REQUIREMENTS REGARDING THE INFLUENCE OF SOIL WORKS ON WHEAT EMERGENCE

Maria Manuela CRISTA, P. Pîrsan, V. D. MIRCOV
USABMV Timișoara
e-mail: manuelacrista@yahoo.com

Abstract: *The way of preparing the ground for sowing the winter wheat is a decision that has to take into account at least some of the known elements: pre-emergent plant, soil type, water supply of soil and basic works performed in previous years. Nowadays, the practice of abandoning the wheat field is being extended, adopting variants of churn without turning the furrow or the variant of the stubble work only with heavy discs. The choice of corrected soil works in different conditions from one year to another requires a great deal of skill to ensure optimal conditions of emergence, which the present paper also pursues. Research should be expanded to follow how soil works influence plant growth and development. In this paper, we have presented the influence of the way of performing the basic soil work and the preparation of the germination bed on the wheat emergence. We have found that among the variants of basic soil work (ploughing, grubbing and deep disking) the best in our experimental conditions has been the deep drilling. Regarding the way of preparing the germination bed (with a disc harrow in an aggregate with fixed tooth harrows and a rotary harrow respectively), the results pointed out that by using the drill the number of plants/m^2 increased "very significantly". The differences between the two experimental years were not big, since in both years the climatic conditions, mainly the water supply of the soil, were of high quality. It has been shown by a better „settlement" of the germination bed when using the drill has created better conditions of germination and emergence mainly due to better contact between the seeds and the soil particles and the faster restoration of the capillary network in the germination bed.*

Key words: *basic soil work, germination bed, sowing, wheat, plants/m^2.*

INTRODUCTION

One of the major factors influencing plant growth and development is soil. The specific characteristics of the soil type are an important criterion for zoning a crop.

Soil properties can be improved to better meet plant requirements by soil work, fertilization, anti-erosion measures, etc. [1,2],

The success of a crop depends on many factors; one that is very important is the density of the crop that has to provide an optimal number of plants/m^2 so that there are prerequisites for achieving high yield but also for ensuring a minimum of "comfort" of growing plants. The number of plants emerging from sown germinable beans is strongly influenced by the conditions the germination bed gives it. [6] That is why choosing the optimal variants of basic and superficial soil works under given conditions is a very important decision and is often difficult to achieve, considering also the possible adverse climatic evolutions after sowing. [3,4,5]

In addition to germination conditions, by soil works we need to take into account a broader goal over time, namely at least preserving, if not improving, the physical features of the soil. [7,8]

The use of certain soil working methods are beneficial for crop plants that must fit into a soil cultivation strategy for at least one rotation.

MATERIALS AND METHODS

The research was carried out in the years 2016 and 2017 in the Recaş area, Timiş County, on a stagnic preluvosol type soil, slightly stagnic-gleyic, whose main features are presented in Table 1.

Table 1.

Soil properties: stagnic preluvisol, slightly stagnic-gleyic

Horizon	*Ap*	*Ahw2*	*A0 w2*	*ABw3*	*Btw3*	*Bt(y)w2*	*BCw2*	*Ck*
Depth	*0-22*	*-35*	*-53*	*-68*	*-88*	*-123*	*-150*	*-200*
TEXTURE	*TT*	*TP*	*TT*	*TT*	*TT*	*TT*	*TT*	*TT*
ph in H2O	*5,96*	*6,11*	*6,33*	*6,51*	*6,58*	*6,56*	*6,75*	*7,62*
Humus (%)	*3,57*	*2,50*	*1,48*					
Nitrogen indicator	*3,07*	*1,91*	*1,22*					
Humus reserve (t/ha)	*193,79*							

The purpose of the research was to determine the influence of soil work on wheat emergence. In order to achieve the proposed goal we have set some goals that we have pursued:

- Germination bed quality;
- Number of plants/m^2.

We have followed both the influence of the basic soil work and the germination bed preparation.

