RESEARCH ON EXPRESSION OF GENERAL COMBINATION CAPABILITY IN CERTAIN INBRED CORN CROSSES IN DIALEL SYSTEM

Dana Lucia SUBA
Agricultural Research and Development Station Lovrin, 200 Lovrin, 307250, România
subadanas@yahoo.com

Abstract: *Knowledge of the general combining ability, ie the additive genetic component passed on by a parent to all his offspring, has a very high practical relevance in corn breeding programs. The objective of the research was to evaluate the additive genetic effects (general combining ability). The overall ability to combine inbred lines is particularly important in making valuable hybrids. By crossing known inbred lines with a high overall combining capability (for production or for another character) in a dialel system, it is normal to carry out a hierarchy of the respective inbred lines.*

Keywords: *inbred lines, combining capability, dialel system, general combining ability*

INTRODUCTION

Of great importance for the extension of the quantitative genetic analysis methods to maize has been the enumeration of the concept of general combinatorial capacity (CGC) and specific combinatorial capacity (CCS) (SPRAGUE AND TATUM, *1942*).

According to this concept, CGC means the additive genetic component transmitted by a parent to all of its progeny, and by CCS is meant the genetic component transmitted to the offspring only after crossing a genitor, specifically with another particular partner.

These two components are genetically equivalent to the effect of CGC additive genes and to the effect of non-dominant dominant gene interactions plus epistaxis in CCS. It can be said that this concept marked spectacular results recorded by the creation of maize hybrids in the second half of the 20th century. (CĂBULEA, *2004*).

MATERIAL AND METHODS

The biological material consisted of a total of seven distinct inbred lines of genotypically and genetically engineered inbred lines and the 21 simple hybrids derived from direct crossbreaks made in a dialeal system.

The research was carried out at the Lovrin Research and Development Resort in 2014-2015.

Simple hybrids were tested for two years in a three-reel randomized block experience.

Simple hybrids were tested for two years in an experimental set-up in randomized blocks in three rehearsals. The plot ranged two rows of 8.5 m long; The distance between rows was 0.7m and the distance between plants per row of 0.33m. The sowing density was 40000 pl / ha.

The comparative cultures were placed in the experimental soil belonging to the corn amelioration laboratory at the Lovrin Agricultural Research and Development Resort, on a well-prepared field through autumn tree, fertilized with 80 kg / ha of P2O5 and 170 kg / ha of active substance N.

In all cases, the precursor plant was the fall wheat. Maintenance work was carried out at the level required by the requirements of the experimental field.

The study of the effects of the general combining ability in the expression of heterosis in the characters: height of insertion, total height, length of the ear, number of grains per row, number of rows on the ear, grain weight, weight of the ear, erect plants, MMB, Grain production was performed using experimental data from a dialel system of type p (p-1) / 2.

Evidence of the variant for the general ability to combine with the dialeal system, as well as the genetic effects involved, was made after the proposed genetic model IV (fixed) GRIFFING (1956).

The overall ability to combine inbred lines is particularly important in making valuable hybrids. Crossing inbred lines known by general high-capacity combining (for production or for another character) in a dialec system is normal to carry out a hierarchy of the respective inbred lines.

Table 1. shows the additive effects values for lines Lv 1700, Lv 92, C103, TA 409, Lv 86, TA 403, B7

Table 1.

Additive gene effects of crosslinked inbred lines in dialel system

(average for two years)

