

INFLUENCE OF THE HERBICIDE TREATMENTS AT WHEAT CROPS ON THREE TYPES OF SOIL IN NORTH-WEST OF ROMANIA

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ABSTRACT

In this paper we present the results obtained during the years 2015, 2016 and 2017. The results were obtained in experiments on three soil types at Livada (Satu Mare County) on typical clay soil and at Bervenii (Satu Mare County) on typical chernozem and histosol.

The floral composition of weeds, the effectiveness of herbicide treatments, the influence of herbicide treatments on the wheat yield and the economic efficiency of the herbicide treatments on the three soil types were analysed.

Keywords: wheat, soil type, efficacy of herbicides, the influence of herbicides on yield, economic efficiency.

INTRODUCTION

Since the small grains are grown in all the areas of the Romania, with very different climatic conditions and soil types, the spread of weeds that infest these crops is also very variable, both as species, but especially as a species ratio (Berca, 2004).

In a modern agriculture, in the integrated weed management, the use of the chemical control method remains a very important link contributing to the increase of yields by reducing the weed competition (Șarpe et al., 1975; Vlăduțu et al., 1988).

Worldwide research has been directed towards the use of combined herbicides (based on 2-3 active substances), as well as granular form of herbicides, characterized by a wider spectrum of control, reducing environmental hazards, decreasing herbicide

doses, increasing flexibility for application time of the treatments (Ciobanu et al., 2005).

MATERIAL AND METHODS

The experiments were located in Satu Mare County at ARDS Livada on a typical clay soil with a pH of 5.6, a clay content of 22.4% and a humus content of 1.8 and at Bervenii (Satu Mare County) on two soil types: typical chernozem with a pH of 7.9, a clay content of 27.5% and a humus content of 3.4 and histosol with a pH of 5.1 and the organic content of 86%, being a nutrient-rich soil.

The experiments were conducted using the Latin rectangle method in three blocks, the plot area being 21 square meters.

The treatment variants for which the herbicide effectiveness was tested is presented in Table 1:

Table 1. The applied herbicide treatments in winter wheat crop on typical clay soil, typical chernozem and histosol

No. var.	Herbicide treatments	Dosa (l, kg/ha)	Active ingredient
1	Rival 75GD	0.015	Clorsulfuron 75%
2	Rival + Hudson	0.010 + 1.0	Clorsulfuron 75% + fluoxipir 200 g/l
3	Dicopur D	1.0	Acid2,4 D 600g/l
4	Rival Star 75GD	0.015	Tribenuron-metil 75%
5	Rival Star 75GD	0.020	Tribenuron-metil 75%
6	Axial One	1.0	Pinoxaden 45 g/l + florasulam5g/l + safener
7	Axial One	2.0	Pinoxaden 45 g/l + florasulam 5 g/l + safener
8	Lancelot Super	0.033	Aminopiraliid 30% + florasulam 15%
9	Pallas 75 WG + Adjuvant	0.110 + 0,5	Piroxsulam 7.5% + safener
10	Attribut	0.060	Propoxicarbazon-sodiu 700 g/kg
11	Floramix + Adjuvant	0.120 + 0.6	Piroxsulam 70.8 g/kg + florasulam 14.2 g/kg + safener
12	Floramix + Adjuvant	0.260 + 0.6	Piroxsulam 70.8 g/kg + florasulam 14.2 g/kg + safener
13	Rival Super Star	0.020	Tribenuron-metil 37.5% + clorsulfuron 37.5%
14	Pelican Delta	0.100	Metsulfuron 6 g/kg + diflufenican 600 g/kg
15	Pallas 75 WG + Adjuvant	0.250 + 0.5	Piroxsulam 7.5% + safener
16	Sekator Progres OD	0.15	Iodosulfuron metil 25 g/l + amidosulfuron 100 g/l + safener
17	Dicopur Top 464 SL	1.0	Acid 2,4 D 344 g/l + dicamba 120 g/l
18	Untreated	-	-

The moment of herbicide treatment application was post-emergence.

