GENERAL AND SPECIFIC COMBINING ABILITY FOR FORAGE MAIZE APTITUDE. PART 1 : INBRED LINES

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ABSTRACT
Ten inbred maize lines were evaluated through their crosses in various environments with the aim of determining their forage production. The ear and stover dry matter were established separately, when variability for both components was found . The effect of the environment was mainly noted in the harvest index. The most outstanding lines were: B84 for ear yield and dry matter yield from the whole plant and L1 for stover yield.

The crosses B84xL2 and B84xL6 produced non-additive effects which were significant for some variables. No significant differences were found when comparing the commercial checks with the highest yielding crosses.

KEYWORDS
Maize, forage yield, inbred lines, combining ability

INTRODUCTION
In the milk belt on the outskirts of Buenos.Aires. maize is the main crop used for silage. At present, the planted area is in constant expansion, but information regarding forage behaviour of inbred lines for the formation of forage maize hybrids is lacking.

The aim of our work was to determine forage aptitude in crosses of inbred lines commonly used in the synthesis of grain maize hybrids.

MATERIALS AND METHODS
Forty-five F1´s were evaluated resulting from a diallelic scheme between 10 maize lines (Mo17, B84, A632 and seven lines developed in Lomas de Zamora University, nominated from L1 to L7). These lines showed diversity in origin, heterotic group, cycle, grain type and plant architecture.

The design employed was a alpha-lattice of 8x6 (45 crosses and 3 commercial grain hybrid checks) with 3 replications x 2 years x 2 sites. The experimental unit consisted of 2 rows 5 m and 0.70 m apart.

The trials were located in the Buenos Aires milk belt during the 1994-1995 and 1995-1996 growing seasons. Harvest time was determined in accordance with Hunt *et al*. (1989). To perform the genetic analysis method 4, model 1 of Griffing (1956) was used.

The variables studied were as follows :
1. **EDMY** (Ear dry matter yield).
2. **SDMY** (Stover dry matter yield).
3. **WPDMY** (Whole plant dry matter yield).
4. **%EDMY** (Proportion of ear dry matter over whole plant dry matter).

RESULTS AND DISCUSSION
The combined analysis (Table 1) shows significant GCA (General combining ability), SCA (Specific combining ability) and GCA x E (General combining ability x environment) effects for all variables ($p<0.01$). The interaction SCA x E was also significant in %EDMY. The importance of this result comes from the fact that the proportion of ear in the chopped mass was one of the determiners of silage quality and was highly conditioned by the environment. (Rutger and Crowder, 1967; Fischer *et al*., 1968 and Matsushima, 1971).

Table 2 shows significant GCA and SCA effects in progenitors and crosses for all variables, where most outstanding were L3 and B84 in EDMY, while L1 and B84 had significant additive effects for SDMY. Only A632 had important additive effects for %EDMY. The non- additive effects were significant in B84xL2 and B84xL6.

The highest yield crosses were compared with commercial checks of maize used for silage (Table 3) and none of these significantly surpassed the crosses in all evaluated variables.

The index Ig establishes a relationship between GCA and SCA (Baker, 1978) and was given by :

$$Ig = 2\ K2g\ \ (2\ K2g + K2s)^{-1}$$

Where K2g y K2s were the components of the mean square of GCA and SCA, respectively, the aforementioned index was found to be high for SDMY and %EDMY. This implies that variation was due mainly to the additive effects. The non- additive effects were also important in the case of EDMY. This result allowed for the consideration of the convenience of exploiting the genetic variability which existed in the stover and ear fractions, but with different strategies depending on the component of the plant, since in the first case the variation was due mainly to the GCA and in the second case to SCA and GCA with similar magnitudes.

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Table 1
Components and means square of the significant variables. (Test F, p<0.01).

S.V.	EDMY	SDMY	WPDMY	%EDMY
GCA	1842.3*	3782.8*	8733.2*	177.8*
SCA	312.9*	270.5*	892.0*	19.8*
GCA x E	366.0*	41.1	857.0*	28.3*
SCA x E	109.1	178.7	345.3	16.8*
Error	76.4	123.9	310.6	9.2
K2g	15.4	39.0	82.0	1.6
K2s	17.0	7.7	45.6	0.25
Ig	64.4	91.1	78.3	92.6

Table 2
Effects of GCA and SCA in lines and F1 which were significant. (Test t, p<0.01).

MATERIALS	EDMY	SDMY	WPDMY	%EDMY
L1	-	19.29*	19.24*	-
L3	10.02*	-	15.19*	-
A632	-	-	-	2.96*
B84	15.11*	10.93*	26.04*	-
B84 x L2	13.54*	15.52*	29.07*	-
B84 x L6	12.77*	-	21.79*	-

Table 3
Ranking in kg ha^{-1} of the best crosses with 3 commercial grain maize checks.

MATERIALS	EDMY	MATERIALS	SDMY	MATERIALS	WPDMY
B84 x L2	13233	**CHECK 2**	13500	**B84 x L2**	26110
B84 x L6	12217	**L1 x L2**	13260	**B84 x L6**	24570
B84 x L3	12075	**A632 x L1**	13140	**L1 x L2**	23720
CHECK 3	11853	**B84 x L2**	12880	**CHECK 3**	23590
B84 x L4	11602	**B84 x L1**	12440	**CHECK 2**	23140
L3 x L6	11584	**B84 x L6**	12350	**B84 x L1**	23103
B84 x A632	11179	**L1 x L3**	12000	**A632 x L1**	22753
B84 x L6	11176	**L1 x L6**	11840	**L2 x L3**	22552
A632 x L3	11155	**CHECK 3**	11750	**L1 x L3**	22244
L2 x L6	10900	**L2 x L3**	11700	**L4 x L6**	22206
L2 x L3	10850	**CHECK 1**	11690	**B84 x L4**	22164
CHECK 1	10001	**L3 x L6**	11340	**B84 x L3**	22105
CHECK 2	9634	**L1 x L4**	11166	**CHECK 1**	21700