RESEARCHES CONCERNING THE VARIABILITY OF FERTILE TILLERS NUMBER FOR THE SOMACLONED AND GAMETOCLONES OF THE WHEAT CULTIVAR DROPIA

CERCETĂRI PRIVIND VARIABILITATEA NUMĂRULUI DE FRAȚI FERTILI LA SOMACLONELE ŞI GAMETOCLONELE SOIULUI DROPIA

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Summary: *The biological material used for these studies was represented of 18 wheat somaclones and 7 gametoclones, material that was obtained in vitro by the culture of two explants types, anthers and immature embryos. The control was constituted by the cultivar Dropia. The somaclones and gametoclones of the cultivar Dropia were studied in two comparative cultures as for the randomized blocks by three repetitions. Comparing the results obtained for the cultivar Dropia's somaclones and gametoclones on observed that the average somaclones fertile tillers number is superior to the gametoclones', but both are inferior to the control for this character.*

Rezumat: *Materialul biologic experimentat a fost reprezentat de 18 somaclone şi 7 gametoclone, material obţinut prin cultura in vitro a două tipuri de explante, antere şi embrioni imaturi, la care s-a adăugat soiul Dropia folosit ca martor. Somaclonele şi gametoclonele obţinute din soiul Dropia au fost studiate în două culturi comparative aşezate după metoda blocurilor randomizate pe trei repetiţii. Din studiul comparativ al somaclonelor şi gametoclonelor soiului Dropia, se observă că numărul mediu de fraţi fertili este superior la gametoclone faţă de somaclone, dar în ambele situaţii inferior martorului.*

Key words: *fertile tillers number, somaclones, gametoclones, variability*
Cuvinte cheie: *număr de fraţi fertili, somaclone, gametoclone, variabilitate*

INTRODUCTION

Wheat is one of the most important crop in the world, being cultured in over 100 countries represents an important source of commercial changes. Wheat is an important source of carbohydrates, proteins, it's easy to store and transport, has a high ecological plasticity, a good mechanization capacity and other important characters that make it a desirable crop.

The capacity of producing tillers is an important character for cereals, plant productivity depending on it. Tillering capacity is expressed by the tillers number produced by one plant and is dependent of internal factors, such as specie or cultivar and external factors as the pedological and climatic conditions or the technology applied.

New intensive wheat cultivars have a better capacity of producing tillers comparing with the old cultivars. Wheat is characterized, in general, by a good tillering capacity; tat has to not overcome 3 or 4 tillers per plant. A too high tillers per plant number would be damaging because the lateral tillers would consume a greater assimilates quantity to the principal tiller disadvantage, but they produce lower than the principal tiller.

In vitro cultures are often used to induce genetic variability. This study wanted to find out if the number of fertile tillers per plant character was influenced by the somaclonal variability that might appear during *in vitro* culture, the biological material of this study being obtained by regeneration from the culture of two explants types, anthers and immature embryos.

MATERIAL AND METHODS

The biological material obtained by *in vitro* culture of two types of explants, anthers and immature embryos, was studied during three years in the experimental field of the Plants Breeding Department of Horticulture Faculty, Timisoara. Seeding was realized at the normal wheat culture distance between rows of about 12.5 cm. the culture method was one somaclone or gametoclone per row. Sowing was done manually at 5-6 cm between grains/row. Thirty plants were choused randomized for each somaclone and gametoclone respectively and biometric measurements were done for the character fertile tillers number.

Data obtained were statistically processed determining the average, the standard deviation and the variability coefficient.

RESULTS AND DISCUSSION

Analyzes on the results registered in the table 1 show that cultivar's Dropia gametoclones variability limits for tillering capacity character were low being between 1,83 tillers per gametoclone 1 and 1,97 tillers for the gametoclone 2. A great variability was observed inside each Dropia gametoclone.

