

Integrated weed control is the rational combination of all weed control measures (2).

Because of weeding, crop yield diminishes with 20-60%, and when there is strong weeding, crops can be completely compromised (6, 7). Maize is one of the most valuable crops due to its high productivity and multiple uses in human nutrition, in animal husbandry and industry. In Romania, grain maize ranks among the most important crops. To yield as much as possible taking into account the biological potential of the plant and the natural soil and weather conditions, maize needs to be protected from weeds for 8-10 weeks from sprouting to the 8-10 leaf phase. Later competition from weeds can result on losses of 5-6% from the potential yield (3). Weed seed reserve in the soil varies between 540 million and 3 billion seeds/ha. Only ¼ of these seeds germinate, while the rest lose their germinating potential (4). Weeds consume the water in the arable and sub-arable soil layers, depriving crops and aggravating drought effects. Such species as *Amaranthus retroflexus*, *Cirsium arvense*, and *Chenopodium album* consume between 800-1200 l of water to produce 1 kg of dry matter, or even 3-4 times more than the crop (5). Weeding needs to be done in due time, i.e. right after weeds sprout since small weeds are easier to control and also because, at the beginning of vegetation, crops are particularly sensitive to weed competition (1). Herbicides should be considered as something complementary, as "an efficient complement of control cultivation technologies, because they cannot be a totally replace the latter." (8, 9)

Starting from the premise of efficiently controlling weeds, we believe we need to well know all the elements involved in the process.

Materials and Methods

Research was carried out in 2011 in Timișoara (Romania). The trial was a monofactorial one, with 17 replicas, on a total number of 51 trial plots.

The trial variants were as follows:

- V1 – no weeding, no treatment
- V2 - Dual Gold (1.5 l/ha) + Bucril Universal (1 l/ha)
- V3 - Dual Gold (1.5 l/ha) + Dicopur (1 l/ha)
- V4 - Dual gold (1.5 l/ha) + Equip (1 l/ha)
- V5 - Frontier (1.6 l/ha) + Bucril Universal (1 l/ha)
- V6 - Frontier (1.6 l/ha) + Dicopur (1 l/ha)
- V7 - Frontier (1.6 l/ha) + Equip (1 l/ha)
- V8 - Merlin Duo (2 l/ha) + Bucril Universal (1 l/ha)
- V9 - Merlin Duo (2 l/ha) + Dicopur (1 l/ha)
- V10 - Merlin Duo (2 l/ha) + Equip (1 l/ha)
- V11 - Adengo (0.4 l/ha) + Bucril Universal (1 l/ha)
- V12 - Adengo (0.4 l/ha) + Dicopur (1 l/ha)
- V13 - Adengo (0.4 l/ha) + Equip (1 l/ha)
- V14 - Gardoprim (4 l/ha) + Bucril Universal (1 l/ha)
- V15 - Gardoprim (4 l/ha) + Dicopur (1 l/ha)
- V16 - Gardoprim (4 l/ha) + Equip (1 l/ha)
- V17 - 2 mechanical weedings + 2 manual weedings

The goals were as follows:

- Determining the composition of weed species in the control variant;
- Determining the impact of weed control measures on weeding level;

- Determining weed control measures on grain maize yield (hybrid Florencia).

Trial Results

From a climatic point of view, the year 2011 was favourable for maize cultivation. The mean annual amount of precipitations was 631.0 mm.

The total number of weeds in the control variant (no weeding, no treatment) in 2011 in maize

was 155.59 weeds/m². The largest share was in the monocot weed species *Setaria glauca* (48.98 weeds/m², i.e. 31.48%), followed by *Echinochloa crus galli* (28 weeds/m², i.e. 17.99%) and *Sorghum halepense* (17.96 weeds/m², i.e. 11.54%). The lowest number of weeds was in the weed species *Cynodon dactylon* (2.34 weeds/m², i.e. 1.50%), *Ambrosia artemisiflora* (2 weeds/m², i.e. 1.28%) and *Solanum nigrum* (1.45 weeds/m², 0.93%).