The bi-factorial experience was organized according to the parcel method subdivided into three repetitions:

The experimental factors were:

Factor A - basic soil work

a1 - ploughed at 20-22 cm

a2 - worked with gruber at 15-17 cm

a3- deeply drilled at 12-14 cm

Factor B - soil preparation work

b1 - 2 x discs + harrow

b2 - harrow work

The preliminary plant was the sunflower.

The variety used was Solehio, sowing density of 530 bg/m^2, the distance between rows of 15.3 cm, and the sowing depth of 4-5 cm. The climatic conditions presented in Table 2 were favourable for wheat sowing in the first days of October 2016 and in the first half of October 2017. Sowing took place on October 3 in 2016 and on October 10 in 2017. The germination bed in both years had sufficient water content to ensure a good emergence. The determination of the number of plants/m^2 was done in the 2-leaf stage.

Table 2.

Monthly average temperature and precipitations recorded at the Meteorological Station Timisoara in the years 2016-2017

Month	***Temperatures***		***Precipitations***	
	2016	***2017***	***2016***	***2017***
I	*-0,3*	*-0,8*	*48,3*	*8,7*
II	*6,9*	*-0,3*	*45,4*	*19,4*
III	*7,7*	*3,8*	*64,6*	*26,0*
IV	*13,7*	*4,9*	*20,0*	*55,9*
V	*16,3*	*11,5*	*51,2*	*53,8*
VI	*21,6*	*15,2*	*177,8*	*58,8*
VII	*22,9*	*16,7*	*76,3*	*19,4*
VIII	*24,3*	*17,2*	*127,8*	*50,1*
IX	*17,4*	*12,4*	*40,0*	*89,2*
X	*10,0*	*6,2*	*69,4*	*27,7*
XI	*5,3*		*68,9*	
XII	*0,9*		*12,0*	

RESULTS AND DISCUSSIONS

The results of the number of plants/m^2 identifications were statistically processed by analysis of the variant.

The results of the 2016 identifications show that this year, when at the time of the basic soil works (November 14), the soil had a slight water deficiency where there were no differences in the significance between working with the plough or the gruber.

Table 3

Results on the effect of the soil cultivation system and the germination bed quality on the emergence of wheat (plants/m^2) in 2016

Factor A Basic work	*Factor B Preparation of the germination bed*		*Average of factor A*			
	Drilling + gdf	*Harrowing*	*No. plants/m^2*	*%*	*Differences*	*Significance*
Ploughing 20 cm	*387*	*452*	*420*	*100*		
Gruber 15-18 cm	*391*	*438*	*415*	*99*	*-5*	
Drilling 12-14 cm	*416*	*473*	*444*	*106*	*24*	*x*

