RESULTS REGARDING THE INFLUENCE OF GENETIC AND TECHNOLOGICAL FACTORS ON YIELD COMPONENTS AT SPRIG WHEAT

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Abstract: *The aim of our experience is to improve the cultivation technology of spring wheat through the accumulation of new knowledge that contributes to the scientific and practice basis by using the best spring varieties, which correlated by the number of sowing seed at square meter and rational fertilizing lead to increasing qualitative and quantitative production, within the limits of economic efficiency and protecting environment. In order to achieve the proposed objectives, it was organized a three factorial experience, 3A (variety) x 3B (number of sowing seeds) x 3C (doze of fertilizers) being taken into study three factors with 3 replications. The tested varieties were: Pădureni (from Romania), GK Marcius and GK Tavasz (from Hungary). Number of sowing seeds were: 250 g.s./m^2, 375 g.s/m^2 and 500g.s./m^2. They were used the following doze of fertilizers: $N_{70}P_{70}K_0$, $N_{100}P_{100}$+foliar, $N_{120}P_{120}K_0$. The paper presents the yields components on spring wheat: number of fertile tillers/plant, number of fertile spikelets/spike, number of grain /spike, thousand kernel weight (TKW). This study allow to us putting out of the phenomena that takes place during growing season and different influences of research factors on yield.*

Key words: *number of grains/spike, spring wheat, TKW, weight of grains/spike.*

INTRODUCTION

Wheat (*Triticum aestivum L.*) can be classified as winter or spring growth habit based on flowering responses to cold temperatures. Spring-types, however, do not require exposure to cold temperatures for normal development and can be planted in spring. Spring wheat, much like winter wheat, is grown for grain that can be milled into flour and for the straw. Hard red spring wheat flour is typically used for making bread and hard baked goods. Variety selection is one very important key to success in any grain production program. Spring wheat is generally planted as soon as possible in the spring when field conditions permit.

MATERIALS AND METHODS

In order to achieve the proposed objectives, it was organized a three factorial experience, 3A (variety) x 3B (number of sowing seeds) x 3C (doze of fertilizers) being taken into study three factors with 3 replications. The tested varieties were: Pădureni (from Romania), GK Marcius and GK Tavasz (from Hungary). Number of sowing seeds were: 250 g.s./m^2, 375 g.s/m^2 and 500g.s./m^2. They were used the following doze of fertilizers: $N_{70}P_{70}K_0$, $N_{100}P_{100}$+foliar, $N_{120}P_{120}K_0$ .The experience has been located in the experimental field of the University from Jucu in 2010.

Experimental variants were collected in the form of bundles by uprooting plants, then they were analyzed in the laboratory to carry out the following determinations and analysis: height of plants, number of tiller/plant, length of principal spike, number of total and fertile spikelets/spike, mass of plant, weight of principal spike, number of grain/spike, thousand kernel weight (TKW), weight of grains/spike harvest index, protein content and wet gluten

content. for each of 81 experimental variants were made less 10 analyses, releasing more than 1000 analyses.

In this paper we present the influence of research factors on principal components of production at spring wheat, respectively: thousand kernel weight (TKW), number of grain/spike and weight of grains/spike.

RESULTS AND DISCUSSIONS

Thousand kernel weight (TKW) is an element of productivity with high implication on quality, because on it depend the size of embryo and quantity of reserve substances for germination seed. TKW is in close connection with production because large-grain varieties may have a higher production capacity. The three genotypes of spring wheat tested were classified in the group of small and medium-sized mass of the grains. In *table 1* notice that two of the cultivars have close values for this index, Pădureni, considered as local check because it is the variety better adapted to local conditions and GK Március. The third variety, GK Tavasz, has mass of 1000 grains with 4,39 g less than the Pădureni.

Table 1

The influence of factor A (variety) on Thousand Kernel Weight at spring wheat in 2010

Symbol	Variant	Thousand Kernel Weight (g)	Different from A_1	Significance of difference
A_1	Pădureni	37,27	Check variant	-
A_2	GK Március	37,96	+ 0,69	-
A_3	GK Tavasz	32,88	- 4,39	000
LSD p 5%			0,88	
LSD p 1%			1,47	
LSD p 0,1%			2,75	

The results presented in *table 2* highlights once again the close proximity of the varieties Pădureni and GK Március regardless TKW, indifferent the variant of density. The GK Tavasz values obtained for TKW were between 32,03 and 34,07 grams, the greater value being obtained at 250 gs/m^2 density. The obtained results allow us to affirm that the wheat production can be increased by increasing the mass of 1000 grains, confirming the results obtained by Protic *& colab.* (2007) and Khalil *& colab.* (2010).

