THE INFLUENCE OF PLOUGH TYPE, SOIL TYPE AND WORKING SPEED UPON SOILS' LOOSENING DEGREE AT SUPERFICIAL PLOUGHINGS

INFLUENȚA TIPULUI DE PLUG, A TIPULUI DE SOL ŞI A VITEZEI DE LUCRU ASUPRA GRADULUI DE AFÂNARE A SOLULUI LA EFECTUAREA ARĂTURILOR SUPERFICIALE

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Abstract. *The aim of the paper is to present what influence have the plough type, soil type and working speed soils' loosening degree when superficial ploughings are realized.*

Rezumat. *Scopul prezentei lucrări este de a stabili cum influențează tipul de plug, tipul de sol şi viteza de lucru asupra gradului de afânare a solului la realizarea arăturilor superficiale.*

Research and experiments have been performed in order to establish the most adequate types of ploughs, which will work in aggregate with the 65 HP tractors.

The main research criteria consist, on the one hand, of reaching the imposed agri-technical demands, and on the other hand, of presenting a rational usage of the energetic base.

Making the soil basic work, as ploughing is known, is in a direct connection with the soil type, which from the point of view of agriculture mechanization has various characteristics, both due to different mechanic features and variations of humidity and soil compaction.

The present paper, aims at establishing the optimal type of plough, in order to be able to perform some superficial ploughings, which will work in aggregate with the 65 HP tractor, within the current framework provided by the conditions of tending and use.

The research took into consideration the study of the types of ploughs used for superficial ploughings (at a depth of 15-20 cm) in aggregate with 65 HP tractors.

MATERIAL AND METHOD

To establish the optimal type of plough used for superficial ploughings were studied the following two ploughing units:

- aggregate formed by U-650M tractor and PP-3-30 plough;
- aggregate formed by U-650M tractor and PRP-3 reversible plough.

The experiences took place on three types of soil with different specific resistance at ploughing:

- easy soil with specific resistance at ploughing (K_0) smaller than 0.35 daN/cm^2 (tipic chernozem) (variant A);
- medium soil with specific resistance at ploughing (K_0) between 0.35-0.55 daN/cm^2 (chernozem cambic mezocalcaric) (variant B);
- hard soil with specific resistance at ploughing (K_0) between 0.56-0.75 daN/cm^2 (luvosoil) (variant C).

Working speeds, which were used during experiments, were from the IIH gear and had the following values: 4.48 km/h; 4.61 km/h; 4.85 km/h and 4.98 km/h.

The working depth was 20 cm and working width was 90 cm.

RESULTS AND DISCUSSIONS

For the four working speeds of the ploughing units, the experimental values of soil loosening degree function of soil type, plough type, and working speed of the unit are presented in tables 1, 2, 3 and 4. The ploughing work, realized by the two ploughing units was done at the depth of 20 cm on all the types of soil.

As it can be observed from the dates presented in table and figure 1 it is obvious the fact that the soil loosening degree, for all three types of soil, is superior to the imposed values

Table 1

Soil loosening degree function of soil type (V_1 = 4.48 km/h)

Working conditions	U-650M+PP-3-30			U-650M+PRP-3		
	Variant A	Variant B	Variant C	Variant A	Variant B	Variant C
Working speed (km/h)	4.48	4.48	4.48	4.48	4.48	4.48
Loosening degree (%)	22.2	26.4	35.8	23.7	27.9	36.9

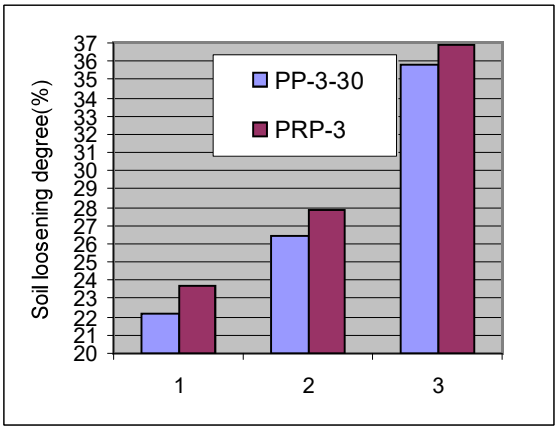

Figure 1. Variation of the soil loosening degree function of soil type (V_1 = 4.48 km/h)

For an easy soil the soil loosening degree obtained after a ploughing work made with PRP-3 reversible plough was with 1.5% better than in the case when PP-3-30 was used, having a value of 23.7% in comparison with the value of 22.2% obtained when the soil was worked with PP-3-30 plough.

