MODIFICATIONS OF THE PHYSICAL PROPERTIES OF THE PRELUVOSOIL FROM ORADEA UNDER DIFFERENT BASE TILLAGE OF THE SOIL AND THE INFLUENCE ON WHEAT YIELD

MODIFICĂRI ALE ÎNSUŞIRILOR FIZICE ALE PRELUVOSOLULUI DE LA ORADEA SUB INFLUENŢA DIFERITELOR LUCRĂRI DE BAZĂ ALE SOLULUI ŞI INFLUENŢA ASUPRA PRODUCŢIEI DE GRÂU

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Abstract: *The paper is based on the researches carried out in a long term trial placed in 1995. The most unfavourable values of the bulk density, total porosity, and penetration resistance were determined in the variant with disk roller; it is followed by variant with plough land of 12 cm depth and chisel; the most favourable values were registered in the variant with summer plough land of 20 cm depth. In the last 3 years, in comparison with the variant of summer plough land of 20 cm, in the others variant the lost yield were of 27,2-49,2% in the variant with disk roller,, of 19,1-25,4% in the variant with chisel and of 11,8-32,1% in the variant with plough land of 12 cm. The results emphasized the importance of summer plough land in the conditions of the soil with 31.5% colloid clay.*

Rezumat: *Lucrarea se bazează pe cercetări efectuate într-o experienţă staţionară amplasată în anul 1995. Cele mai nefavorabile valori ale densităţii aparente, porozităţii totale, rezistenţei la penetrare şi conductivităţii hidraulice s-au determinat în varianta lucrată cu grapa cu discuri, urmată de varianta arată la 12 cm adâncime, varianta cu cizel, iar cele mai favorabile în varianta arată la 20 cm. În ultimii 3 ani, comparativ cu varianta cu arătură de vară executată la 20 cm adâncime, în celelalte variante s-au înregistrat pierderi de producţie cuprinse între 27,2 şi 49,2% în varianta lucrată cu grapa cu discuri, între 19,1 şi 25,4% în varianta lucrată cu cizelul şi între 11,8 şi 32,1% în varianta arată la 12 cm. Rezultatele obţinute evidenţiază importanţa arăturii de vară ca lucrare de bază a solului, în condiţiile în care pe stratul arat conţinutul în argilă coloidală este de 31,5%.*

Key words*: bulk density, total porosity, penetration resistance, hydraulic conductivity, plough land, and yield*
Cuvinte cheie: *densitate aparentă, porozitate totală, rezistenţă la penetrare, conductivitate hidraulică, arătura, producţie*

INTRODUCTION

Soil tillage has a big importance to realize the optimum vegetation conditions for crops. In the some time, the base soil tillage involved the use of the big quantity of energy. To reduce of the energy consumption is an important objective but to create an optimum conditions for vegetation is very important, too (Budoi Gh., Penescu A., 1996; Guş P. et all 2005); in these conditions, to optimize the soil tillage in function of the soil and of the plant requirement is necessary (Domuţa C., 2005, A. Samuel et al, 2003).

MATERIAL AND METHOD

The researches were carried out in a long trial placed in 1995 on the preluvosoil from Oradea. The variants of the experiment were:

V_1 = plough land 20 cm depth;
V_2 = plough land 12 cm depth;
V_3 = work with chisel;
V_4= work with roller disk.

The experiment was placed in randomized band; the surface of the experiment plot = 2000 m^2. Crop rotation used: maize-wheat. Fertilization system: N_{120} kg/ha s.a.; P_{90} kg/ha s.a.

Soil physical properties were determined using the methods from the network of the National Research Institute for Pedology, Agrochemistry and Environment Protection Bucharest. Depth determinations = 20 cm. Number of repetitions used: 5.

Climate conditions from wheat vegetation period were very different in the research years. Multiannual average of the rainfall for period March-June from Oradea is of 228,8 mm; in the research period the rainfall registered were of 250,5 mm in 2004, of 221,3 mm in 2005 and of 315,7 mm in 2006.

RESULTS AND DISCUSIONS

Influence of the base work of the soil on the value of the bulk density and of the total porosity

After the realization of the germination bed, the smallest values of the bulk density were registered in the variant with plough land of 20 cm. In the variant with plough land of 12 cm depth bulk density value increase with 2.5%, with 3.4% in the variant with roller disc, with 4.3% in the variant with chisel (table 1).