Table 2

The influence of interaction of factors A (variety) and B (number of sowing seeds) on thousand kernel weight at spring wheat varieties tested on Jucu (Cluj-Napoca) in 2010

Symbol	Variant	Thousand Kernel Weight (g)	Different from check variant	Significance of difference
A_1x B_1	Pădureni x 250 gs/sm	36,96	Check variant	-
A_2 x B_1	GK Március x 250 gs/sm	37,48	+ 0,52	-
A_3 x B_1	GK Tavasz x 250 gs/sm	34,07	- 2,89	000
A_1 x B_2	Pădureni x 375 gs/sm	37,97	Check variant	-
A_2 x B_2	GK Március x 375 gs/sm	38,50	+ 0,53	-
A_3 x B_2	GK Tavasz x 375 gs/sm	32,54	-5,42	000
A_1 x B_3	Pădureni x 500 gs/sm	36,88	Check variant	-
A_2 x B_3	GK Március x 500 gs/sm	37,89	+ 1,01	-
A_3 x B_3	GK Tavasz x 500 gs/sm	32,03	-4,84	000

LSD p 5%	1,06
LSD p 1%	1,47
LSD p 0,1%	2,07

The number of grains /spike is an important component in the production of spring wheat. This component is dependent on the capacity of differentiation of fertile spikelets in spike and the level of nutrition that the plants had in that time. The largest number of grains per spike was obtained from the GK Tavasz, followed by the Pădureni, the fewest being obtained from GK Marcius.The average number of grains /spike was 42,63 to Pădureni, 39,57 at GK Marcius and 47,14 at GK Tavasz (*table 3*).

Table 3

The influence of factor A (variety) on number of grains/spike at spring wheat

Symbol	Variant	Number of grains/spike	Different from A_1	Significance of difference
A_1	Pădureni	42,63	Check variant	-
A_2	GK Március	39,57	-3,06	00
A_3	GK Tavasz	47,14	+4,50	**
LSD p 5%			1,74	
LSD p 1%			2,88	
LSD p 0,1%			5,39	

As described earlier, the number of grains on spike depends on the level of nutrition that the plants had in that time. On the level of fertilization $N_{120}P_{120}K_0$ is obtained the largest number of grains in spike, an average of 3.11 grains rather than the level of fertilization $N_{70}P_{70}K_0$ (*table 4*).

Table 4

The influence of factor C (fertilization) on number of grains/spike at spring wheat

Symbol	Variant	Number of grains/spike	Different from C_1	Significance of difference
C_1	$N_{70}P_{70}K_0$	41.64	Check variant	-
C_2	$N_{100}P_{100}$+foliar	42.95	+ 1,31	xx
C_3	$N_{120}P_{120}K_0$	44.75	+ 3,11	xxx
LSD p 5%			0,74	
LSD p 1%			1,00	
LSD p 0,1%			1,32	

Factor B density (number of germination seeds/sm) has a much smaller influence on the number of grains in spike, but it appears that at 500 gs. /sm the number of grains is reduced, this being due to the reduction of space for plant nutrition (*table 5*).

Table 5

The influence of factor B density (number of germination seeds / square meter) on number of grains/spike at spring wheat

Symbol	Variant	Number of grains/spike	Different from B_1	Significance of difference
B_1	250 g.s./sm	43,29	Check variant	-
B_2	375 g.s./sm	44,11	+0,82	-
B_3	500 g.s./sm	41,94	-1,34	00

LSD p 5%	0,84
LSD p 1%	1,18
LSD p 0,1%	1,67

Were also identified interactions between the research factors that influenced number of grains /spike. Among them are noteworthy interactions AxB (variety x density) and CxA (fertilization x variety). At Pădureni variety, the largest number of grains in spike was obtained with the density of 375 g.s. /sm and the lowest number with density of 500g.s./ sm (*table 6*). It is worth noting the GK Tavasz variety, where number of grains / spike has not varied much according to their density, obtaining more than 46 grains/spike.

Table 6

The influence of interaction of factors A(variety) and B (density of sowing) on number of grains/spike at spring varieties tested on Jucu (Cluj-Napoca) in 2010

Symbol	Variant	Number of grains/spike	Different from Check variant	Significance of difference
A_1x B_1	Pădureni x 250 g.s./sm	43,84	Check variant	-
A_2 x B_1	GK Március x 250 g.s./sm	38,11	-5.73	000
A_3 x B_1	GK Tavasz x 250 g.s/sm	47,91	+4.07	**
A_1 x B_2	Pădureni x 375 g.s./sm	44,59	Check variant	-
A_2 x B_2	GK Március x 375 g.s./sm	41,31	-3,28	00
A_3 x B_2	GK Tavasz x 375 g.s./sm	46,42	+1,83	-
A_1 x B_3	Pădureni x 500 g.s./sm	39,47	Check variant	-
A_2 x B_3	GK Március x 500 g.s./sm	39,29	-0,18	-
A_3 x B_3	GK Tavasz x 500 g.s./sm	47,08	+7,61	***
LSD p 5%			2,10	
LSD p 1%			3,27	
LSD p 0,1%			5,62	

Another interesting interaction between research factors is that of which I have found the effect that fertilization had on the number of grains/spike for each variety, respectively CxA. Again the GK Tavasz variety stands out, in which the number of grains/spike in very little depending on the variant of fertilization (*table7*).

