

INFLUENCE OF SOIL TILLAGE SYSTEM ON WEEDING DEGREE AND CORN YIELD

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Abstract

In every culture there are certain characteristic weeds which are adapted to the biological particularities of the cultivated plant and to the specific technology. The most representative and common species of weeds which infest the maize culture on the argic-stagnic faeoziom soil are: Setaria sp., Echinochloa crus-galli, Digitaria sanguinalis, Agropyron repence, Amaranthus retroflexus, Chenopodium album, Sinapis arvensis, Raphanus sativus, Xanthium strumarium, Polygonum sp., Galinsoga parviflora, Hibiscus trionum, Matricaria sp., Capsela bursa pastoris, Lepidium draba, Cirsium arvense, Convolvulus arvensis, Sonchus sp., Rubus caesius. The production achieved in the maize culture varies according to the soil tillage system with productions of 6327-6412 kg/ha in conventional variants, as compared to unconventional variants in which productions of 6121-6322 kg/ha have been obtained. With variants of soil tillage with disk and rotary harrow and rotary harrow, there have been noted significantly distinct negative differences and significantly negative ones, with a production between 6121-6196 kg/ha in comparison with the witness variant of 6327 kg/ha.

INTRODUCTION

Soil tillage is the oldest method of fighting weeds, but it is also very important in the present.

Soil tillage works in the following manner concerning weed fighting: the seeds in the superficial layer are pushed to the depth where from it is difficult for them to spring or where from they don't spring at all.

By soil tillage, perennial weeds are partially destroyed, especially the suckered ones (*Cirsium*, *Sonchus*, *Convolvulus*). A large part of the underground organs mass is brought to the surface of the soil and destroyed by drying in the summer and by freezing in the winter.

Worldwide, the research concerning the influence of soil tillage on the production has been an essential aim. The results obtained in the most diverse pedoclimatic conditions and cultures are generally encouraging for applying the minimum soil tillage system or the no tillage one, considering the effect of soil conservation, too.

Straw cereals are plants which display the highest success rate when this system is applied, followed by maize and bean vegetables.

When elaborating alternative systems of soil tillage, not only immediate effects (large productions) should be considered, but even more the long term ones, which should provide durability to the system in time.

The research conducted during fifty years of use confirms that the unconventional system guarantees to the maize culture productions which are close to those obtained in the classic system.

Synthesizing the data published in expert literature comparatively between the two systems, classic and unconventional similar production levels are achieved [1, 2, 3, 4, 5, 6, 7].

MATERIAL AND METHODS

The results presented in this paper have been obtained in the experimental fields of the Agriculture Faculty in Cluj-Napoca, the Agrotechnical Department, on an argic-stagnic Faeoziom type of soil, with a humus content of 3.8% and 6.5 pH. From the climatic point of view, the hilly area where the experiments have been taking place is characterized by average multiannual values, with precipitations between 550-650 mm a year. The thermal regime of the area is characterized by average multiannual temperatures between 8.0 and 8.2°C.

The aim of this research was to determine the influence the soil tillage systems have on the weed growing and the production achieved in the maize culture.

The experimental alternatives were these:

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| Conventional system: | V ₁ – conventional plough + disk (2 times) |
| | V ₂ – reversible plough + rotative harrow |
| Minimum system: | V ₃ – disk+ rotative harrow |
| | V ₄ – rotative harrow |
| | V ₅ – paraplow + rotative harrow |
| | V ₆ – chisel + rotative harrow |

RESULTS AND DISCUSSION

By the nature of their biology, the maize plants are characterized, in the first stages of vegetation, by the total lack of the ability to compete with weeds. Due to the slow growing in the first 4-6 weeks and to the reduced thickness (5-8 maize plants/m²), a competition is created from the beginning for space, food and water, in favor of the weeds, producing great damage to the maize culture. The damage varies in the 30-90% limits and they depend on the degree of infestation, the frequency and domination of the weeds, as well as the ratio between monocotyledons and dicotyledons (which also depend on the pedoclimatic

conditions of the area). Both the degree of infestation and the ratio between multiple types of weeds are influenced by the soil tillage system.

The weed control strategy when applying minimal systems must be first priority and different from the one used with the classic system. Special attention should be given to indirect methods and especially to crop rotation. The soil tillage elements and the measures for fighting weeds have an important role in the case of hoeing crops for the control of weed growth in the first vegetation stages, periods during which these cultures are very sensitive to the vivacity of the weeds.