	A	*B*
DL 5%	*22,3*	*15,7*
1%	*27,7*	*21,4*
0,1%	*33,3*	*26,8*

Average of factor B

No. plants/m^2	*398*	*454*
%	*100*	*114*
Difference		*56*
Significance		*xxx*

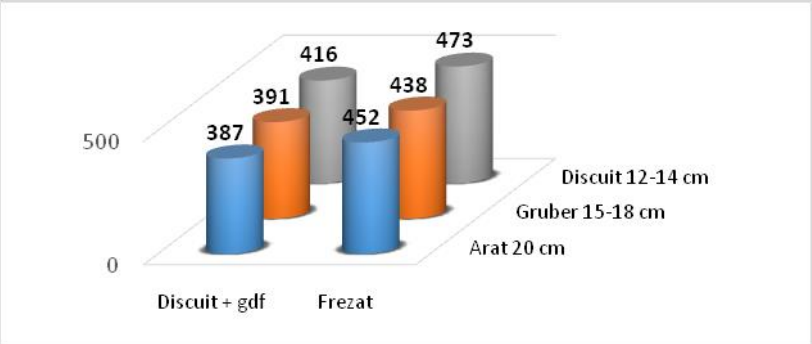

Fig. 1. Factor A(basic work) and factor B(preparing the germination bed) in 2016

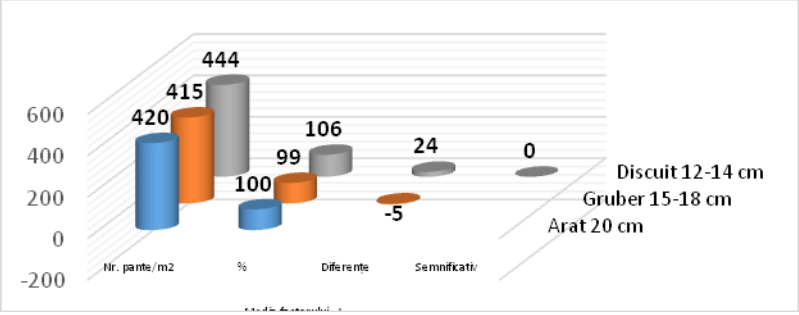

Fig. 2. Factor A(basic work) and average of factor A in 2016

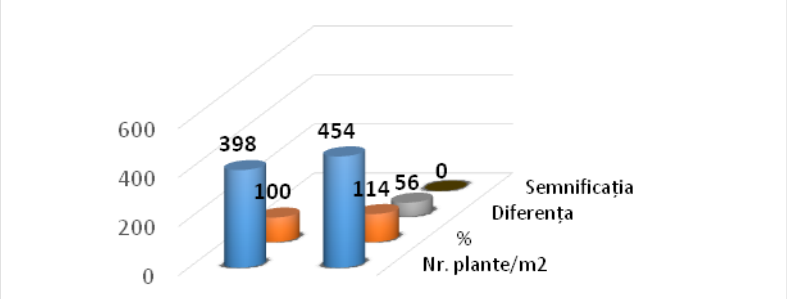

Fig. 3. Average of factor B in 2016

The basic work done with the 12-14 cm heavy disc determined, on average for the two variants of germination bed preparation, an increase in the number of plants by 6%, respectively by 24 plants/m^2, statistically ensured at the level ,,significant".

The method of preparing the germination bed has strongly influenced the emergence of wheat. Thus, when the germination bed was prepared with a milling cutter (rotating harrow), the number of plants was by 14% higher, namely 56 plants/m^2, compared to the variant in which the germination bed was prepared with the disk in the aggregate with the fixed tooth harrow.

The milling work will ensure, in addition to the very good soil shredding, a "settling" of the soil that leads to an optimal air content in the soil, which allows for a better contact of the seeds with it and the water intake from the soil layer beneath the germination bed (raw furrow) by forcing the capillaries to form faster. The variant with the best seedlings was drilling 12-14 cm + milling cutter (473 plants/m^2) and the variants with the lowest number of plants were ploughing at 20 cm + drilling + gdf (387 plants/m^2) and gruber 15-17 cm + drilling + gdf (391 plants/m^2). In 2017, the results presented in Table 4 reveal that by performing the basic soil work with a heavy disc harrow at 12-14 cm, the number of emerging plants was by 14% higher compared to the variant ploughing and by 10% compared to the gruber. The difference is statistically ensured at the "very significant" level.

Table 4

Results on the effect of the soil cultivation system and the germination bed quality on the emergence of wheat (plants/m^2) in 2017

Factor A Basic work	*Factor B Preparation of germination bed*		*Average of factor A*			
	Drilling + gdf	*Harrowing*	*No. plants/m^2*	*%*	*Difference se*	*Significance*
Ploughing 20 cm	*346*	*431*	*389*	*100*		
Gruber 15-18 cm	*363*	*442*	*403*	*104*	*14*	
Drilling 12-14 cm	*407*	*480*	*444*	*114*	*55*	*xxx*

	A	*B*
DL 5%	*27,3*	*17,8*
1%	*39,6*	*24,5*
0,1%	*47,3*	*32,6*

Average of factor B

No. plants/m^2	*372*	*451*
%	*100*	*121*
Difference		*79*
Significance		*xxx*

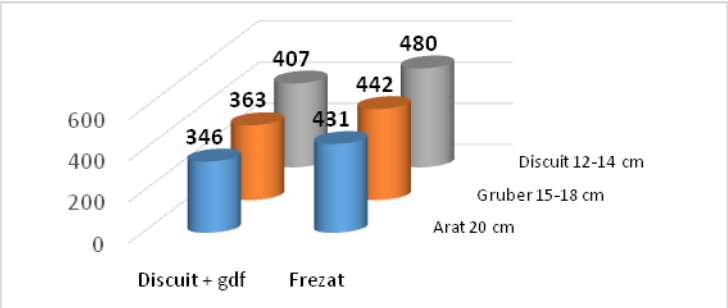

Fig. 4. Factor A (basic work) and factor B (preparation of germination bed) in 2017