Table 1

Composition of weed species in maize in the control variant in 2011

Weed species	Number of weeds/m ²	% of participation
<i>Setaria glauca</i>	48.98	31.48
<i>Echinochloa crus galli</i>	28	17.99
<i>Sorghum halepense</i>	17.96	11.54
<i>Chenopodium album</i>	15	9.64
<i>Amaranthus retroflexus</i>	14	8.99
<i>Xanthium strumarium</i>	10.2	6.55
<i>Polygonum convolvulus</i>	5.12	3.29
<i>Cirsium arvense</i>	4	2.57
<i>Hibiscus trionum</i>	3.42	2.19
<i>Sinapis arvensis</i>	3.12	2.00
<i>Cynodon dactylon</i>	2.34	1.50
<i>Ambrosia artemisiflora</i>	2	1.28
<i>Solanum nigrum</i>	1.45	0.93
Total	155.59	100

After applying the herbicides, the number of weeds diminished with 139.36 weeds/m² in the variant treated with Adengo (0.4 l/ha) + Equip (1 l/ha) and with 138.34 weeds/m² in the variant treated with Dual gold (1.5 l/ha) + Equip (1 l/ha). The best weed control is ensured by these variants, with a control degree of 88.56% and 88.91%, respectively.

The highest weed control degree was in the variant treated with Gardoprim (4 l/ha) + Bucril Universal (1 l/ha) (78.80%) and in the variant treated with Gardoprim (4 l/ha) + Dicopur (1 l/ha) (74.88%) (Table 2).

The highest maize yields per ha in 2011 were in the variants treated with Adengo (0.4 l/ha) + Equip (1 l/ha) (75 q/ha) and in the variant treated with Adengo (0.4 l/ha) + Dicopur (1 l/ha) (74.85 q/ha).

The lowest yields were in the variants treated with Gardoprim (4 l/ha) + Bucril Universal (1 l/ha) (65.20q/ha) and with Gardoprim (4 l/ha) + Equip (1 l/ha) (62 q/ha). In the control variant (no weeding, no treatment), yield reached 7.70 q/ha, with a significantly negative difference compared to the mean.

Table 2

Impact of weed control measures on weeding degree in grain maize in 2011

Variant	Number of weeds/m ²	Weed control degree (%)	Difference to the control	Significance of the difference
V13 - Adengo (0.4 l/ha) + Equip (1 l/ha)	16.23	89.56	-139.36	000
V4 - Dual gold (1.5 l/ha) + Equip (1 l/ha)	17.25	88.91	-138.34	000
V12 - Adengo (0.4 l/ha) + Dicopur (1 l/ha)	17.56	88.71	-138.03	000
V2 - Dual Gold (1.5 l/ha) + Buctril Universal (1 l/ha)	20.55	86.79	-135.04	000
V5 - Frontier (1.6 l/ha) + Buctril Universal (1 l/ha)	21.89	85.93	-133.7	000
V6 - Frontier (1.6 l/ha) + Dicopur (1 l/ha)	23.00	85.21	-132.59	000
V3 - Dual Gold (1.5 l/ha) + Dicopur (1 l/ha)	23.99	84.58	-131.6	000
V7 - Frontier (1.6 l/ha) + Equip (1 l/ha)	25.13	83.84	-130.46	000
V17 - 2 mechanical weedings + 2 manual weedings	24.36	84.34	-131.23	000
V11 - Adengo (0.4 l/ha) + Buctril Universal (1 l/ha)	27.78	82.14	-127.81	000
V8 - Merlin Duo (2 l/ha) + Buctril Universal (1 l/ha)	31.88	79.51	-123.71	000
V10 - Merlin Duo (2 l/ha) + Equip (1 l/ha)	32.12	79.35	-123.47	000
V9 - Merlin Duo (2 l/ha) + Dicopur (1 l/ha)	35.10	77.44	-120.49	000
V16 - Gardoprim (4 l/ha) + Equip (1 l/ha)	36.66	76.43	-118.93	000
V15 - Gardoprim (4 l/ha) + Dicopur (1 l/ha)	39.07	74.88	-116.52	000
V14 - Gardoprim (4 l/ha) + Buctril Universal (1 l/ha)	42.32	72.80	-113.27	000
V1 - control (no weeding, no treatment)	155.59	0	Mt.	-

