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THE EFFECT OF DIFFERENT WEED CONTROL TECHNOLOGIES ON YIELD OF MAIZE AND PROFITABILITY OF MAIZE PRODUCTION

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ABSTRACT
In our investigation, we used different weed control technologies in the different phenology states of the maize. The farm experiment has been carried out in 2017, in Hungary, Kunágota, on good quality chernozem soil, on 20 x 50 m plots. The experiment can be regarded as 9 weed-control strategies where, in addition to the untreated control, two chemicals are applied (Laudis, Capreno) in different doses, two mechanical weed-control technologies, and two combination of chemicals and mechanical weed-control technologies were used. Mechanical weed-control was connected to the herbicide treatments in different times: until 4-6-leaves age weedless, in 4-6-leaves age hoed once, in 4-6-leaves age cultivation once. In our farm experiment, there were assessed the number of plants, length of plants, leaf number of maize, corncob-number, corncob-length, line number of corncob, thousand seed weight yield and profitability of maize production.
Our results were evaluated by a one-factor analysis of variance. Our one-year weed control experiment show that Capreno performed better, than Laudis with respect of plant height, number of leaves, length of corn-cob, number of lines of corn-cob, thousand seed weight and yield. By increasing the dose of Capreno, all the tested values of crop elements degraded except for plant height, so the crop yield also decreased.

Keywords: maize, weed-control, yeald components, profitability

INTRODUCTION

The maize is one of the most important arable crops in Hungary and in the World. The extreme weather conditions of the last years in Hungary pointed out that the farmers need to adapt to changing terms by the help of agrotechnical factors. The late years' economical, climate and the cultivar changes gave new jobs to agrotechnique researches in Central Europe.
Weeds mean one of the most important problems in maize fields. We can protect against weeds with prevention (BERZSENYI, 1988), with agrotechnical methods (ALKÄMPER, 1976; KOVÁCS, 1992; KISMÁNYOKI, 1994; ANTAL, 2005; RACSKÓ, 2004), with mechanical methods (HUNYADI ET AL., 2000.) with chemicals methods (NAGY, 2007; REISINGER, 2010; GYULAI ET AL., 2016; KAZINCZI, 2016) or with combination of these. The change of method is one of the most important problem in the weed-control for farmers. The aim of our study is to compare the effects of the different weed control technologies on the yield components, the yield and profitability of maize.

MATERIAL AND METHOD

The experiments were carried out in Békés county, Kunágota, in 2017 on good quality, homogeneous, flat surface chernozem soil. Sunflower was the forecrop of our farm

experiment. The sunflower forecrop was sprayed with Pulsar. 54 kg ha^{-1} N active agent was emitted in springtime. The sowing was done with Dekalb DKC 5275 maize hybrid, on 5 April 2017, with 70.000 seeds m^{-2} amounts of seeds, interline spacing was 75 cm. The research was established farm conditions on 20 x 50 m plots. *Table 1* shows the applied weed-control technologies in the experiment.

Table 1. Weed-control technologies in the experiment

Treatments	Rate (l ha^{-1})	Mode of application
1. untreated control		all the time weedy
2. mechanical weed-control		in 4-6-leaves age hoed once
3. mechanical weed-control		until 4-6-leaves age weedless
4. Laudis	2	postemergence (in maize 4-6-leaves age)
5. Capreno	0.4	postemergence (in maize 4-6-leaves age)
6. Capreno	0.3	postemergence (in maize 4-6-leaves age)
7. Capreno	0.2	postemergence (in maize 4-6-leaves age)
8. Laudis	2	postemergence (in maize 4-6-leave age) + in 4-6-leaves age cultivation once
9. Capreno	0.3	postemergence (in maize 4-6-leave age) + in 4-6-leaves age cultivation once

Table 2 contains the meteorological data during the time of the experiment.