On a medium soil the loosening degree recorded an improvement of 1.5% when for ploughing was used the reversible plough PRP-3 (27.9%) in comparison with the value of 26.4% obtained when the soil basic work was made with PP-3-30 plough.

The difference between the values obtained for hard soil was of 1.1% in the favour of PRP-3 plough (36.9%) while at ploughing with PP-3-30 the value of this index was 35.8%.

As can be observed from the dates presented in table and figure 2 it is obvious the fact that the values of soil loosening degree, on all three types of soil, are in according with the imposed values also when the working speed is changed from 4.48 km/h to 4.61 km/h.

The soil loosening degree of an easy soil realized after the ploughing was made with reversible plough PRP-3 was with 1.2% better then in the case of making ploughing with PP-3-30 plough, having a value of 23.0% in comparison with the value of 21.8% obtained when soil was worked with PP-3-30 plough.

On a medium soil the loosening degree recorded an improvement of about 1.1% when the ploughing work was made with PRP-3 reversible plough (27.0%) face to the value of 25.9% obtained at ploughing with PP-3-30 plough.

For hard soil the difference between the obtained values was the greatest, of 1.9% in the fovour of makig the soil basic work with a reversible plough PRP-3 (35.6%), while at making the ploughing with PP-3-30 plough the value of this index was 33.7%.

It is obvious the fact that on hard soils the ploughings must be realized with a reversible plough.

Table 2

Soil loosening degree function of soil type (V_2 = 4.61 km/h)

Working conditions	U-650M+PP-3-30			U-650M+PRP-3		
	Variant A	Variant B	Variant C	Variant A	Variant B	Variant C
Working speed (km/h)	4.61	4.61	4.61	4.61	4.61	4.61
Loosening degree (%)	21.8	25.9	33.7	23.0	27.0	35.6

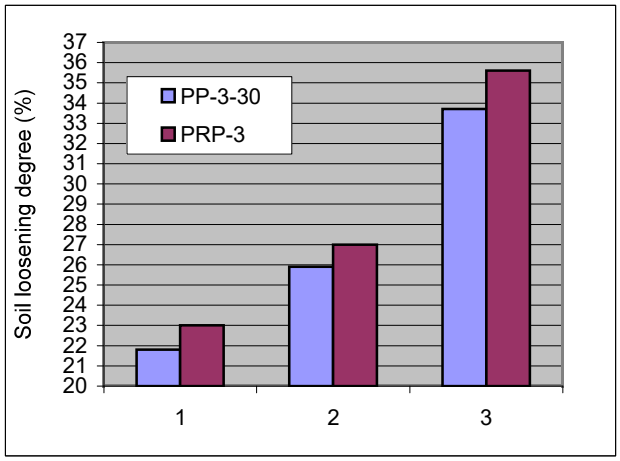

Figure 2 - Variation of the soil loosening degree function of soil type (V_2 = 4.61 km/h)

Tracking the way in which the increase of the working speed (V_3=4,85 km/h) influence the quality of ploughing realized by the two ploughing units on different types of soil it is showed the fact that at easy soils the loosening degree had the greatest values, and this ones decreasing after the soil texture but being in according with the imposed values. In table and figure 3 are presented the values of soil loosening degree on all the three types of soil.

So for an easy soil the loosening degree obtained after ploughing with PRP-3 was with 1.5% better than in the case of ploughing with PP-3-30 plough, having a value of 22.4% in comparison with the value of 20.9% obtained at ploughing with PP-3-30 plough.

Table 3

Soil loosening degree function of soil type (V_3 = 4.85 km/h)

Working conditions	U-650M+PP-3-30			U-650M+PRP-3		
	Variant A	Variant B	Variant C	Variant A	Variant B	Variant C
Working speed (km/h)	4.85	4.85	4.85	4.85	4.85	4.85
Loosening degree (%)	20.9	25.7	32.5	22.4	26.2	33.4

At the variant B (medium soil) the loosening degree recorded an improvement of 0.5% at making the ploughing work with reversible plough PRP-3 (26.2%) face to the value of 25,7% obtained when the ploughing was made with the normal plough PP-3-30.