	Lv 1700		Lv 92		C 103		TA 409		Lv86		TA 403		B 73	
CHARACTER	(ĝm)	DL 5%	(ĝm)	DL 5%	(ĝm)	DL 5%	(ĝm)	DL 5%	(ĝm)	DL 5%	(ĝm)	DL 5%	(ĝm)	DL 5%
Height of insertion	-3,93	4,43	-5,05	4,43	12,22	4,43	0,97	4,43	-8,26	4,43	-1,22	4,43	5,27	4,43
Total height	-14,26	20,08	-15,02	20,08	20,26	20,08	-5,07	20,08	3,92	20,08	0,23	20,08	17,76	20,08
Length of the ear	-1,13	2,25	-0,74	2,25	2,55	2,25	-0,24	2,25	-1,50	2,25	-0,13	2,25	1,19	2,25
Number of grains per row	-5,12	4,73	-0,69	4,73	4,23	4,73	1,58	4,73	0,23	4,73	0,21	4,73	-1,82	4,73
Number of rows on the ear	-0,53	1,71	-0,78	1,71	-1,94	1,71	3,25	1,71	-0,93	1,71	0,77	1,71	0,17	1,71
Grain weight	-49,27	22,36	-33,99	22,36	25,40	22,36	-10,81	22,36	-0,43	22,36	-6,48	22,36	75,57	22,36
Weight of the ear	-21,98	26,72	-11,45	26,72	-3,67	26,72	6,91	26,72	1,08	26,72	-9,40	26,72	38,52	26,72
MMB	-35,28	37,51	4,28	37,51	22,75	37,51	3,01	37,51	-11,49	37,51	9,22	37,51	-6,90	37,51
Erect plants	-1,71	9,85	4,08	9,85	-1,60	9,85	-1,75	9,85	-0,50	9,85	-1,31	9,85	2,5	9,85
Production	-4,44	7,21	-7,47	7,21	7,67	7,21	8,4	7,21	-2,26	7,21	-3,89	7,21	1,97	7,21

It can be seen that the positive values of additive effects in terms of unit insertion height were noted at the lines: C103 (12,22), B73 (5,72) and Lv86 (0,97); So, the overall best combining ability for this character is C103. The lowest values were found on lines Lv 86 (- 8.26), Lv 92 (-5.05) and TA 403 (- 5.05).

Additive effects of genes with significant plant height values met at C103 (20,26) and B73 (17,76). The inbred lines with the lowest additive effects were Lv 92 (-15.02) and Lv 1700 (-14.26).

All lines C 103 (2.55) and B 73 (1.19) had positive values of additive effects on ear length. The Lv 1700 (- 1.13) and TA 403 (-1.5) lines were recorded with minimum values.

Of all the characters, for the number of grains per row, the most positive effects of the additive gene effects on inbred lines were as follows: C 103 (4.23), TA 409 (1.58), Lv 92 (0.69), Lv 86 (0.23), TA 403 (0.21). The lowest value was encountered on line Lv 1700 (- 5.12).

The maximum limit of additive effects for the number of rows per ear was calculated for the TA 409 line (3.25) and the lower limit for line C 103 (-1.94).

High additive gene effects for grain weight showed line B 73 (75,75), followed by line C 103 (25,4).

The minimum value for this character was recorded for line Lv 1700 (-49.27), followed by line Lv 92 (-33.99) and TA 409 (-10.81). The highest value for the effects of the general combining ability in the case of the weight of the ear was recorded on lines B73 (38,52), followed by the value found at line Lv 86 (6,91) and the lowest value was recorded at line Lv 1700 (-21.98).

Regarding the MMB, it can be seen that the upper limit of additive effects values is line C 103 (22,75), followed by TA 403 (9,22) and Lv 92 (4,98), and at the lower limit is Lv 1700 (35.28) and Lv 86 (3.01).

For the percentage of erect plants, the maximum additive effect was found at line Lv 92 (4.08) and the minimum value at line TA 409 (- 1.75). Additive gene effects for grain production - the most sought after breeder - were maximum at TA 409 (8.4) and line C103 (7.67) and minimum at line Lv 92 (-7.47) and at Line Lv 1700 (4.44).

In Figure 1., additive genetic effects for each inbred line are shown.