The biological material used in the experimental fields was the Glosa wheat variety bred at NARDI Fundulea. It is an early variety, has good lodging resistance, is winterhardy, resistant to drought and heat. It also has a good resistance to sprouting, with medium resistance to leaf rust, and good resistance to powdery mildew.

RESULTS AND DISCUSSION

The estimation of herbicidal efficacy was done by counting weeds per species per 1 square meter in each plot of the experiments.

The results obtained in the experiments conducted on the Latin rectangle method on the three soil types: typical clay soil, typical chernozem and histosol showed that the best variant was the variant treated with

Rival 0.010 kg/ha + Hudson 1.0 l/ha on typical chernozem, where an efficacy of 97% was obtained, followed by the variants Rival Star 75GD 0.020 kg/ha and Floramix 0.120 kg/ha + Adjuvant 0.6 l/ha (Table 2).

Good results were also obtained on the typical clay soil from Livada. The best efficacy was achieved in the variant treated with Pelican Delta 0.100 kg/ha followed by treatments with, Rival 0.010 kg/ha + Hudson 1 l/ha, Axial One 2.0 l/ha (Table 2).

Analysing the efficacy of herbicide treatments on histosol, it was found that the best control of weeds was achieved in the variant treated with Rival 0.010 kg/ha + Hudson 1.0 l/ha, Rival Star 75 GD 0.015 g/ha and Axial One 2.0 l/ha (Tabelul 2).

The competition between the wheat plants and the weeds was the same among the treated or untreated variants. The herbicides favoured this competition in the treated variants.

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Table 2. The efficacy of herbicide treatments at winter wheat crops on typical clay soil, typical chernozem and histosol

No. var.	Herbicide treatments	Dosa (l, kg/ha)	The efficacy % on		
			Typical clay soil	Typical chernozem	Histosol
1	Rival 75GD	0.015	81	87	84
2	Rival + Hudson	0.010 + 1.0	88	97	91
3	Dicopur D	1.0	74	90	80
4	Rival Star 75GD	0.015	68	93	91
5	Rival Star 75GD	0.020	74	94	86
6	Axial One	1.0	83	89	84
7	Axial One	2.0	86	93	87
8	Lancelot Super	0.033	81	88	83
9	Pallas 75 WG + Adjuvant	0.110 + 0.5	76	93	83
10	Attribut	0.060	74	88	87
11	Floramix + Adjuvant	0.120 + 0.6	73	94	85
12	Floramix + Adjuvant	0.260 + 0.6	83	87	82
13	Rival Super Star	0.020	73	88	83
14	Pelican Delta	0.100	89	88	85
15	Pallas 75 WG + Adjuvant	0.250 + 0.5	76	86	80
16	Sekator Progres OD	015	72	85	84
17	Dicopur Top 464 SL	1.0	68	79	75
18	Untreated	-	42	23	28

Analysing the effectiveness of herbicide treatments in winter wheat we found that in all the treated variants a very good

effectiveness irrespective of soil type was obtained (Figure 1).

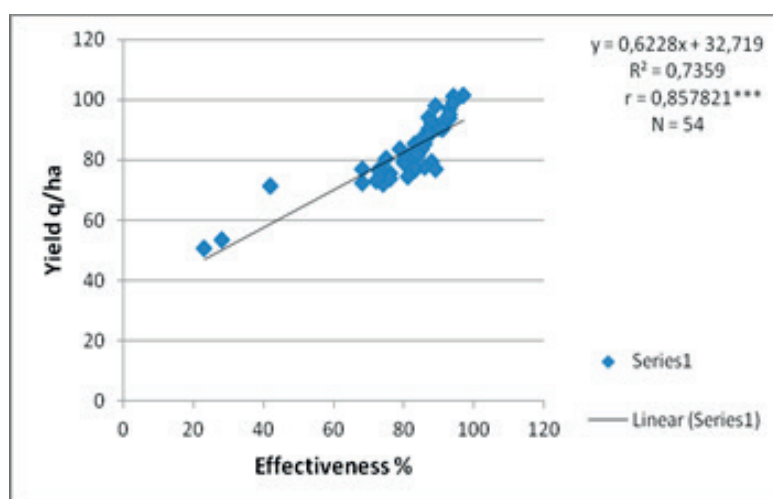


Figure 1. The relationship between the effectiveness of the herbicide treatments and the yield on the three soil types

Statistically significant yield increases were obtained on all three soil types.

