PHENOTIPICAL STUDY OF CERTAIN MAIZE HYBRIDS AND THEIR PARENTAL FORMS (INBRED LINES) DIFFERENTIATED THROUGH CYTOPLASM

Camelia CHICINAŞ[1], I. HAŞ[1, 2], Voichiţa HAŞ[2], Teodora ŞCHIOP[1], I. COSTE[1], Agnes BORS[1]

[1]University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca
[2] Agricultural Research and Development Station Turda
3-5 Mănăştur Street, Postcode 400372, Cluj-Napoca, Romania,
Corresponding author: camelia_chicinas@yahoo.com

Abstract: *This paper presents the study on single cross hybrids of maize and their parental forms (inbred lines), at a density of 60.000 plants/ hectare. During the period of vegetation were performed phenotypic observations for on six characteres (plant height, height of insertion of main ear, number of branches/ tassel, the total number of leaves/ plant, leaf length of the main ear, leaf width of the main ear), on a number of 5 plants from the central rows of each plot. Based on values obtained from leaf length of the main ear and leaf width of the main ear, it was determinated the foliar area of the leaf of the main ear. Plants were harvested individually to determine the ear weight, grain weight, ear length, kernel row number/ ear, kernel number/ row, ear diameter, rachides diameter, the thousand kernel weight. Based on the obtained values were also determined kernel depth and kernel yield/ plant.*

Key words: *cytoplasm, phenotypical variability, single cross, inbred lines*

INTRODUCTION

This paper presents the study on single cross hybrids of maize and their parental forms (inbred lines), at a density of 60.000 plants/ hectare. Genetic diversity is the basis for maize breeding (HALLAUER AND MIRANDA, 1988). Ear length, ear diameter, number of kernel rows/ear, kernel number/ row and thousand kernel weight are the most important yield components of grain yield in maize. These yield characters are significantly correlated with maize grain yield (AUSTIN AND LEE, 1998). Maize grain yield combining ability has been studied intensively and the results have been widely used in maize breeding programs(FAN ET AL., 2004; MELANI AND CARENA, 2005; BARATA AND CARENA, 2006). Limited research, however, has been reported on maize yield component traits combining abilities and the relationship between grain yield combining ability and yield component traits combining abilities (FAN ET. AL, 2008).

MATERIAL AND METHODS

Experimentats were performed under natural conditions, witout irrigation, in field research of ARDS Turda, in 2009. The experimental model was a comparative polifactorial settlement with plots. Eight of comparative cultures were each 21 plots, four of them had 28 plots and one of them had 30 plots. The plot consists of two rows of 5 m long each, with a distance of 70 cm between rows, 23,7 cm distance between plants in a row, 23 plants in a row, to obtain a density of 60.000 plants/ hectare. Sowing took place between April 24 to 27, 2009 and harvesting between September 28 and October 5, 2009. During the period of vegetation were performed phenotypic observation for a total of six characteres (plant height, height of insertion of main ear, number of branches/ tassel, the total number of leaves/ plant, leaf length of the main ear, leaf width of the main ear), at a number of 5 plants from the central rows of each plot. Based on values obtained from leaf length of the main ear and leaf width of the main

ear, it was determinated the foliar area of the leaf of the main ear. Plants were harvested individually to determine the ear's weight, kernel's weight, ear's length, number of rows/ ear, kernel number/ row, ear's diameter, rachides's diameter, mass of a thousand grains. Based on the obtained values were also determined kernel number/ ear, kernel's depth and kernel yield/ plant. In determing the existence of phenotypic differences between inbred isonuclear lines obtained by transformation through backross of the genotypes TC 209, TC 243, TC 221, TC 367 and D 105, the nucleus of each of these inbred lines was transformed by backross on 14 cytoplasms (A 665, T 291, W 633, TB 329, TC 243, TC 208, TC 177, TC 221, D 105, K 1080, K 2051, TC 209, TC 316).