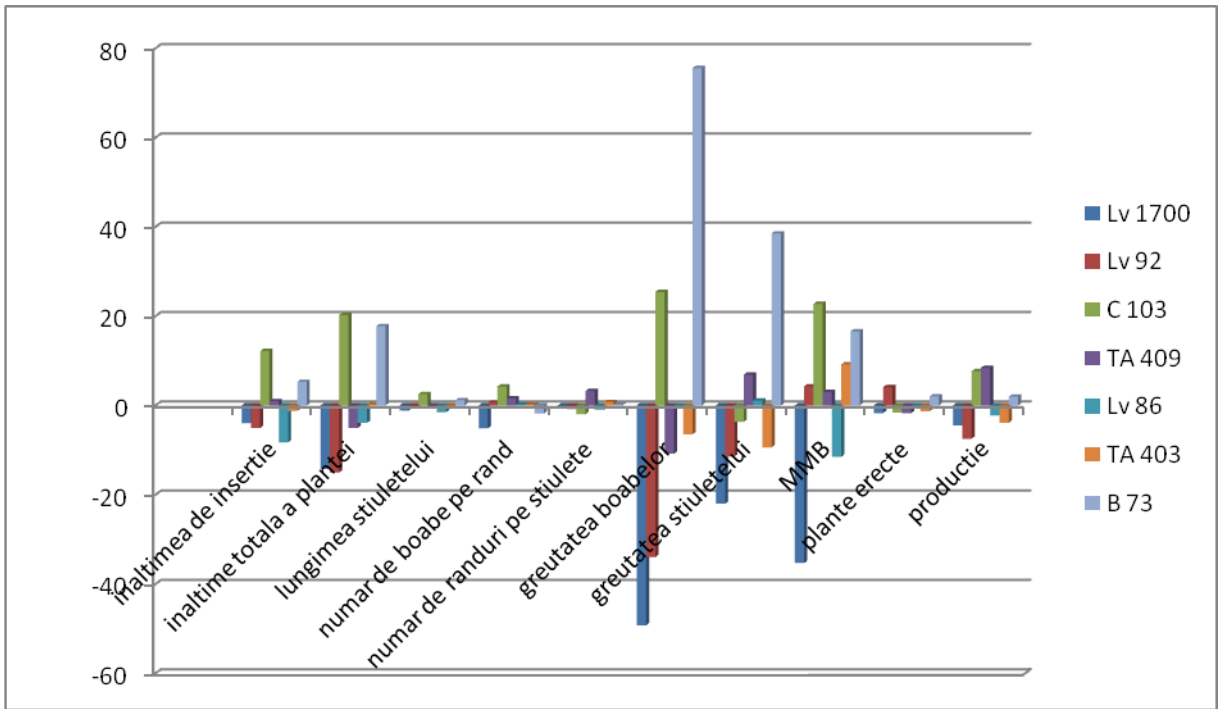

Figure 1 Additive genetic effects on 7 inbred lines in study

From the graphical representation analysis we can see that the lines where the additive genetic effects were most pronounced and for most characters were: C 103 at the characters - height of insertion, total plant height, length of the ear, number of rows of grain, grain weight, ear weight, percentage of erect plants and grain production, and TA 409 for: number of grains in a row, number of berries, MMB and grain production. The opposite is the Lv 1700 line with a manifestation minimal additive genetic effects.

Lines C103, B73 and TA 409 have been noted as having a good overall combining ability, and can be used as parenting or improvement programs to improve the character of other inbred lines.

We appreciate that these results have a low degree of generalization because they come from the analysis of a "fixed" dialectical system, although the inbred lines chosen for this study have been attempted to represent germplasm sources as diverse as possible.

CONCLUSIONS

Based on the study, it was found that the highest overall combining capacity for the characters: the height of the ear, the height of the plants, the length of the ear, the number of grains per row, the number of rows on the ear and MMB was C103.

Regarding the character of the grain weights, the highest combining capacity is the B73 line, the number of rows per ear and the character of the grain production has the TA 409 line, the weight of the B73 line and the percentage for the Lv line 92.

Lines C 103, B 73, TA 409 and Lv 92 have been characterized by a good overall combining ability, which can be used as parental forms or in programs for the improvement of inbred maize lines.

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