When ploughing with the mouldboard plough, the weed seeds are spread in the entire ploughable layer, their germination being spaced out, while the deeply buried ones lose their vitality. With unconventional processing, the seeds are concentrated in the first 10 cm and they germinate explosively during the first year, causing excessive weed growth. The diversity of seed reserve grows from the mouldboard plough ploughing to minimal tillage varieties. The unconventional systems change, in the first place, the floral composition of the weeds, by increasing the percentage of monocotyledonous weeds and decreasing annual dicotyledons (which are easier to fight), and secondly, a general increase of weed growth in the first years of applying.

Table 1

Weeding in corn depending on soil tillage system

Segment of weeds	Medium number of weeds/m ² , crop harvesting					
	Conventional plough + disk (2 times)	Reversible plough + rotative harrow	Disk + rotative harrow	Rotative harrow	Paraplow+ rotative harrow	Chisel + rotative harrow
M*	17.3	17.6	21.3	22.6	19.5	20.3
DA**	41.3	40.2	39.6	40.6	44.3	42.6
DP***	6.3	5.9	17.6	18.6	9.5	12.9
Total (weeds/m ²)	64.9	63.7	78.5	81.8	73.3	75.8
Total (%)	100.00 (Mt)	98.1	120.9	126.0	112.9	116.8

*M-monocotyledonates, **DA-dicotyledonate annuals, ***DP-dicotyledonate perennial

When harvesting the maize culture, the medium weed growth data obtained on argic-stagnic faeozom shows a number of 63.7-64.9 weeds/m² with conventional tillage, and 73.3-81.8% weeds/m² with the unconventional variants. The weed growth degree is 12.9-26% higher in systems with minimal tillage. The differences occur especially concerning the weed growth degree and the percentage of perennial dicotyledons. Thus, the medium number of monocotyledons was 17.3-17.6 weeds/m² with the plough variants and 19.5-22.6 weeds/m² with the variants

with minimum tillage. The average number of dicotyledonous weeds was 40.2-41.3 weeds/m² with the plough variants and 39.6-44.3 weeds/m² with the minimum tillage variants. The differences between the perennial dicotyledonous weeds growth were significant, as 5.9-6.3 weeds/m² have been noted with the plough variants and respectively 9.5-18.6 weeds/m² with the minimum tillage variants.

Table 2

Influence of soil tillage system on corn yield

Specification	Technological variant					
	Conventional plough + disk (2 times)	Reversible plough + rotative harrow	Disk + rotative harrow	Rotative harrow	Paraplow + rotative harrow	Chisel + rotative harrow
STAS (kg/ha) grain production	6327 (Control)	6412	6121	6196	6322	6310
Relative production (%)	100.00	101.4	96.7	97.9	99.9	99.7
Difference in production (kg/ha)	-	+ 85	- 206	- 131	- 5	- 17
Differences significance	-	-	00	0	-	-

LSD 5% = 119.54 kg/ha, LSD 1% = 169.93 kg/ha, LSD 0.1% = 246.05 kg/ha

The soil tillage system has influenced the productions obtained in the maize culture, of 6121-6412 kg grains/ha on the argic-stagnic faeozom with a standard humidity of 15.5.

The largest productions have been noted in ploughed variants: 6327-6412 kg grains/ha. Compared to these, the unconventional tillage varieties productions represented 96.7-99.9% with negative differences of 5-137 kg grains/ha. The analysis of the significance of the differences between the tested variants shows that as compared to the witness: classical plough + disk 2x, the productions are distinctively significantly negative with the disk + rotary harrow tillage variants, significantly negative with the rotary harrow tillage variant, and practically equal with the paraplow + rotary harrow and chisel + rotary harrow tillage variants.

CONCLUSIONS

1. The unconventional soil tillage systems will be applied only on field from which the weeds have been removed using proper technology, or by applying total action herbicides on the stubble. The soil tillage elements and

the measures for fighting weeds have a crucial role in the case of hoeing cultures for the weed growth control in the first stages of vegetation, periods in which these cultures are very sensitive to the vivacity of the weeds.

2. When harvesting the corn culture, the average weed growth data obtained in the argic-stagnic faeozom shows a number of 63.7-64.9 weeds/m² with the conventional tillage variants, and 73.3-81.8% weeds/m² with the unconventional tillage variants. With unconventional processing, the seeds are concentrated in the first 10 cm, they germinate explosively in the first year of applying, determining excessive weed growth. The diversity of the seed reserve grows from the mouldboard plough variety to the minimum tillage varieties. Unconventional systems change, in the first place, the floral composition of the weeds, by an increase in the percentage of monocotyledonous weeds and a decrease of annual dicotyledons (which are easier to fight), and secondly, a general increase of weed growth in the first years of applying.
3. The largest productions have been achieved with the ploughed variants: 6327-6412 kg grains/ha, and compared to this, the productions obtained with unconventional tillage variants represented 96.7-99.9%, with negative differences of 5-137 grains/ha.

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