

STUDY REGARDING THE INFLUENCE OF FERTILIZATION ON THE CROP RESULTS AND ON THE SEED QUALITY OF SOME VARIETIES OF TRITICUM TURGIDUM (L) THELL,ssp.TURGIDUM conv.DURUM (DESF.)MK.

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Abstract. The researches were carried out in a characteristic region of the Mureş – Bega inter-river field, on a typical chernozem soil. Many climatic types are dovetail with each other in this region: Mediterranean, temperate continental and oceanic climate. The annual average temperature is of 10,8°C, according to the data obtained from the Meteorological station Sănnicolau Mare, and the annual precipitations are of 519 mm. The researched varieties of durum wheat were Grandur and Condurum, created in Romania, and Selyemdur and Betadur coming from Hungary. The crop results of the researched field NoP 80 K80, N100P 80 K80, N150P 80 K80, N200P 80 K80, showed a crop amplitude of between 3682 kg/ha (Selyemdur - NoP 80 K80,) and 6478 kg/ha (Condurum - N200P 80 K80). As an average of the four varieties there has been noticed, that by fertilizing with N100 the crop result increased by 18%, respectively to 767 kg/ha, by increasing the nitrogen doses to N150 the crop result increased with 31%, respectively there has been obtained a yield difference of 1321 kg/ha, and by using a dose of N200 the crop increased with 37%, meaning a yield difference of 1576 kg/ha. It results that the crop yield increase obtained by using one kg N s.a. was of 7,67 kg seeds for a dose of N100, of 8,80 kg seeds for a dose of N150 and of 7,88 kg seeds for a dose of N200. As an average for the four agrifunds, the highest crop was obtained for the variety Condurum, being of 5672 kg/ha, that is 7% respectively 368 kg/ha more than the yield obtained for the reference variety, Grandur, a very significant yield difference, the lowest yield, that of 4252 kg/ha, being obtained for the variety Selyemdur, this being statistically a very significant negative difference. Laboratory analyses done on average samples revealed an evolution of the mass of 1000 seeds of between 33,50 g for the variety Selyemdur and 38,75 g for the variety Condurum; the hectolitre mass was of between 77,16 kg/hl for the variety Selyemdur and 82,10 kg/hl for the variety Grandur. The protein content varied between 13,8% at the variety Selyemdur and 14,4% at the variety Grandur; the wet gluten content was of 28,6% at the variety Selyemdur and of 30,1% at the variety Betadur; the deformation coefficient was 2 mm at the variety Grandur and 3 mm at the other three varieties and the coefficient of falling was of between 373 seconds at the variety Selyemdur and 482 seconds at the variety Grandur.

Key words: durum wheat, differentiated fertilization.

INTRODUCTION

Durum wheat is the most important tetraploid species originating from einkorn wheat by mutations. The world surface cultivated with durum wheat varied between 18 – 23 million ha, respectively it is cultivated on about 9-10% of the world's surface dedicated to wheat cultures in the last years. The durum wheat world production is of about 30 million tonnes. After common wheat, durum wheat is the most widely grown crop in: Portugal, Spain, France, Italy, Greece, Bulgaria, Turkey, Iran, Iraq, Egypt, Libya, Algeria, Morocco and Ethiopia. Durum wheat cultures also cover large surfaces in the southern part of Ukraine, in Transcaucasia, Turkestan and Kazakhstan. It can also be found on

smaller areas in Pakistan, India and China. It is also cultivated on large surfaces in Canada, the United States of America, Mexico, Central America, Argentina, Uruguay and Peru (PETERSON, 1965). It is sporadically cultivated in other countries too, including Romania (SĂULESCU, 1984). In the last years, Canada, USA, Australia, China and Russia cultivated the largest surfaces with durum wheat, meaning for each one of the above mentioned countries 2-3 million ha per year. Moreover, this wheat species has the largest share in culture in Europe in countries such as Italy, Turkey, Spain and France (in the southern part). The pedoclimatic conditions in our country permit us to obtain some economically motivated crops, which should completely ensure the entire need of wheat for inner consumption, but also important agricultural surplus for export, a fact that is not reflected in the surface cultivated with this variety, which decreased from 12500 ha in the year 2010 to only 4346 ha in the year 2013.

MATERIAL AND METHODS

The subject of this research aimed mainly at bringing contributions to the identification of the variety structure of this species in the agricultural area Câmpia de Vest (Western Plain) of our country, a favourable area for cultivating the studies species. In order to be able to manifest their production potential under the pedoclimatic conditions taken into consideration, the studied varieties were observed during a bifactorial organized experiment, with three repetitions and the following graduations of the factors:

-factor A – agrifund

a₁ – N₀P₈₀K₈₀;

a₂ – N₁₀₀P₈₀K₈₀

a₃ – N₁₅₀P₈₀K₈₀

a₄ – N₂₀₀P₈₀K₈₀

-factor B – cultivates variety, with four graduations;

b₁ – Grandur – Romania *Triticum turgidum* (L) Thell, ssp. *Turgidum* conv. *Durum* (Desf.) MK.

b₂ – Condurum – Romania *Triticum turgidum* (L) Thell, ssp. *Turgidum* conv. *Durum* (Desf.) MK.

b₃ – Selyemdur Hungary *Triticum turgidum* (L) Thell, ssp. *Turgidum* conv. *Durum* (Desf.) MK.

b₄ – Betadur Hungary *Triticum turgidum* (L) Thell, ssp. *Turgidum* conv. *Durum* (Desf.) MK.