Table 1

Estimative values concerning the number of fertile tillers for Dropia's gametoclones analyzed in the experimental period (2000-2003)

Nr. crt.	Genotype	2000-2001		2001-2002		2002-2003		2000-2003 Average	
		$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$
1	Control	1,96+ 0,10	28,27	1,96 + 0,10	28,27	1,96 + 0,10	28,27	1,96 + 0,10	28,27
2	Gametoclone 1	1,63 ± 0,11	33,68	1,93 ± 0,11	33,08	1,93 ± 0,14	40,60	1,83 ±0,07	35,63
3	Gametoclone 2	1,86 ± 0,12	34,00	2 ± 0,12	34,74	2,06 ± 0,13	35,79	1,97 ±0,07	34,55
4	Gametoclone 3	1,96 ± 0,11	33,68	2 ± 0,12	34,74	1,93 ± 0,14	40,59	1,96 ±0,07	36,20
5	Gametoclone 4	1,86±0,121	34,83	2,10 ± 0,14	36,13	1,93 ± 0,14	40,60	1,96 ±0,07	37,11
6	Gametoclone 5	1,90 ±0,12	34,83	1,90 ± 0,13	37,47	1,96 ± 0,14	38,89	1,92 ±0,07	36,76
7	Gametoclone 6	1,90 ± 0,11	33,90	1,93 ± 0,12	35,76	2,03 ± 0,14	37,61	1,95 ±0,07	35,93
8	Gametoclone 7	1,80 ± 0,13	35,33	1,90 ± 0,13	39,94	1,93 ± 0,13	38,26	1,88 ±0,07	37,48
Gametoclones average		1,84±0,04	5,78	1,96±0,02	3,66	1,97±0,02	2,83	1,92±0,02	4,09

Regarding this character, can be observed, from the table 2, that cultivar Dropia's somaclones have the average variability limits between 1,72 tillers for the somaclone 1 and 2,02 tillers for the somaclone 17. these results show a low variability between the cultivar Dropia's somaclones studied regarding the number of tillers per plant, that certify a good uniformity between them.

Data presented in the table 2 show the existence of a high variability inside each somaclone of the cultivar Dropia.

Comparing the results obtained of the somaclones with the control constituted by the cultivar Dropia can be observed that excepting the somaclone 1 that is significant inferior than the control, all the somaclones presented no significant values comparing with the control.

The gametoclone 1 results are significant inferior to the control whilst the other gametoclone present no significant differences comparing with the control and between them regarding the number of fertile tiller per plant character, data shown in the table 4.

Table 2

Estimative values concerning the number of fertile tillers for Dropia's somaclones analyzed in the experimental period (2000-2003)

	Genotype	2000-2001		2001-2002		2002-2003		Media 2000-2003	
		$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$
1	Control	1,96 ± 0,10	28,27	1,96±0,10	28,27	1,96 ±0,10	28,27	1,96 ±0,10	28,27
2	Somaclone 1	1,63 + 0,15	52,05	1,76+0,09	28,52	1,76 +0,11	35,43	1,72 + 0,07	38,95
3	Somaclone 2	1,63 + 0,21	53,91	1,83±0,11	35,33	1,83 ±0,14	43,17	1,76 ± 0,09	46,57
4	Somaclone 3	2,2 ± 0,10	32,16	1,76±0,10	32,16	1,93 ±0,12	35,76	1,96 ±0,06	33,49
5	Somaclone 4	1,76 ± 0,1	28,82	1,9 ± 0,10	28,82	2,03 ±0,12	32,88	1,90 ± 0,06	30,21
6	Somaclone 5	1,9 ± 0,09	26,93	1,76±0,11	35,43	2,06 ±0,12	33,45	1,91 ± 0,06	32,36
7	Somaclone 6	1,93 ± 0,12	34,74	1,73±0,12	39,89	1,66 ±0,12	39,65	1,77 ±0,07	38,34
8	Somaclone 7	2 ± 0,15	40,04	1,83±0,13	40,72	1,70 ±0,12	38,30	1,84 ±0,07	40,31
9	Somaclone 8	2,06 ± 0,14	36,52	1,80±0,14	44,73	1,80 ±0,14	44,73	1,89 ± 0,08	42,16
10	Somaclone 9	2,16 ± 0,17	43,69	1,90±0,18	54,15	1,80 ±0,13	39,68	1,95 ±0,09	46,64
11	Somaclone 10	2,20 ± 0,19	50,56	1,73±0,13	42,67	1,76 ±0,11	35,43	1,90 ±0,08	44,85
12	Somaclone 11	2,10 ± 0,12	33,45	1,76±0,13	41,20	1,80 ±0,11	33,90	1,89 ± 0,07	36,43
13	Somaclone 12	2,06± 0,15	38,49	1,93±0,17	50,70	1,86 ±0,10	30,60	1,95 ±0,08	41,05
14	Somaclone 13	2,20± 0,14	37,61	1,73±0,14	45,28	1,90 ±0,13	37,47	1,94 ±0,07	40,03
15	Somaclone 14	2,03 ± 0,15	43,23	1,73±0,13	44,10	1,80± 0,11	33,90	1,85 ± 0,07	40,78
16	Somaclone15	1,96 ± 0,14	36,13	1,70±0,13	41,30	1,96 ±0,11	31,26	1,87 ±0,07	36,76
17	Somaclone 16	2,10 ± 0,15	36,51	2 ± 0,16	45,48	1,93 ±0,11	33,08	2,01 ±0,08	38,92
18	Somaclone 17	2,26 ± 0,14	36,53	1,80±0,16	49,26	2 ± 0,13	37,14	2,02 ±0,08	40,93
19	Somaclone 18	2,16 ± 0.13	43.98	1.53±0,12	44.44	1.90 ±0.12	34.83	1,86 ±0.07	41,29
Somaclones average		2,02±0,04	9,34	1,78±0,02	5,84	1,86±0,02	6,00	1,88±0,02	7,06

