

RESEARCH RESULTS ON THE EFFECTS OF SOIL TILLAGE TECHNIQUES, SOWING DATE AND PLANT DENSITY ON SUNFLOWER PRODUCTION

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Abstract

The research examined the possibility of reducing soil ground tillage to save fuel without decreasing the yield.

Reduction of ploughing depth from 30 cm to 20 cm or replacement ploughing with discing, chiseling or paraplowing did not seriously affect yield levels, but allowed a decrease in fuel consumption of 10-15l/ha.

Decreasing tillage, especially by discing as ground work, year by year showed a steady increase in weed infestation, especially the perennial weed species.

The effect of sowing outside the optimal period and also differences in plant density on yields varied depending on the hybrid variety used. The earlier hybrid variety is less sensitive to variations in the above factors.

Introduction

As part of sunflower husbandry the rationalisation of soil tillage and optimal sowing conditions are the main factors for achieving efficient yields. In comparison with other crops, there has been limited research into reduced soil tillage on sunflower. The results obtained demonstrate the different responses of this crop to different tillage methods.

Soil tillage involves a high level of energy consumption. Therefore the experiments performed examined the opportunities for reducing fuel consumption.

Sowing at the right time and optimal nutrition of the plant populations are technical factors for the achievement of higher yields without additional costs. The response of varieties to these factors and the hybrid characteristics of the varieties were the main element of the field experiments.

Materials and methods

The trials were conducted by the Research Institute for Cereals and Industrial Crops - Fundulea, on leached chernozem, well drained, formed on loess, with 33% clay content and 2,8% organic matter in arable layer.

The annual average of rainfall during the research period, 1992 - 1995 was of 566 mm with variations between 410 - 580 mm.

The experiments on soil ground tillage included the following treatments:

- ploughing every year to a depth of 30 cm (P30)
- ploughing every year to a depth 20 cm (P20)
- alternate, 1 year ploughing - 1 year discing (P-D)
- alternate, 1 year ploughing - 2 years discing (P-D-D)
- alternate, 1 year ploughing - 3 years discing (P-D-D-D)
- no ploughing, discing every year to a depth of 10 - 12 cm (D)
- deep tillage with chiselling to a depth of 18 -20 cm
- tillage by paraplow to a depth of 18 - 20 cm

Sowing treatments included the following:

- different sowing dates; during April
- plant density; 30,40, 50, and 60 thousand plants /ha

Two sunflower hibrids were used Turbo and Florom 350(early variety)

The experiments were organised stationary in a four year rotation(sunflower after wheat and maize) and designed in randomised blocks, in 4 replicates; the size of the experimental plots was 120 sq. m. Except for variables of soil tillage, sowing date and plant density, the sunflower crop technology was managed in an identical manner on all plots.

Results and discussions

Data presented in Table1 shows little difference between the yields obtained when the ploughing depth is decreased, or by replacing ploughing with discing as soil tillage method for 1-2 years. The reduced tillage allows fuel savings up to 13l/ha, which was the equivalent of 4 litres/tonne of seeds.

Further reduction in soil cultivation by replacing ploughing with discing for 3 consecutive years and also with continuous discing led to a decrease of fuel consumption in the yield of the crop.

Reduced tillage encouraged weed infestation especially with perennial species; 9% in ploughed plot compared with 32 % for disced plot (Table 2).

Table 3 shows that the replacement of the plough with other tillage equipment like the chisel and paraplough does not significantly affect the yields obtained with different fuel consumption.

This data showed opportunities for using minimal cultivation system for sunflower by replacing ploughing with reduced tillage undertaken using disc, chisel or paraplough.

Regarding sunflower response to sowing date, the earlier hybrid Florom 350 proved less sensitive to sowing at different dates during April in comparison with the Turbo hybrid which is more sensitive to sowing delays (Figure 1).

Variations of plant density had less effect on Florom 350 hybrid which had a higher capacity of compensation for the yield components in comparison with the Turbo hybrid which showed an increase in yield, with increasing plant density(Figure 2).

Conclusions

-rationalisation of soil ground tillage for sunflower consists of the replacement of ploughing(1-2 years) with minimal tillage done by disc, chisel or paraplow will not significantly affect yield levels.

-sowing at different dates during April and variations in plant density demonstrated a varietal differences; the earlier hybrid Florom 350 showed a low response to these factors. The later Turbo hybrid is more sensitive but has potentially higher productivity.

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Table 1. Effect of soil tillage on sunflower yield and fuel consumption. Fundulea 1992 - 1995.

Ground tillage	Yield		Fuel consumption	
	kg/ha	%	l/ha	l/t seeds
P - 30cm	2970	102	33	11,1
P - 20 cm	2920	100	24	8,2
D - P 20 - 30	2870	98	23	8,1
D - D - P 20 - 30	2800	96	20	7,1
D - D - D - P 20 - 30	2760	95	17	6,5
D	2660	91	14	5,5
LSD 5%	140			

Table 2. Weed infestation (before 1st cultivation) in sunflower depending on ground tillage (1992 - 1995)

Weeds / sq. m.	Ground tillage				
	P20-30	P-D	P-D-D	P-D-D-D	D
Total	23	30	35	40	44
perennial	2	5	6	9	14

Table 3. Effect of soil tillage on sunflower yield and fuel consumption -Fundulea 1992- 1995.

Ground tillage	Yield		Fuel consumption	
	kg/ha	%	l/ha	l/t
P 20-30	2870	100	26	9,1
C	2760	96	18	6,5
P	2700	94	23	8,5
D _p	2380	83	14	5,9
LSD 5%	180			

Figure 1: Sunflower yield depending on sowing date
Fundulea 1992

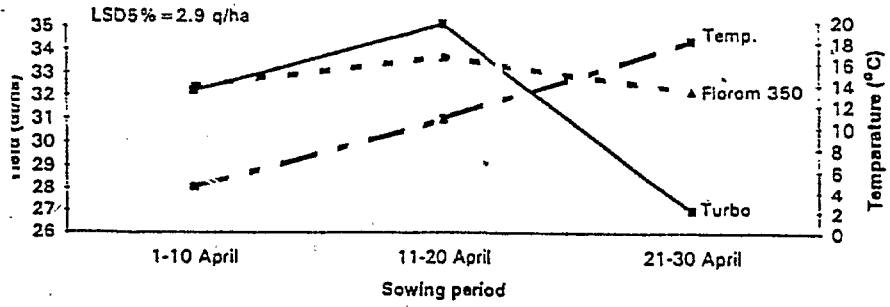


Figure 2: Sunflower yield depending on plant population