Table 2. Meteorological data during the experiment

Months	Decade	Average temp. (°C)	Precipitation (mm)
April	1.	12.25	10
	2.	9.3	22
	3.	12.1	4
May	1.	15.35	6
	2.	18.25	20
	3.	19.18	20
June	1.	21.25	16
	2.	21.18	7
	3.	25	13
July	1.	23.7	1
	2.	22.9	11
	3.	23.86	31
August	1.	27.75	14
	2.	23.85	18
	3.	21.31	0
September	1.	20.27	35
Total			**228**

During our field test, in four replications, we determined area unit of number of plants, height of plants, number of corn-cob, number of leaf of plant, length of corn-cob, number of line of corn-cob, number of seeds of line, thousand seed weight and the yield. We calculated all expense, return and profit of maize production.

RESULTS

Table 3 shows the effect of weed-control technologies on yield components of maize. *Figure 1* shows the effect of weed-control technologies on yield weight of maize.

Table 3. The effect of weed-control technologies on yield components of maize

Yield component	1.	2.	3.	4.	5.	6.	7.	8.	9.	$SzD_{5\%}$
height of plant (cm)	190.31	192.31	248.84	242.75	245.89	244.67	248.53	242.71	241.59	13.55
number of plants (pc)	5.38	5.13	5.63	5.5	4.88	5	5.13	5.38	5.5	0.5
number of corn-cob of plant (pc)	1	1.05	1.11	1.2	1.05	1.13	1.15	1.21	1.09	0.16
number of leaves of plant (pc)	10.50	10.90	11.20	10.70	10.50	10.80	11.10	10.9	11	0.58
length of corn-cob (cm)	10.73	18.52	19.31	18.26	17.96	18.79	17.96	19.2	18.02	1.91
number of line of corn-cob (pc)	13.75	17.39	17.3	17.34	17.91	17.98	18.18	17.57	17.37	0.33
number of seed of line (pc)	17.97	35.1	36.79	34.83	33.88	34.64	33.73	34.85	32.91	4.46
thousand seed weight (g)	212.5	277.5	310	270	285	295	272.5	272.5	272.5	31.53

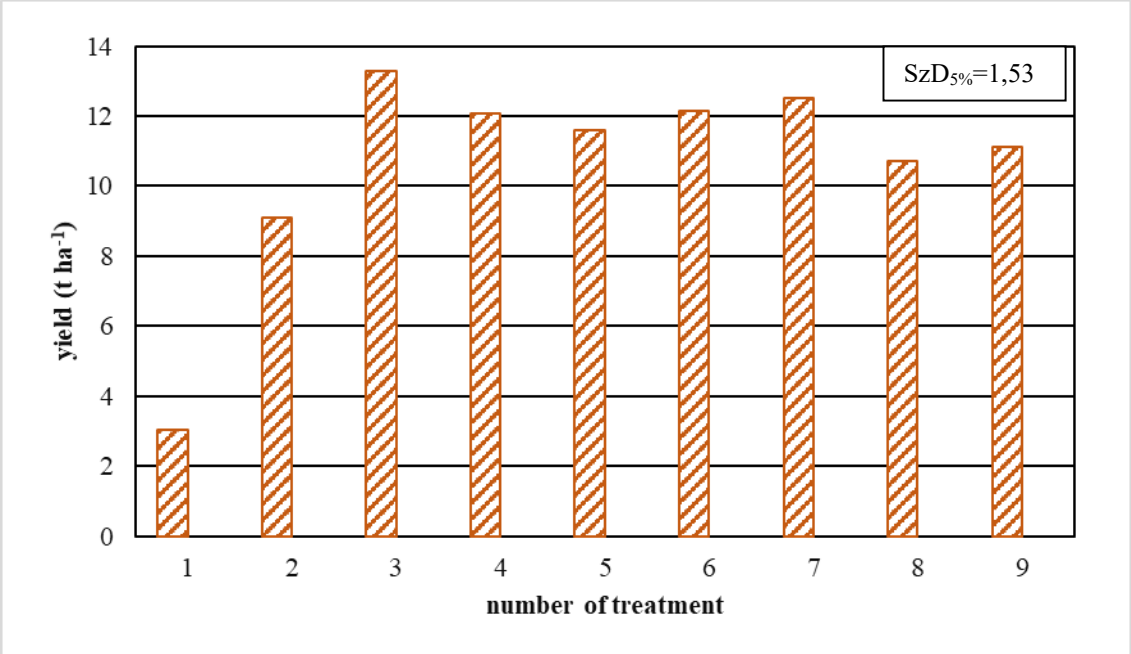

Figure 1. The effect of weed-control technologies on yield weight of maize

Table 4 contains the constant expense, variable expense, total expense and return of examined weed-control technologies on of maize production. *Figure 2* shows the effect of weed-control technologies on the profit of maize production.

