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**Direct and correlated responses to selection for earliness in a tropical maize population**

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Earlier flowering is desired for many tropical maize cultivars for production for brief rainy seasons or for specific cropping sequences. Half-sib family selection was used in Compuesto Seleccion Precoz, a tropical cultivar, to decrease the number of days from planting to pollen shed but to retain the relatively high yield. Half-sib family recurrent selection was conducted at two locations in Mexico with primary emphasis given to selection for earlier flowering (days to pollen shed). Two cycles of selection were completed each year. Data for evaluation of response to selection were obtained at 12 locations (11 tropical and one temperate). Cycles C0, C3, C6, C9, C12, and C15 were evaluated to determine direct response to selection for earlier flowering and the correlated response (indirect effects of selection) for seven agronomic traits. The C15 selection cycle was earlier than checks at all tropical environments. Average response to selection for earlier flowering was about 0.5 days per cycle of selection (Table 1). The additive genetic effects, measured as the linear component of the model when partitioning cycles per se, accounted for 89% of the total genetic variation. Parameters from the Smith model (Crap

Information from eight environments were used to determine the indirect effects of selection for earlier flowering (Table 1). Selection for earlier flowering resulted in correlated changes for all traits except root and stalk lodging. The estimates of the additive genetic effects varied among traits: 81% for grain yield, 63% for grain moisture, 27% for plant height, 50% for ear height, and 79% for leaf area. The correlated changes in means were negative (decreased) for all traits except root and stalk lodging (Table 1). For the one temperate location, grain yield increased from 1.86 t ha<sup>-1</sup> (C0) to 3.67 t ha<sup>-1</sup> (C15) because of the effects of earlier flowering of the C15 (10 days earlier than the C0) selection cycle. Correlated responses to selection for earlier flowering on a per cycle basis showed that yield decreased about 95 kg/ha, plant and ear heights decreased about 2 cm, grain moisture decreased about 0.08%, and leaf area decreased about 172 cm<sup>2</sup>.

Direct response for earlier flowering in the tropical cultivar Compuesto Seleccion Precoz was about 0.5 days per cycle vs. about 3.0 days per cycle for mass selection within tropical cultivars in temperate areas. The C15 was about 5 days earlier than the C0 when evaluated in tropical environments, but C15 was 10 days earlier than the C0 in the one temperate environment with a corresponding 97.3% increase in grain yield. The objective of selection for developing an earlier maturity strain of Compuesto Seleccion Precoz, but retaining yield, was not as effective as desired: the C15 was 5 days earlier but yield decreased 28% (Table 1).

Table 1. Means of selection cycles in Compuesto Seleccion Precoz tropical cultivar for days to flower (direct response) and correlated responses for seven agronomic traits with selection for earlier flowering.

Cycle of selection	Days to flower	Traits <sup>1</sup>						Leaf area
		Grain		Lodging		Height		
		Yield	Moisture	Root	Stalk	Plant	Ear	
	no.	t ha <sup>-1</sup>	%	-----%	-----cm-----		cm <sup>2</sup> x 10	
C0	58.2	5.53	19.6	3.4	1.4	199	95	813.1
C3	54.2	4.70	19.6	2.4	3.1	190	63	681.3
C6	53.8	4.74	20.1	2.7	3.7	184	78	613.1
C9	53.1	4.75	18.9	1.2	3.2	180	71	633.2
C12	51.3	4.01	18.7	2.3	3.6	169	53	628.4
C15	50.4	3.98	18.7	1.2	1.2	161	62	508.7
X	53.5	4.62	19.3	2.2	2.7	180	70	646.3
2(ALI + DLI)	-0.42	-0.09	-0.10	0.07	0.12	-2.29	-2.21	-15.2
R <sup>2</sup>	0.89	0.99	0.99	0.91	0.94	0.99	0.99	0.99
Linear (b)	-0.46	-0.10	-0.09	-0.12	-0.05	-2.22	-2.00	-16.2
R <sup>2</sup>	0.89	0.81	0.63	0.30	0.46	0.27	0.51	0.71
(C15 - C0)/15	-0.55	-0.10	-0.06	-0.07	-0.10	-2.50	-2.26	-203.0

<sup>1</sup>Direct responses is for earlier male flowering measured in 12 environments. Changes for other traits are the correlated changes with selection for earlier male flowering with data from eight environments.

Sci. 23:35-40, 1983) showed that the homozygotes and heterozygotes were highly significant for the C0 and selected cycles, but the homozygous contribution was more important. For the one temperate environment (Ames, Iowa), the average number of days from planting to male flowering was 79.6 days, decreasing from 85.3 days for C0 to 75.7 days for C15, nearly 10 days earlier with selection in tropical environments.