On typical clay soil, we achieved significant yield increases in variants treated with the herbicides: Rival 75 GD 0.015 kg/ha and Rival 75 GD 0.010 kg/ha + Hudson 1.0 l/ha (Table 3).

On typical chernozem and histosol, the obtained yield increase were statistically very

significant in all herbicide-treated variants (Table 3).

Chemical weed control on typical chernozem and histosol is a very important crop management element, without which the other management measures can not express at their true value, but on typical clay soil, the herbicide treatment is less important, but still necessary.

Table 3. The influence of herbicide treatments on winter wheat yield on typical preluvosol, typical chernozem and histosol

No. var.	Yield (q/ha)			Difference (+/-from the average)			Statistical significance		
	Typical clay soil	Typical chernozem	Histosol	Typical clay soil	Typical chernozem	Histosol	Typical clay soil	Typical chernozem	Histosol
1	79.16	94.10	81.36	7.66	43.44	28.03	x	xxx	xxx
2	79.30	101.43	92.50	7.80	50.77	39.17	x	xxx	xxx
3	72.83	90.70	79.96	1.33	40.04	26.63		xxx	xxx
4	72.30	97.06	90.43	0.8	46.40	37.10		xxx	xxx
5	72.03	101.10	85.26	0.53	50.44	31.93		xxx	xxx
6	76.73	97.86	84.03	5.23	47.20	30.70		xxx	xxx
7	77.80	93.83	88.43	6.30	43.17	35.10		xxx	xxx
8	74.66	89.30	83.40	3.16	38.64	30.07		xxx	xxx
9	75.73	95.23	85.53	4.23	44.57	32.20		xxx	xxx
10	75.06	92.36	88.20	3.56	41.70	34.87		xxx	xxx
11	76.83	99.16	86.33	5.33	48.50	33.00		xxx	xxx
12	77.30	90.26	81.40	5.80	39.60	28.07		xxx	xxx
13	76.16	92.43	82.73	4.66	41.77	29.40		xxx	xxx
14	77.03	92.90	83.76	5.53	42.24	30.43		xxx	xxx
15	73.73	88.00	79.06	2.23	37.34	25.73		xxx	xxx
16	73.13	86.86	81.76	1.63	36.20	28.43		xxx	xxx
17	76.90	83.46	80.30	5.40	32.80	26.97		xxx	xxx
18	71.50	50.66	53.33	-	-	-		-	-

Typical clay soil

LSD 5% = 7.64 q/ha

LSD 1% = 10.30 q/ha

LSD 0.1% = 13.67 q/ha

Typical chernozem

LSD 5% = 14.56 q/ha

LSD 1% = 19.63 q/ha

LSD 0.1% = 26.03 q/ha

Histosol

LSD 5% = 12.49 q/ha

LSD 1% = 16.84 q/ha

LSD 0.1% = 22.35 q/ha

The analysis of herbicide costs underlines that herbicide costs are different, but the yields are also different due to different efficacy on the floral composition of the weeds on the three soil types. The calculation of herbicide expenditure and the calculation of the value of the production increases showed that:

- On typical clay soil the highest profits were obtained in the variants treated with Rival 75 GD 0.015 kg/ha, Rival 75 GD 0.010 kg/ha + Hudson 1.0 l/ha and Dicopur Top 1.0 l/ha (Table 4). Due to smaller value of the yield increase, losses were obtained at variants with the number 5, 7, 12, 15, which implies that in some years the application of herbicide treatments, especially the expensive ones, can be abandoned.