DL₅%=6.7 weeds/m²; DL₁%=11.25 weeds/m²; DL_{0.1}%=18.46 weeds/m²

Table 3

Synthesis of trial results regarding the impact of weed control methods on yield in grain maize in 2011

Variant	Number of weeds/m ²	Weed control degree (%)	Difference to the control	Significance of the difference
V13 - Adengo (0.4 l/ha) + Equip (1 l/ha)	75.00	114.01	+9.22	xxx
V12 - Adengo (0.4 l/ha) + Dicopur (1 l/ha)	74.85	113.78	+9.07	xxx
V4 - Dual gold (1.5 l/ha) + Equip (1 l/ha)	73.22	111.31	+7.44	xx
V5 - Frontier (1.6 l/ha) + Buctril Universal (1 l/ha)	73.00	110.97	+7.22	xx
V2 - Dual Gold (1.5 l/ha) + Buctril Universal (1 l/ha)	72.50	110.21	+6.72	xx
V6 - Frontier (1.6 l/ha) + Dicopur (1 l/ha)	71.89	109.28	+6.11	xx
V3 - Dual Gold (1.5 l/ha) + Dicopur (1 l/ha)	70.57	107.28	+4.79	x
V7 - Frontier (1.6 l/ha) + Equip (1 l/ha)	70.32	106.90	+4.54	x
V11 - Adengo (0.4 l/ha) + Buctril Universal (1 l/ha)	70.03	106.46	+4.25	x
V8 - Merlin Duo (2 l/ha) + Buctril Universal (1 l/ha)	69.75	106.03	+3.97	x
V10 - Merlin Duo (2 l/ha) + Equip (1 l/ha)	69.20	105.19	+3.42	x
V9 - Merlin Duo (2 l/ha) + Dicopur (1 l/ha)	68.78	104.56	+3.00	-
V17 - 2 mechanical weedings + 2 manual weedings	68.00	103.37	+2.22	-
V15 - Gardoprim (4 l/ha) + Dicopur (1 l/ha)	67.00	101.85	+1.3	-
Mean	65.88	100	Mt.	-
V14 - Gardoprim (4 l/ha) + Buctril Universal (1 l/ha)	65.20	99.11	-0.58	-
V16 - Gardoprim (4 l/ha) + Equip (1 l/ha)	62.00	94.11	-3.88	0
V1 - control (no weedings, no treatment)	7.70	11.70	-58.18	000

DL₅%=3.15 weeds/m²; DL₁%=5.28 weeds/m²; DL_{0.1}%=7.96 weeds/m²

Conclusions

As a result of research carried out in 2011, we can draw the following conclusions:

The number of weeds in grain maize crops in the control variant (no weeding, no treatment) was 155.59 weeds/m². The highest share (31.48%) was in the monocot species *Setaria glauca*. After applying the herbicides, the number of weeds diminished with 139.36 weeds/m² in the variant treated with Adengo (0.4 l/ha) + Equip (1 l/ha), with a weeding degree of 89.56%. The highest yields in maize were in the

variant treated with Adengo (0.4 l/ha) + Equip (1 l/ha), with an increase in yield of 75.00 q/ha. In the control variant (no weeding, no treatment) yield reached only 7.70 q/ha, with a significantly negative difference compared to the control.

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