Table 4. The effect of weed-control technologies on expense and return of maize production

Expense and return data	1.	2.	3.	4.	5.	6.	7.	8.	9.
Constant expense (Ft ha^{-1})	100650	100650	100650	100650	100650	100650	100650	100650	100650
Variable expense (Ft ha^{-1})	0	35000	175000	20057	25975	13660	19818	22388	22388
Total expense (Ft ha^{-1})	100650	135650	275650	120707	126625	114310	120468	123038	123038
Total return (Ft ha^{-1})	127260	382620	557760	507780	486780	509880	525840	449820	467040

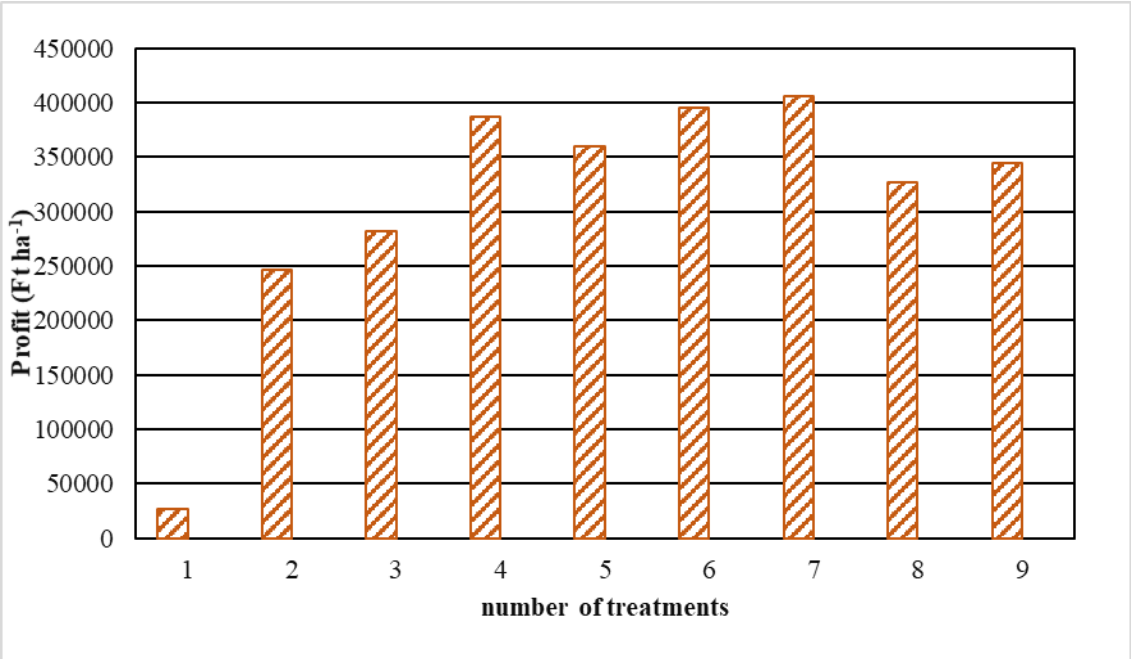

Figure 2. The effect of weed-control technologies on the profit of maize production

CONCLUSIONS

Capreno performed better than Laudis with respect of plant height, number of leaves, length of corn-cob, number of lines of corn-cob, thousand seed weight and yield. By increasing the dose of Capreno, all the tested values of crop elements degraded except for plant height, so the crop yield also decreased. With regard to the profitability of our one-year weed control experiment, it can be stated that the lowest profit was in the case when weeds were all the way through, but there were hardly any differences in the profitability of chemical treatments per hectare.

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