RESULTS AND DISCUSSIONS

In what follows will be highlighted the phenotyipic characteristics of plants and ears of maize single crosses and their parental forms (inbred lines) with differentiated cytoplasm. The phenotypically aspects after biometrics measurements performed both single crosses and parental forms were observed the following:

As can be seen in table 1, in terms of plant's height, the average value reported for single crosses was 245,3 cm, and in case of inbred lines of 174,4 cm. The height of insertion of the main ear had average value of 83,5 cm in case of single crosses and 58,6 cm in case of inbred lines. The number of branches/ tassel on average value, ranged between 9,8 and 18,0 in case of single crosses, respectively 6,8 and 13,8 in case of inbred lines. The number of leaves/ plant in average value was 13,0 for single crosses and 12,4 in case of inbred lines. The leaf's length of the main ear had average values between 75,7 cm and 87,5 cm in case of single crosses, respectively 67,9 cm and 74,3 cm for inbred lines. The leaf's width of the main ear had average values between 9 cm and 11,8 cm in case of single crosses, respectively 8,1 cm and 10,0 cm in case of inbred lines. Foliar ear of the main ear recorded in average values was 600,5 cm^2 in case of single crosses and 430,9 cm^2 in case of inbred lines. Ear's weight had average value of 189,4 g in case of single crosses and 91,9 g in case of inbred lines. Kernel's weight ranged between 140,3 g and 169,8 g in case of single crosses, respectively 87,7 and 61,5 in case of inbred lines. Ear's length recorded in average value was 19,3 cm in case of single crosses and 14,6 cm in case of inbred lines. The number of rows/ ear had average values between 13,2 and 17,9 in case of single crosses, respectively 13,4 and 17,8 in case of inbred lines. Kernel number/ row had average value of 39,7 in case of single crosses and 29,4 in case of inbred lines. Ear's diameter ranged between 4,1cm and 4,6 cm in case of single crosses and 3,4 cm and 4,1cm in case of inbred lines. Rachide's diameter had average value of 2,6 cm in case of single crosses and 2,3 cm in case of inbred lines. Mass of a thousand grains recorded in average value was 278,8 g in case of single crosses and 201,3 g in case of inbred lines. Kernel number/ ear recorded in average value was 620 in case of single crosses and 464,6 in case of inbred lines. Kernel's depth in average value was 0,9 cm in case of single crosses and 0,7 cm in case of inbred lines. Kernel yield/ plant ranged between 81,7 % and 83,7% in case of single crosses and 79,8 % in case of inbred lines.

In table 2 and table 3 is found as if the line TC 209, by changing the cytoplasm with T 291, the plant height was reduced with 10 cm from the original line. Changing the cytoplasm with W 633 was favorable in terms of plant's height, boosting its line of 4 cm from the original one. By change the cytoplasm with T 291, is a noticeable loss of height of insertion of the main ear with 5 cm from the original line. By changing the cytoplasm with A 665, the number of branches/ tassle increased from the original line and decreased by changing the cytoplasm with T 248.