- On the typical chernozem, the most

profitable variants were the variants treated with the herbicides: Rival Star 75 GD 0.020 kg/ha, Rival 75 GD 0.010 kg/ha + Hudson 1.0 l/ha and Axial One 1.0 l/ha (Table 4).

- On histosol the most profitable variants were those treated with the herbicides: Rival 75 GD 0.010 kg/ha + Hudson 1.0 l/ha, Rival Star 75 GD 0.015 kg/ha followed by the variant treated with Attribut 0.060 kg/ha (Table 4).

- On typical chernozem and histosol there were no losses, the value of the yield increase being higher than the expenditures with applied herbicide.

- On all three soil types profit was obtained on the variant treated with the herbicides: Rival 75 GD 0.010 kg/ha + Hudson 1.0 l/ha.

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Table 4. The value of the yield increases and the herbicide treatment costs against the untreated variant on the three soil types

Nr. var.	Herbicide Cost (RON/ha)	Typical clay soil		Typical chernozem		Histosol	
		Value of yield Increase (RON/ha)	Profit/Losses RON/ha	Value of yield Increase (RON/ha)	Profit/Losses (RON/ha)	Value of yield Increase (RON/ha)	Profit/Losses (RON/ha)
1	33.75	383.00	349.25	2172.00	2138.25	1401.50	1367.75
2	112.50	390.00	277.50	2538.50	2426.00	1958.50	1846.00
3	28.00	66.50	38.50	2002.00	1974.00	1331.50	1303.50
4	31.50	40.00	8.50	2320.00	2288.50	1855.00	1823.50
5	42.00	26.50	-15.50	2522.00	2480.00	1596.50	1554.50
6	258.20	261.50	3.30	2360.00	2301.80	1535.00	1276.80
7	516.40	315.00	-201.40	2158.50	1642.10	1755.00	1238.60
8	57.00	158.00	101.00	1932.00	1875.00	1503.50	1446.50
9	122.46	211.50	89.04	2228.50	2106.04	1610.00	1487.54
10	107.40	178.00	70.60	2085.00	1977.60	1743.50	1636.10
11	146.66	266.50	119.84	2425.00	2278.34	1650.00	1503.34
12	308.39	290.50	-17.89	1980.00	1671.61	1403.50	1095.11
13	43.00	233.00	190.00	2088.50	2045.50	1470.00	1427.00
14	64.85	276.50	211.65	2112.00	2047.15	1521.50	1456.65
15	268.06	111.50	-156.56	1867.00	1598.94	1286.50	1018.44
16	72.15	81.50	9.35	1810.00	1737.85	1421.50	1349.35
17	53.00	270.00	217.00	1640.00	1587.00	1348.50	1295.50
18	-	-	-	-	-	-	-

* The value of the yield increase was calculated at 0.50 RON/kg.

CONCLUSIONS

The research was carried out during the years 2015, 2016, 2017 on three soil types in winter wheat, located in Satu Mare County at the Agricultural Research and Development Station Livada (typical clay soil) and at the Berveni Village near Carei City (typical chernozem and histosol).

The effectiveness of post-emergence herbicides in winter wheat was different on soil types depending on prevalent weed species at the time of treatment.

Soil fertility influenced the wheat crop yield potential.

Yield increases were obtained on each type of soil, but on typical clay soil not all variants produced - statistically significant increases as on typical chernozem and histosol.

The costs of the herbicide treatments are different, but the yields were also different due to different efficacy on the floral composition of the weeds on the three soil types.

Compared with the untreated variant, profits were made on each type of soil except for variants treated with the herbicides: Rival Star 75GD 0.020 kg/ha, Axial One 2.0 l/ha,

Floramix 0.260 kg/ha + Adjuvant 0.6 l/ha, Pallas75 WG 0.250 kg/ha + Adjuvant 0.5 l/ha applied on wheat crop on typical clay soil.

On all three soil types, profit was obtained on the variant treated with the herbicides: Rival 75 GD 0.010 kg/ha + Hudson 1.0 l/ha.

The calculation of herbicide costs and of the value of the yield increase is helpful in making correct technical decisions.

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