Table 7

The influence of interaction of factors C(fertilization) and A (variety) on number of grains/spike at spring varieties tested on Jucu (Cluj-Napoca) in 2010

Symbol	Variant	Number of grains/spike	Different from Check variant	Significance of difference
C1- $N_{70}P_{70}K_0$	PĂDURENI	40,63	Check variant	-
C2 - $N_{100}P_{100}$+foliar		42,57	+ 1,93	xx
C3 - $N_{120}P_{120}K_0$		44,70	+ 4,07	xxx
C1- $N_{70}P_{70}K_0$	GK MÁRCIUS	37,49	Check variant	-
C2 - $N_{100}P_{100}$+foliar		40,07	+ 2,58	xxx
C3 - $N_{120}P_{120}K_0$		41,16	+ 3,67	xxx
C1- $N_{70}P_{70}K_0$	GK TAVASZ	46,79	Check variant	-
C2 - $N_{100}P_{100}$+foliar		46,22	-0,57	-
C3 - $N_{120}P_{120}K_0$		48,40	+ 1,61	x
LSD p 5%			1,29	

LSD p 1%	1,73
LSD p 0,1%	2,28

Weight of grains/spike is a very important component, depending on the genes, the plasticity of the variety, but in the large measure depend the climatic factors from period of filing grains. A particularly important factor contributing to the reduction of grain weight are diseases, in particular those of spike. The average weight of the grains/spike was 1.62 g to Pădureni, the other two varieties had values close of this as can seen from the *table 8*. This means that were not differences between the three varieties tested in this experience regarding the character weight of grain per spike.

Table 8

The influence of factor A (variety) on weight of grains/spike at sprig wheat

Symbol	Variant	Weight of grains/spike (grams)	Different from A_1	Significance of difference
A_1	Pădureni	1,62	Check variant	-
A_2	GK Március	1,50	-0,12	-
A_3	GK Tavasz	1,57	-0,05	-
LSD p 5%			0,12	
LSD p 1%			0,20	
LSD p 0,1%			0,37	

Weight of grain/spike is also influenced by the density of sowing and the level of nutrition of plants. As can be seen from the data in *table 9* low density of sowing has produced the greatest weight of the grains/spike. To density of 500 b. g. /m2 were obtained differences very significant but negative comparative to other densities.

Table 9

The influence of factor B (density) on weight of grains/spike at sprig wheat

Symbol	Variant	Weight of grains/spike (grams)	Different from B_1	Significance of difference
B_1	250 g.s./m^2	1,60	Check variant	-
B_2	375 g.s./m^2	1,60	0,00	-
B_3	500 g.s./m^2	1,47	-0,13	000
LSD p 5%			0,06	
LSD p 1%			0,08	
LSD p 0,1%			0,11	

Fertilizing factor has contributed to increase weight of grains per spike with 0.09 and 0.17 grams with differences significant and very significant positive (*table 10*).

Table 10

The influence of factor C (fertilization) on weight of grains/spike at sprig wheat

Symbol	Variant	Weight of grains/spike (grams)	Diferența față de S1	Semnificația
C_1	$N_{70}P_{70}K_0$	1,47	Mt.	-
C_2	$N_{100}P_{100}$+foliar	1,56	+ 0,09	x
C_3	$N_{120}P_{120}K_0$	1,64	+ 0,17	xxx

LSD p 5%	0,07
LSD p 1%	0,10
LSD p 0,1%	0,13

Research in this area have been reported by other researchers at the autumn wheat (BÂLTEANU, 1991; KADAR , 2002; MOLDOVAN, 1999).

CONCLUSIONS

Thousand kernel weight is primarily influenced by the genetic factor, respectively variety in our study, followed by interaction AxB (variety x density), than the density and less by fertilization.

Pădureni and GK Március varieties have close values for TKW, and GK Tavasz has mass of 1000 grains with 4,39 g less than the Pădureni, respectively 32,88 grams; the highest values for TKW being obtained at 500 g.s./sm.

From studied factors, the most important influnce on number of grains/spike hasd variety, than fertilization, A X B interaction (variety x density) and the last density factor. The average number of grains /spike was 42,63 to Pădureni, 39.57 to GK Marcius and 47,14 at GK Tavasz

Density factor has a much smaller influence on the number of grains/spike, but it is worth noting that at density of 500 g.s. /m^2 number of grains is reduced, this being due to the reduction of space for plant nutrition.

The average weight of grains/spike at Pădureni variety was 1.62 grams, the other two varieties had values for this character quite close to this.

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