Table 1

The phenotypic characterization of plants and ears for single crosses

	601*	602*	603*	604*	605*	606*	607*	608*	609*	610*	612*	613*	Single cross average	Inbred line average
Plant's height(cm)	243,9	245,6	230,7	230	257,5	261	237,4	238,8	252,7	251,5	174,3	174,5	244,9	174,4
Height of insertion of the main ear(cm)	79,5	80,4	70,4	73,8	90	90,2	82	79,6	87,3	88,1	57,4	59,7	82,1	58,6
Number of branches/ tassel	10	10,4	9,8	11,2	16,4	18	12,4	9,9	14,9	11,6	6,8	13,8	12,5	10,3
Number of leaves/ plant	13	12,8	13	12,8	13,5	13,3	13,7	13,7	11,8	11,7	12,5	12,3	12,9	12,4
Leaf's length of the main ear(cm)	82,2	83,3	79,3	80,5	81,5	83,1	75,7	78,7	87,5	87,3	67,9	74,3	81,9	71,1
Leaf's width of the main ear (cm)	9,4	9,7	10,3	10,3	11,8	10,2	9,6	9,7	9	9,6	8,1	8,1	10,0	8,1
Foliar area of the main ear (cm^2)	581	606,6	613,5	625	623,5	638,1	543	574	589	623,1	411,5	450,2	601,7	430,9
Ear's weight (g)	196,3	193,0	208,0	209,5	184,1	197,8	168,6	176,1	174,8	185,4	106,9	77,0	189,4	91,9
Kernel's Weight(g)	165,2	161,6	169,8	174,5	150,6	162,1	140,3	146,8	144,0	149,2	87,7	61,5	156,4	74,6
Ear's length (cm)	19,4	19,4	20,1	19,5	20,3	20,8	19,0	19,4	17,5	17,8	14,3	14,8	19,3	14,6
Number of rows/ ear	17,5	17,9	16,5	16,4	15,57	15,8	15,0	15,0	13,3	13,2	17,8	13,4	15,6	15,6
Kernel number/ row	40,6	40,2	41,3	41,1	39,5	41,7	38,2	38,5	37,8	37,8	31,2	27,6	39,7	29,4
Ear's diameter (cm)	4,5	4,5	4,6	4,6	4,2	4,3	4,1	4,2	4,2	4,3	4,1	3,4	4,4	3,7
Rachide's diameter (cm)	2,6	2,5	2,6	2,6	2,6	2,6	2,4	2,4	2,5	632,1	2,4	2,2	65,5	2,3
Mass of a thousand grains (g)	249,8	249,9	283,2	276,4	263,4	274,9	276,8	279,3	312,3	322,4	198,7	203,9	278,8	201,3
Kernel number/ ear	703,8	715,6	675,8	673,3	615,1	659,7	571,6	579,0	505,4	501,2	554,4	374,7	620,0	464,6
Kernel's depth (cm)	1,0	1,0	1,0	1,0	0,8	0,8	0,9	0,9	0,9	0,9	0,8	0,6	0,9	0,7
Kernel yield/ plant (%)	83,5	83,7	83,0	83,4	81,9	82,1	83,2	83,4	82,3	81,7	82,0	79,8	82,8	80,9

- trials number

Table 2

The phenotypic characterization of plants at TC 209 inbred line with diversified cytoplasm

No.	The name of maize inbred line with differentiated cytoplasm	Plant's height (cm)	Height of insertion of the main ear (cm)	Number of branches/ tassel	Number of leaves/ plant	Leaf's length of the main ear (cm)	Leaf's width of the main ear (cm)	Foliar area of the main ear (cm^2)
1.	TC 209	181,1	64,9	6,2	12,8	73,0	7,6	415,2
2.	TC 209 (cit. A665)	178,0	62,6	7,3	12,2	73,2	7,5	412,7
3.	TC 209 (cit. T 291)	171,1	59,9	6,3	12,1	72,2	7,3	392,8
4.	TC 209 (cit. T 248)	179,7	62,7	5,8	12,5	71,4	7,7	410,0
5.	TC 209 (cit. W 633)	185,1	62,2	5,6	12,3	76,5	7,0	397,6
6.	TC 209 (cit. TC 177)	182,3	66,4	6,3	12,6	72,9	7,3	397,1
7.	TC 209 (cit. D 105)	177,7	62,5	6,3	12,4	70,6	7,4	392,2

Table 3

The phenotypic characterization of ears at TC 209 inbred line with diversified cytoplasm

No.	The name of maize inbred line with differentiated cytoplasm	Ear's weight (g)	Kernel's weight (g)	Ear's length (cm)	Number of rows/ ear	Kernel number/ row	Ear's diameter (cm)	Rachides's diameter (cm)	Mass of a thousand grains (g)	Kernel number/ ear	Kernel's depth (cm)	Kernel yield/ plant (%)
1.	TC 209	121,33	100,67	15,00	18,80	31,93	4,25	2,39	214,59	599,95	0,93	82,95
2.	TC 209 (cit. A665)	105,25	86,67	13,93	19,83	31,68	4,18	2,39	173,49	629,02	0,89	82,33
3.	TC 209 (cit. T 291)	93,75	79,58	12,38	18,92	25,42	4,08	2,24	190,12	480,29	0,92	84,95
4.	TC 209 (cit. T 248)	113,00	91,33	14,38	19,83	31,48	4,08	2,33	189,32	626,13	0,88	80,75
5.	TC 209 (cit. W 633)	102,67	84,00	13,97	20,40	28,60	3,98	2,26	183,17	582,91	0,86	81,83
6.	TC 209 (cit. TC177)	123,00	102,42	14,93	19,70	33,10	4,13	2,38	202,13	651,87	0,87	83,31
7.	TC 209 (cit. D 105)	102,78	82,92	14,03	18,67	29,94	4,01	2,24	199,23	559,06	0,89	80,78