For hard soil (variant C) the difference between the obtained values was of 0.9% for working the soil with the reversible plough PRP-3, while at working the soil with PP-3-30 plough the recorded value was of 32.5%.

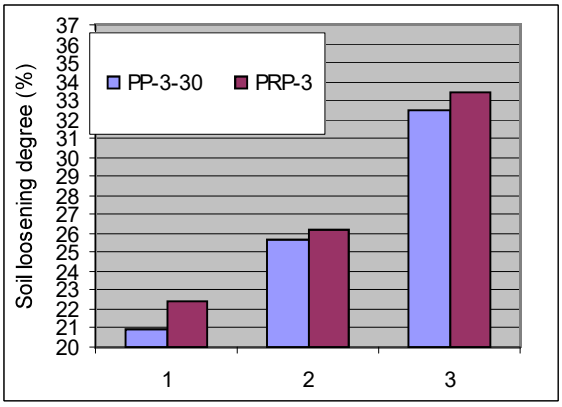

Figure 3 - Variation of the soil loosening degree function of soil type (V_3 = 4.85 km/h)

In table and figure 4 are presented the dates regarding the last working speed V_4=4.98 km/h and it is put in light the fact that the values of soil loosening degree, for all the three types of soil, are in according with the imposed values.

Table 4

Soil loosening degree function of soil type (V_4 = 4.98 km/h)

Working conditions	U-650M+PP-3-30			U-650M+PRP-3		
	Variant A	Variant B	Variant C	Variant A	Variant B	Variant C
Working speed (km/h)	4.98	4.98	4.98	4.98	4.98	4.98
Loosening degree (%)	20.5	25.3	31.6	21.1	25.9	32.1

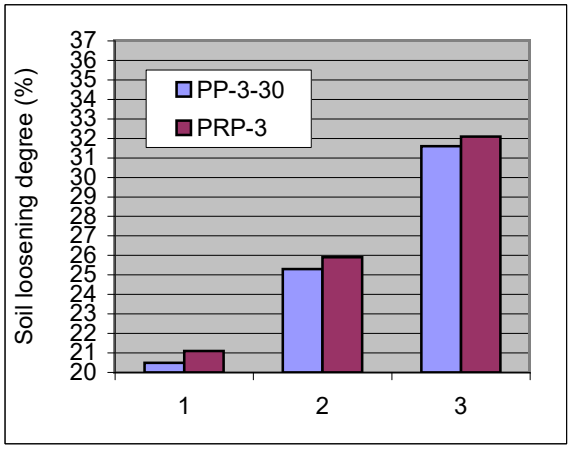

Figure 4 - Variation of the soil loosening degree function of soil type (V_4 = 4.98 km/h)

So for an easy soil the loosening degree obtained after making the ploughing work with PRP-3 plough was with 0.6% better than in the case of ploughing with PP-3-30 plough, having a value of 21.1% in comparison with the value of 20.5% obtained at ploughing with PP-3-30 plough.

Soil loosening degree in the case of a medium soil recorded also an improvement of 0.6% at ploughing with PRP-3 reversible plough (25.9%), while at ploughing with PP-3-30 plough the obtained value was of 25,3%.

The difference between the values obtained was, for hard soil, of 0.55 when ploughing was made with a reversible plough PRP-3 (32.1%) while at ploughing with a normal plough PP-3-30 the recorded value was of 31.6%.

CONCLUSIONS

From the above presented dates, result as a conclusion that in the conditions in which the working speed of the ploughing unit increase, the soil loosening degree will have more and more smaller values, the lowest values being obtained at the greatest working speeds and the higher values being recorded at the lowest working speeds.

The soil loosening degree will have the higher values when the ploughinh work is made by the aggregate formed by U-650M tractor and PRP-3 reversible plough, and the lowest values will be recorded when ploughing work is realized by the aggregate formed by U-650M tractor and PP-3-30 plough, for the same type of soil.

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