The technology applied to the culture was the one currently applied for wheat cultures in the area Câmpia de Vest (Western Plain). The precursory crop was maize. The seeding for this experiment was done in October 2014. The fertilizers containing phosphorus and potassium were applied under the ploughed row. The fertilizers continuing nitrogen were applied in fractions, when preparing the germination bed (1/2 of the dose) and the rest of the dose was applied during the winter, in January 2015. The calculation of the harvest terms was done according to the method of placing the experiment on the field.

RESULTS AND DISCUSSIONS

Table 1 presents the crop results obtained in 2015. It results that the fertilizers containing nitrogen very significantly influenced the yield for both dose graduations studied. So, by fertilizing with N₁₀₀, and keeping the level of phosphorus and potassium constant (P₈₀ K₈₀), there has been obtained an increase in yield of 18%, the difference being of 767 kg/ha, which is a very significant difference. By increasing the dose of fertilizers containing nitrogen up to N₁₅₀, the increase of the yield obtained as related to the reference crop was of 31%, which means a very significant difference of 1321 kg/ha. The highest average yield for the four varieties was of 5784 kg/ha, that is 37% more than the crop result obtained for the reference variety, the difference of 1576 kg/ha being very significant. This means that, by using a dose of N₁₀₀, there has been obtained an increase of 7,67 kg seeds/one kg N s.a., the increase being of 8,80 kg seeds when using a dose of N₁₅₀ and of 7,88 kg seeds by using a dose of N₂₀₀. These figures result from Figure 1.

Table 1

The crop results obtained in region of the Mureş – Bega inter-river

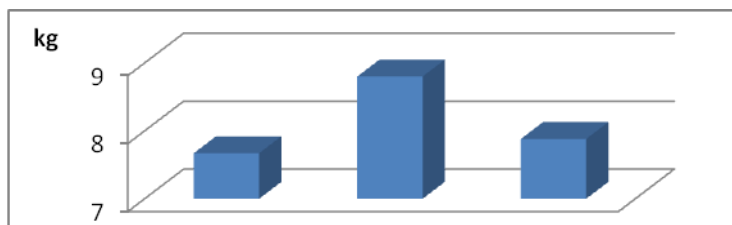
Factorul A Agrofondul	Factorul B – soiul				Mediile factorului B			
	GRANDUR	CONDURUM	SELYEMDUR	BETADUR	Recolta Kg/ha	%	Diferența Kg/ha	Semnificația
N ₀ P ₈₀ K ₈₀	4280	4665	3682	4206	4208	100		
N ₁₀₀ P ₈₀ K ₈₀	5214	5449	4018	5222	4975	118	767	XXX
N ₁₅₀ P ₈₀ K ₈₀	4814	6097	4478	5722	5229	131	1321	XXX
N ₂₀₀ P ₈₀ K ₈₀	5910	6478	4833	5916	5784	137	1576	XXX

DL 5%=181
DL 1%= 275
DL 0,1%=442

Mediile factorului B

Specificare	GRANDUR	CONDURUM	SELYEMDUR	BETADUR
Recolta kg/ha	5304	5672	4252	5266
%	100	107	80	99
Diferența kg/ha		368	-1052	-38
Semnificația		XXX	000	

DL 5% =140 DL 1% = 191 DL 0,1% =256

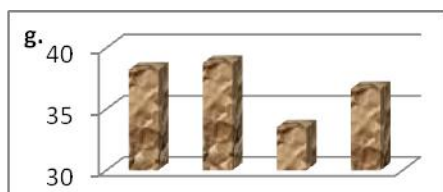


Specification	Increase according to the dose of nitrogen (kg)			
Dose of N	N ₀	N ₁₀₀	N ₁₅₀	N ₂₀₀
Increase kg/ 1 kg N s.a.	-	7,67	8,80	7,88

Fig. 1. Average yield increase value obtained for one kg N s.a., applied on a constant base of phosphorus and potassium.