The foliar area of the leaf of the main ear increased by changing the cytoplasm with A 665 from the original line. By changing the cytoplasm with T 291 is observed a decrease in ear's weight with 27,9 g from the original line. Grain's weight decreased by 14 g compared with the original line, by changing the cytoplasm with A 665, the same cytoplasm leading to lower ear length, from the original line.

Table 4

The phenotypic characterization of plants at TC 243 inbred line with diversified cytoplasm

No.	The name of maize inbred line with differentiated cytoplasm	Plant's height (cm)	Height of insertion of the main ear (cm)	Number of branches/ tassel	Number of leaves/ plant	Leaf's length of the main ear (cm)	Leaf's width of the main ear (cm)	Foliar area of the main ear (cm^2)
1.	TC 243	146,9	35,0	5,8	11,7	60,5	7,9	360,2
2.	TC 243 (cit. A 665)	159,0	45,2	4,3	11,6	61,0	8,7	396,6
3.	TC 243 (cit. T 248)	157,8	42,0	5,5	12,3	64,1	8,6	414,9
4.	TC 243 (cit. TC 208)	163,3	49,0	5,5	12,2	60,5	8,6	392,0
5.	TC 243 (cit. TC 221)	154,7	42,8	6,6	11,6	61,5	8,8	405,7
6.	TC 243 (cit. K 1080)	153,3	39,9	6,0	11,6	63,1	8,4	398,8
7.	TC 243 (cit. K 2051)	156,6	42,8	5,8	11,9	60,2	8,5	385,6

Table 5

The phenotypic characterization of ears at TC 243 inbred line with diversified cytoplasm

No.	The name of maize inbred line with differentiated cytoplasm	Ear's weight (g)	Kernel's weight (g)	Ear's length (cm)	Number of rows/ ear	Kernel number/ row	Ear's diameter (cm)	Rachides's diameter (cm)	Mass of a thousand grains (g)	Kernel number/ ear	Kernel's depth (cm)	Kernel yield/ plant (%)
1.	TC 209	105,67	86,67	14,50	17,40	31,40	4,07	2,49	197,31	545,20	0,79	81,96
2.	TC 209 (cit. A665)	93,50	76,33	14,27	16,30	31,38	3,99	2,41	184,46	511,52	0,79	81,48
3.	TC 209 (cit. T 291)	85,00	68,67	14,13	15,73	30,93	3,81	2,29	197,68	486,19	0,76	80,86
4.	TC 209 (cit. T 248)	115,69	93,33	14,99	16,78	33,39	4,17	2,59	208,88	559,99	0,78	80,72
5.	TC 209 (cit. W 633)	121,81	101,67	14,68	16,00	34,11	4,15	2,45	224,03	545,94	0,85	83,39
6.	TC 209 (cit. TC177)	106,11	85,28	14,60	15,78	32,17	4,03	2,47	211,04	506,39	0,78	80,36
7.	TC 209 (cit. D 105)	107,00	87,67	14,53	15,23	31,35	4,03	2,46	197,31	477,51	0,79	81,88

The number of rows/ ear increased by changing the cytoplasm with W 633, the same cytoplasm causind reduced ear's diameter and rachides diameter, from the original line. The

kernel yield/ plant decreased by changing the cytoplasm with T 248 and increased by changing the cytoplasm with T 291, from the original line.