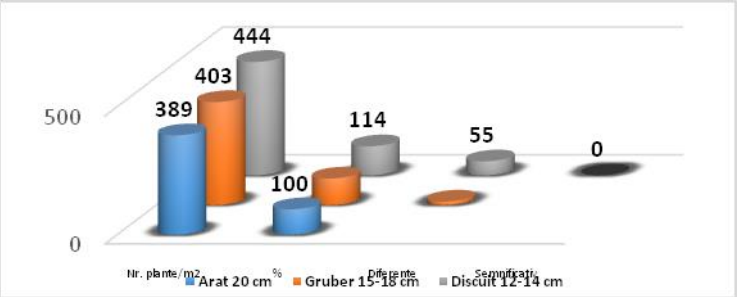

Fig. 5. Factor A (basic work) and average of factor A in2017

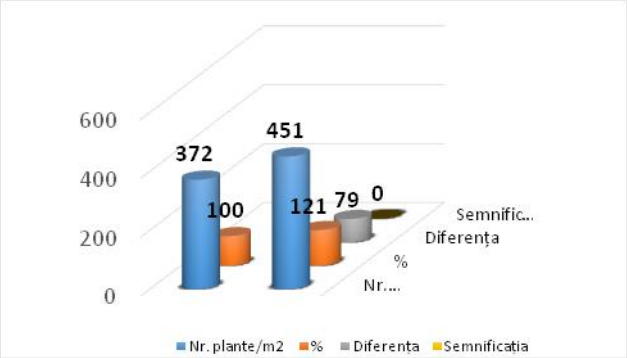

Fig. 6. Average of factor B in 2017

As to the variants of the germination bed this year, the work done with the milling cutter was better, ensuring an increase of the number of plants/m^2, emerging of 21%, namely 79 plants/m^2 statistically classified as "very significant". Since the research results did not cover an experimental cycle of at least three years, it was not possible to synthesize the experimental results. However, some conclusions can be drawn from the two years of research.

CONCLUSIONS

1. In the two experimental years there were good sowing conditions at the beginning of the optimum period in 2016 (1-5 October) and towards the end of the optimum period (10-15 October) in 2017.
2. Under favourable conditions, especially due to good water supply of the soil in both years, the basic work was carried out through a deep work (12-14 cm) with the disc, which caused an increase in the number of plants/m^2 compared to the variants ploughing or loosening with gruber.
3. The preparation of the germination bed with the harrow provided better conditions of emergence compared to the variant in which the disc harrow was used in the aggregate with the fixed tooth harrow, the differences were statistically ensured at the very significant level.
4. More research is needed in order to make recommendations, and the solutions can vary widely depending on the pre-emerging plant, soil water supply, soil type, baseline work performed in the previous year, etc.

BIBLIOGRAPHY

1. BÂLTEANU GHE. 1989- Fitotehnie, Editura Ceres, București;
2. DAVID GHE ȘI COLAB 2006 – Tehnologia plantelor de câmp, Editura Eurobit, Timișoara;
3. GUȘ P. ȘI COLAB 1998- Agrotehnică Ed. Risopint, Cluj Napoca;
4. MUNTEANU L. ȘI COLABORATORI 2003- Fitotehnie, Editura Ion Ionescu de la Brad, București
5. ONCEA I. , 2012- Tehnologii agricole performante, Editura Ceres București
6. PÂRȘAN P și colaboratori 2006- Cereale și leguminoase pentru boabe, Editura Eurobit, Timișoara
7. OKROS ADALBERT – Teză de doctorat - 2012
8. ROMAN GHE. și colab 2011- Fitotehnie, Editura Universitară București.