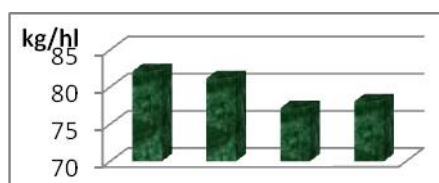
As regards the behaviour of the varieties, the highest yield was obtained for the variety Condurum, the average of the four agrifunds being of 5672 kg/ha, 7% more than the crop result obtained for the variety Grandur, the very significant difference being of 368 kg/ha. The lowest average yield was obtained for the variety Selyemdur, being of 4252 kg/ha, the difference of 1052 kg as compared to the reference variety being a very significant negative difference. The yields obtained for the varieties Grandur and Betadur were close in value, the difference being of no significance. Figure 2 presents data referring to the mass of 1000 boabe. It results that the varieties are situated between 33,50 g (Selyemdur) and 38,75 g (Condurum). To be noticed is the fact that at all varieties the mass of 1000 was situated under the limit specified for the experimented varieties, which was caused by the severe precipitation deficiencies registered in this area during the time in which seeds were formed, filled and became mature.

The hectolitre mass, shown in Figure 3, has values situated within the limits specified for the researched varieties, that is of between 77,16 kg/hl (Selyemdur) and 82,10 kg/hl (Grandur). Values of over 80 kg/hl have been registered also for the variety (81,15 kg/hl), a variety adapted to the conditions in our country.



Grandur	Condurum	Selyemdur	Betadur
38,20	38,75	33,50	36,65

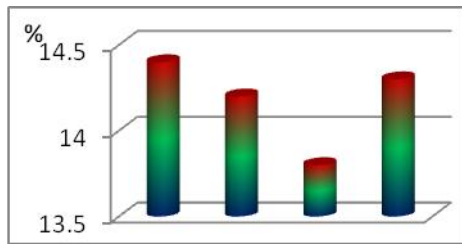
Fig 2. Mass of 1000 seeds of wheat



Grandur	Condurum	Selyemdur	Betadur
82,10	81,15	77,16	78,05

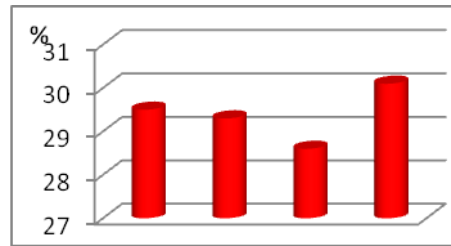
Fig 3. Hectolitre mass kg/hl

The protein content is presented in Figure 4. It results from here an amplitude of between 13,8% for the variety Selyemdur and 14,2 and 14,4% for the other three varieties. The wet gluten content was of over 28% at all four studied varieties (Figure 5). The deformation coefficient presented in Figure 6 was of 2 mm at the variety Grandur and of 3 mm at the other three varieties, and the coefficient of falling, presented in Figure 7, situated the varieties at between 373 seconds and 482 seconds. The coefficients of quality presented were affected by the climatic conditions of the year 2015, a year considered atypical for the reference area and even for the entire country.



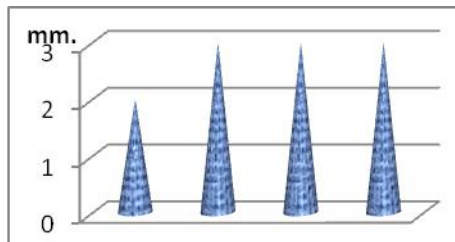
Grandur	Condurum	Selyemdur	Betadur
14,4	14,2	13,8	14,3

Fig.4. Protein content



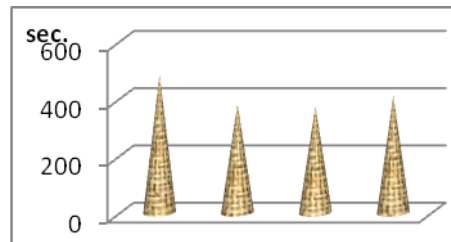
Grandur	Condurum	Selyemdur	Betadur
29,5	29,3	28,6	30,1

Fig.5. Wet gluten content (%)



Grandur	Condurum	Selyemdur	Betadur
2	3	3	3

Fig .6. Deformation coefficient (mm)



Grandur	Condurum	Selyemdur	Betadur
482	381	373	409

Fig .7. Coefficient of falling (sec.)

CONCLUSIONS

The pasta consumption in the last decades determined an increase in the researches carried out in this field and for this type of culture in our country too, as this is the only species which makes possible the production of qualitative pasta, meeting the high level of exigency on the world market. The area the researches were carried out is favourable for this species in terms of climate and of the value of the here existing soil, which motivates the extension in cultivating the best varieties in our country and in the countries with similar pedoclimatic conditions. Following varieties have distinguished themselves from among the researched varieties: Condurum and Grandur created in Romania and Betadur from Hungary. The fertilizers containing nitrogen, applied on a basis of necessary phosphorus and potassium in quantities of $N_{100} - N_{200}$, ensured an increase in yield with 767 and up to 1576 kg/ha. The most efficient dose was N_{150} , which led to an increase in yield of 31%. An increase of the dose up to N_{200} is not motivated economically. The determined gross protein content and wet gluten content guarantee the production of highest quality pasta, motivating the extension of durum wheat cultivations.

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