Table 3

Experimental results concerning the number of fertile tillers for Dropia's somaclones obtained in the experimental period (2000-2003)

Genotype	Average	Relative value toward the control	Difference toward the control	Significance
Control	1,96	100,00	0,00	Control
Somaclone 1	1,72	87,59	-0,24	o
Somaclone 2	1,76	89,97	-0,20	-
Somaclone 3	1,96	100,17	0,00	-
Somaclone 4	1,90	96,77	-0,06	-
Somaclone 5	1,91	97,28	-0,05	-
Somaclone 6	1,77	90,48	-0,19	-
Somaclone 7	1,84	94,05	-0,12	-
Somaclone 8	1,89	96,26	-0,07	-
Somaclone 9	1,95	99,66	-0,01	-
Somaclone 10	1,90	96,77	-0,06	-
Somaclone 11	1,89	96,26	-0,07	-
Somaclone 12	1,95	99,49	-0,01	-
Somaclone 13	1,94	99,15	-0,02	-
Somaclone 14	1,85	94,56	-0,11	-
Somaclone 15	1,87	95,58	-0,09	-
Somaclone 16	2,01	102,55	0,05	-
Somaclone 17	2,02	103,06	0,06	-
Somaclone 18	1,86	95,07	-0,10	-

$DL_{5\%} = 0,23$ $DL_{1\%} = 0,30$ $DL_{0,1\%} = 0,40$

The character the number of fertile tillers per plant is a very important character that can influence plant productivity. This character is determined by genes and their allele situated in the chromosomes 1B, 2A and 2B.

A very important element of crops yield is the number of spices at the surface unit that depends of the tillering capacity and fertile tillers production per plant. The productive cultivars develops around 300-400 fertile tillers per square meter. In our case most of the somaclones and gametoclones developed around 350 fertile tillers/m^2.

Table 4

Experimental results concerning the number of fertile tillers for Dropia's gametoclones obtained in the experimental period (2000-2003)

	Genotype	Average	Relative value toward the control	Difference toward the control	Significance
1	Control	1,96	100,00	0,00	Control
2	Gametoclone 1	1,83	93,37	-0,13	o
3	Gametoclone 2	1,97	100,68	0,01	-
4	Gametoclone 3	1,96	100,17	0,00	-
5	Gametoclone 4	1,96	100,17	0,00	-
6	Gametoclone 5	1,92	97,96	-0,04	-
7	Gametoclone 6	1,95	99,66	-0,01	-
8	Gametoclone 7	1,88	95,75	-0,08	-

$DL_{5\%} = 0,12$ $DL_{1\%} = 0,17$ $DL_{0,1\%} = 0,24$

Genetic determinism of this character is not very well known being determined by multiple genes action. The fertile tillers per plant number character is a component of the yield capacity conditioned, as the others components, by hereditary and external factors.

CONCLUSIONS

1. The variability existing between the studied gametoclones is low determining a interesting uniformity regarding the fertile tillers number per plant, but inside each gametoclone there is a great variability.

2. Only one gametoclone is significantly inferior to the control, regarding the number of fertile tillers per plant character, the other gametoclones presenting no significant differences comparing with the control.

3. Dropia's somaclones present an accentuate uniformity regarding the number of fertile tillers per plant, proving that somaclonal variation did not affect this character.

4. The somaclone 1 is significantly inferior to the control regarding this character, the other somaclones presenting no statistically demonstrated differences comparing with the control.

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