In case of the line TC 243, by changing the cytoplasm with TC 208, increased the plant height with 16,4 cm from the original line and the same cytoplasm caused a increase of the height of insertion of the main ear. The number of branches/ tassle decreased by changing the cytoplasm with A 665. The total number of leaves/ plant increased by changing the cytoplasm with T 248. The cytoplasm T 248 has led to increasing the leaf's length and the leaf's width and default the foliar area of the leaf of the main ear, from the original line. Ear's weight decreased by 12,7 g from the original line, by changing the cytoplasm with A 665, a positive influence on this character was observed by changing the cytoplasm with TC 221, causing an increase with 16,4 cm from the original line. Changing the cytoplasm with A 665, T 291, T 248, W 633, TC 177 and D 105 determined a decrease of the number of rows/ ear, from the original line. Ear's diameter decreased by changing the cytoplasm with K 2051 from the original line. the kernel number/ ear decreased by changing the cytoplasm with K 2051, from the original line, as can be seen in table 4 and table 5.

Table 6

The phenotypic characterization of plants at TC 221 inbred line with diversified cytoplasm

No.	The name of maize inbred line with differentiated cytoplasm	Plant's height (cm)	Height of insertion of the main ear (cm)	Number of branches/ tassel	Number of leaves/ plant	Leaf's length of the main ear (cm)	Leaf's width of the main ear (cm)	Foliar area of the main ear (cm^2)
1.	TC 221	192,7	70,3	18,0	13,5	72,9	7,8	426,5
2.	TC 221 (cit. T 248)	202,0	73,3	18,2	13,8	76,1	7,8	442,5
3.	TC 221 (cit. TC 243)	196,3	70,6	18,3	13,8	80,2	7,6	459,2
4.	TC 221 (cit. TC 208)	201,2	70,6	16,4	12,9	72,9	7,9	434,0
5.	TC 221 (cit. TC 209)	194,7	68,1	17,5	12,9	74,5	7,9	439,9
6.	TC 221 (cit. K 1080)	202,5	70,0	17,0	13,1	76,4	8,0	460,1
7.	TC 221 (cit. TC 316)	193,0	72,5	16,7	13,7	77,8	7,7	450,7

Table 7

The phenotypic characterization of ears at TC 221 inbred line with diversified cytoplasm

No.	The name of maize inbred line with differentiated cytoplasm	Ear's weight (g)	Kernel's weight (g)	Ear's length (cm)	Number of rows/ ear	Kernel number/ row	Ear's diameter (cm)	Rachides's diameter (cm)	Mass of a thousand grains (g)	Kernel number/ ear	Kernel's depth (cm)	Kernel yield/ plant (%)
1.	TC 221	82,50	66,25	16,00	14,50	31,25	3,25	2,22	174,36	453,13	0,52	80,34
2.	TC 221 (cit. T 248)	100,0	80,00	17,54	14,00	32,92	3,49	2,33	189,45	460,83	0,58	80,04
3.	TC 221 (cit. TC 243)	95,00	74,17	17,79	14,67	32,86	3,44	2,35	174,36	481,61	0,54	77,98
4.	TC 221 (cit. TC 208)	85,33	70,33	17,10	14,40	30,93	3,37	2,23	182,74	445,63	0,57	82,37
5.	TC 221 (cit. TC 209)	83,75	66,94	16,57	15,83	29,56	3,29	2,34	189,44	468,52	0,47	79,86
6.	TC 221 (cit. K 1080)	90,00	71,67	17,50	13,83	30,17	3,34	2,33	199,50	416,58	0,51	79,56
7.	TC 221 (cit. TC 316)	87,67	71,67	17,60	14,00	32,67	3,49	2,31	191,12	457,71	0,59	81,79

The tables 6 and 7 shows that if the line TC 221, by changing the cytoplasm with K 1080 led to an increase in plant height with 9,8 cm from the original line. The height of

insertion of the main ear decreased by changing the cytoplasm with TC 209 and increased by changing the cytoplasm with TC 248. The number of branches/ tassle was reduced by changing the cytoplasm with TC 208, from the original line. The total number of leaves/ plant was reduced by changing the cytoplasm with TC 208 and TC 209. The foliar area of the leaf of the main ear increased by changing the cytoplasm with K 1080. Ear's length increased with 1,8 cm by changing the cytoplasm with TC 243, from the original line and the kernel yield/ plant decreased by changing the cytoplasm with the same cytoplasm, from the original line.