Table 1

Influence of the base soil tillage on bulk density (BD) of preluvosoil from Oradea, 2005

Variant	BD	
	g/cm^3	%
1. Plough land, 20 cm depth	1.17	100
2. Plough land, 12 cm depth	1.20	102.5
3. Work with chisel	1.22	104.3
4. Work with roller disc	1.21	103.4

The most favourable total porosity was registered in the variant with plough land of 20 cm depth; in the variant with 12 cm depth total porosity decreased with 2% and in the variant with roller disk with 3,4%. The smallest value of the total porosity was registered in the variant with chisel, 53.9% (table 2).

Table 2

Influence of the base soil tillage on total porosity (PT) of preluvosoil from Oradea, 2005

Variant	PT	
	%	%
1. Plough land, 20 cm depth	55.8	100
2. Plough land, 12 cm depth	54.7	98.0
3. Work with chisel	53.9	96.6
4. Work with roller disc	54.3	97.3

Influence of the base tillage on penetration resistance

On 0-5 cm depth, the value of the penetration resistance was the biggest in the variant with chisel on, 5-10 cm depth and on 10-20 cm depth the biggest value of the penetration

resistance was registered in the variant with roller disk. On 20-30 cm and on 30-60 cm depth, the biggest values of the penetration resistance were registered in the variant with plough land of 12 cm depth. (Table 3)

Table 3

Influence of the base soil tillage on penetration resistance values (Mpa) of preluvosoil from Oradea, 2005

Variant	Depth – cm –				
	0-5	5-10	10-20	20-30	30-60
1. Plough land, 20 cm depth	0.8	1.2	2.5	4.4	5.9
2. Plough land, 12 cm depth	0.8	1.3	3.2	5.2	6.5
3. Work with chisel	0.9	1.5	2.6	3.1	5.0
4. Work with roller disc	0.8	2.1	3.8	4.8	6.0

Influence of the base soil tillage on wheat yield

Both in the rainy year 2006 and in the years 2004 and 2005 when the rainfall registered had the close values of multiannual value, the biggest wheat yield was registered in the variant with plough land of 0-20 cm depth. (Table 4)

Table 4

Influence of the base soil tillage on wheat yield, Oradea 2004-2006

Variant	Yield		Difference		Statistically significant
	Kg/ha	%	Kg/ha	%	
2004					
1. Plough land, 20 cm depth	6620	100	-	-	Mt
2. Plough land, 12 cm depth	5840	88.2	-780	-11.8	000
3. Work with chisel	5360	80.9	-1260	-19.1	000
4. Work with roller disc	4820	72.8	-1800	-27.2	000
$DL_{5\%}$ = 198	$DL_{1\%}$= 282		$DL_{0,1\%}$= 436		
2005					
1. Plough land, 20 cm depth	4051	100	-	-	Mt
2. Plough land, 12 cm depth	2750	67.9	-1301	-32.1	000
3. Work with chisel	3023	74.6	-1028	-25.4	000
4. Work with roller disc	2060	50.8	-1991	-49.2	000
$DL_{5\%}$ = 186	$DL_{1\%}$= 276		$DL_{0,1\%}$= 412		
2006					
1. Plough land, 20 cm depth	6910	100	-	-	Mt
2. Plough land, 12 cm depth	5310	76.8	-1600	23.2	000
3. Work with chisel	5470	79.2	-1440	20.8	000
4. Work with roller disc	4760	68.8	-2150	31.2	000
$DL_{5\%}$ = 243	$DL_{1\%}$= 349		$DL_{0,1\%}$= 790		

All the years, the smallest yields were registered in the variant with roller disk. Yield results sustain the need of the summer plough land of 20 cm depth in the conditions of the preluvosoil from Oradea.

CONCLUSIONS

The best favourable physical properties of the preluvosoil from Oradea – bulk density, total porosity, penetration resistance – were obtained in the variant with plough land of 20 cm depth; in the variants with plough land of 12 cm depth, with chisel and with roller disk the negative evolution of the physical properties of the soil were registered.

The same phenomena was registered regarding the wheat yield, the biggest yields were obtained in the variant with plough land of 20 cm depth all the years.

The results research sustains the importance of the summer plough land of 20 cm depth on the preluvosoils.

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