XII. Eucarpia Congress 1989
5-21
Vorträge für Pflanzenzüchtg. 15. 1989

Yield and Leaf Traits in Commercial Hybrids of Maize

A.M. Verdú[1], F. Casañas[1], Ll. Bosch[1] and F. Nuez[2]

1 Escola Superior d'Agricultura de Barcelona Urgell, 187. (08036) Barcelona. Spain.
2 E. S. de Ingenieros Agrónomos de Valencia. Camino de Vera, 16. (46022) Valencia. Spain.

INTRODUCTION

Increased grain production has been the primary goal of maize breeding programs. Ever since Jenkins (1) began to study the correlations between yield and various morphological characters, the search for traits appropiate for indirect selection has not ceased.

The present study examines the possibility of using leaf-related traits, some of which have not been extensively explored in the literature, to realize such selections.

MATERIAL AND METHODS

Fifty-one commercial corn hybrids of 6 different cycles (FAO 200-700), were employed in a random block design with 5 blocks. Twelve plants per plot were controlled. The final plant density was 83000 plants/ha.

After pollen shedding, the following traits were measured in the first leaf above the ear: length (L); midrib thickness (T); orthogonal projection in relation to the stem (P); and the angle formed by the base and the stem, measured on a scale from 1 (lax) to 3 (erect)(E). Days from planting to black layer formation (C) and ear yield per plant (Y) were also controlled.

RESULTS AND DISCUSSION

As reported in Table 1, all characters except P present high coefficients of genotypic correlation with Y. T presents the highest value, and also correlates well with C. But if one were to consider the estimated correlation between Y and T to be mostly attributable to an effect of cycle, the trait would not be of interest as an instrument of indirect selection.

Table 1: Matrix of coefficients of genotypic correlation among the characters studied.

	Cycle	Thick.	Length	Pro.	Erection
Yield	.852**	.874**	.767**	-.060	.741**
Cycle		.854**	.673**	-.224	.760**
Thickness			.793**	-.111	.792**
Length				.018	.492**
Projection					.140

** p≤0.01

However, the existence of a direct genetic relationship between Y and T cannot be dismissed in light of the values presented in Table 2 for the coefficients of correlation between Y and T within each cycle. In effect, these values are high and statiscally significant for the 200, 300 and 700 cycles. In the other cycles, lack of significance might be a result of the low number of hybrids in each of these groups. The study of partial correlations shown in Table 3 stregthens this idea: the trait T is not conditioned exclusively by the cycle, although, to some extent, it is influenced by it.

Table 2: Coefficients of genotypic correlation between yield (Y) and midrib thickness (T) within each FAO cycle.

cycle	n of Hybrids	r
200	5	.942*
300	10	.701*
400	5	.744
500	8	.655
600	9	.451
700	14	.743**

* p≤0.05; ** p≤0.01

Table 3: Coefficients of partial genotypic correlation between yield (Y) and midrib thickness of the leaf (T), successively eliminating the influence of the rest of the characters.

L	.680**	L,P	.675**	L,P,E	.377*
P	.874**	L,E	.375*	L,P,C	.355*
E	.700**	L,C	.356*	L,C,E	.231+
C	.537**	P,C	.520**	P,C,E	.464**
		P,E	.701**		
		C,E	.482**	L,P,E,C	.232+

(+) p≤0.1; (*) p≤0.05; (**) p≤0.01

The high correlation between Y and T could be explained in part, by the lenght of the cycle, and in part by the strategy of the capture of energy by the leaves (E, P, and L). The residual influence of T on Y (p≤0.1) could very well be of a physiological nature, favoring the transport of nutrients.

If the magnitude of this correlation is confirmed in populations used as a base for selection, T could be employed, together with other well known characters, to breed for yield improvement.

ACKNOWLEDGEMENTS

This work has been done with a grant from "La Caixa de Pensions de Catalunya i Balears".

REFERENCES

(1) JENKINS, M.T. 1929. Jour. Agric. Res., 30: 677-721