Table 8

The phenotypic characterization of plants at TB 367 inbred line with diversified cytoplasm

No.	The name of maize inbred line with differentiated cytoplasm	Plant's height (cm)	Height of insertion of the main ear (cm)	Number of branches/ tassel	Number of leaves/ plant	Leaf's length of the main ear (cm)	Leaf's width of the main ear (cm)	Foliar area of the main ear (cm^2)
1.	TB 367	160,2	53,0	13,2	13,6	68,3	9,1	468,2
2.	TB 367 (cit. T 248)	152,0	51,3	13,4	13,3	67,3	8,4	422,3
3.	TB 367 (cit. TB 329)	152,0	46,2	11,5	13,6	66,6	8,1	406,3
4.	TB 367 (cit. TC 208)	160,9	49,3	12,5	13,1	65,5	8,3	409,8
5.	TB 367 (cit. TC 221)	162,9	56,2	12,5	13,7	68,1	8,2	419,7
6.	TB 367 (cit. TC 209)	160,0	52,2	12,3	13,9	69,7	8,4	441,7
7.	TB 367 (cit. K 2051)	159,7	46,5	10,9	12,7	66,5	8,1	402,9

Table 9

The phenotypic characterization of ears at TB 367 inbred line with diversified cytoplasm

No	The name of maize inbred line with differentiated cytoplasm	Ear's weight (g)	Kernel's weight (g)	Ear's length (cm)	Number of rows/ ear	Kernel number/ row	Ear's diameter (cm)	Rachides's diameter (cm)	Mass of a thousand grains (g)	Kernel number/ ear	Kernel's depth (cm)	Kernel yield/ plant (%)
1.	TB 367	66,11	52,36	15,67	13,94	24,50	3,23	1,97	194,48	341,36	0,63	79,46
2.	TB 367 (cit. T 248)	69,17	55,00	15,54	13,33	29,67	3,25	2,06	179,39	395,58	0,60	79,48
3.	TB 367 (cit. TB 329)	77,58	63,00	15,85	13,83	26,80	3,35	2,03	204,53	370,87	0,66	81,17
4.	TB 367 (cit. TC 208)	65,42	52,50	15,09	13,33	26,33	3,16	1,98	189,44	351,00	0,59	80,15
5.	TB 367 (cit. TC 221)	72,17	57,25	15,58	14,17	28,17	3,32	2,06	171,01	398,71	0,63	79,22
6.	TB 367 (cit. TC 209)	76,00	61,33	16,47	13,60	28,20	3,32	2,05	204,53	382,64	0,64	80,63
7.	TB 367 (cit. K 2051)	79,25	62,25	15,88	14,03	29,08	3,41	2,05	192,80	409,03	0,68	78,52

The results presented in tables 8 and 9 shows that if the line TB 367, the plant height decreased with 8,2 cm by changing the cytoplasm with T 248 and TB 329. A positive influence in terms of plant height was found by changing the cytoplasm with TC 208 and TC 221. A decrease in the number of branches/ tassle was found by changing the cytoplasm with K 2051. By changing the cytoplasm with TB 329 the height of insertion of the main ear decreased with 6,8 cm from the original line. The total number of leaves/ plant decreased by changing the cytoplasm with K 2051. The foliar area of the leaf of the main ear decreased by changing the cytoplasm with TB 329, from the original line. A positive influence on ear's length had the change of the cytoplasm with K 2051, the same cytoplasm causing an increased on kernel number/ ear. Kernel's depth decreased from the original line, by changing the cytoplasm with TC 208.

Table 10

The phenotypic characterization of plants at D 105 inbred line with differentiated cytoplasm

No.	The name of maize inbred line with differentiated cytoplasm	Plant's height (cm)	Height of insertion of the main ear (cm)	Number of branches/ tassel	Number of leaves/ plant	Leaf's length of the main ear (cm)	Leaf's width of the main ear (cm)	Foliar area of the main ear (cm^2)
1.	D 105	177,9	57,1	11,6	10,3	74,4	7,9	439,2
2.	D 105 (cit. T 291)	172,2	64,2	11,7	10,3	83,2	7,8	483,8
3.	D 105 (cit. T 248)	168,7	52,5	10,4	10,1	77,2	7,7	445,4
4.	D 105 (cit. TB 329)	169,9	57,4	10,7	10,0	79,8	8,2	491,2
5.	D 105 (cit. TC 243)	154,6	58,9	13,9	10,3	83,9	7,9	497,6
6.	D 105 (cit. TC 209)	166,4	58,6	11,2	10,1	78,9	8,1	478,6
7.	D 105 (cit. K 1080)	165,4	55,6	12,5	10,0	79,3	8,5	503,7

Table 11

The phenotypic characterization of ears at D 105 inbred line with diversified cytoplasm

No	The name of maize inbred line with differentiated cytoplasm	Ear's weight (g)	Kernel 's weight (g)	Ear's length (cm)	Number of rows/ ear	Kernel number/ row	Ear's diameter (cm)	Rachides 's diameter (cm)	Mass of a thousand grains (g)	Kernel number/ ear	Kernel 's depth (cm)	Kernel yield/ plant (%)
1.	D 105	67,50	53,75	10,96	12,33	22,00	3,52	2,27	226,33	271,17	0,63	79,72
2.	D 105 (cit. T 291)	65,97	52,36	11,50	12,17	23,78	3,45	2,22	238,07	289,33	0,62	79,37
3.	D 105 (cit. T 248)	67,36	54,58	11,40	12,06	22,44	3,46	2,34	234,71	270,20	0,56	81,02
4.	D 105 (cit. TB 329)	68,33	54,58	10,92	12,17	22,83	3,54	2,30	239,74	276,25	0,62	79,90
5.	D 105 (cit. TC 243)	80,56	64,44	12,34	12,22	26,33	3,57	2,34	233,04	322,00	0,61	79,93
6.	D 105 (cit. TC 209)	72,22	57,22	12,72	11,55	25,44	3,37	2,23	224,65	293,56	0,57	79,22
7.	D 105 (cit. K 1080)	65,00	49,17	10,67	12,00	23,17	3,57	2,27	248,13	313,50	0,65	75,53

In case of the line D 105, the plant height was reduced by changing the cytoplasm with TC 243. The height of insertion of the main ear increased by changing the cytoplasm with T 248. The number of branches/ tassle increased by changing the cytoplasm with TC 243. The leaf length increased by changing the cytoplasm with TC 243 and the foliar area of the leaf of the main ear, increased by changing the cytoplasm with K 1080. Ear's weight increased with 13,1 g by changing the cytoplasm with TC 243, from the original line. Kernel number/ ear increased by changing the cytoplasm with TC 243, and kernel yield/ plant decreased from the original line, by changing the cytoplasm with K 1080, as can be seen in table 10 and table 11.

CONCLUSIONS

The experimental results revealed the following:

As regarding the line TC 209, a favorable effect on plant's height had changing the cytoplasm with W 633 and changing the cytoplasm with A 665 decreased the grain's weight.

For the line TC 243, changing the cytoplasm with A 665, T 291, T 248, W 633, TC 177 and D 105 determined a decrease of the number of rows/ ear, from the original line.

For the line TC 221, the height of insertion of the main ear decreased by changing the cytoplasm with TC 209 and increased by changing the cytoplasm with TC 248.

As regarding the line TB 367 a positive influence in terms of plant height was found by changing the cytoplasm with TC 208 and TC 221 and in terms of ear's length had the change of the cytoplasm with K 2051.

For the line D 105 Ear's weight increased with 13,1 g by changing the cytoplasm with TC 243 and kernel number/ ear increased by changing the cytoplasm with TC 243.

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