INHERITANCE OF HEIGHT AND ASSOCIATION AMONG HEIGHT, YIELD AND YIELD COMPONENTS IN WHEAT

by

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A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Major Subject: Plant Breeding

Approved:

In Charge of Major Work

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Iowa State University
Ames, Iowa

1969

SUMMARY

To determine the mode of inheritance of the semidwarfness trait in wheat and the genotypic relationship of this character to grain yield, number of spikes per plant, number of spikelets per spike, and date of maturity, I studied all of these traits and their interactions in nine wheat hybrids between three normal height varieties, Napo 63, Crespo 63 and Bonza 63, and three semidwarf varieties, Sonora 64, Son 64-Sk^{6}_{E}/An^{3}_{E}, and Wt_{E_3}-Nar 59. Measurements were made on spaced plants of the parents and F_1's in 1965 and of the parents and F_2's in 1966 at the Santa Catalina Experimental Station near Quito, Ecuador.

In 1965, the wheat plants were grown, one population (i.e., parent or F_1) per plot, in a non replicated experiment, but in 1966, the six parent and nine F_2 populations were grown in a randomized block design with four replicates. In the latter experiment the number of plants per parent varied between 242 and 287 and the number of plants per F_2 populations varied from 780 to 905. Data were collected on a plant basis for number of spikelets per spike, number of spikes, grain yield, plant height, days-to-flowering, glume color and awn expression.

Genetic analyses of the crosses showed an expression of partial dominance of tallness over semidwarfness. Degrees of dominance varied from 0.12 to 0.90. The variation in dominance

values among crosses when the three normal parents were crossed to a common semidwarf suggested that Napo 63, Crespo 63 and Bonza 63 may carry different alleles at the same plant height locus. It appeared that the normal varieties differed from the semidwarf varieties, Sonora 64, Son 64-Sk^{6}_{E}/An^{3}_{E} and Wt_{E_3}-Nar 59 by alleles at one, two and two plant height loci, respectively. Apparently, a total of three independently segregating loci were present in my crosses: the dominant homozygote (i.e., AA, BB or CC) was 27 cm taller than the recessive homozygote (i.e., aa, bb or cc) at the A-a locus, 13 cm taller at the B-b locus, and 26 cm taller at the C-c locus, and the interlocus interaction for plant height was completely additive. The suggested genetic constitution for semidwarf and normal parental varieties used in my study are:

Parent	Height range	Genotype
Normal parents	(100-120 cm)	AABBCC
Sonora 64	(74-84 cm)	aaBBCC or AABBcc
Son 64-Sk^{6}_{E}/An^{3}_{E}	(62-72 cm)	aabbCC or AAbbcc
Wt_{E_3}-Nar 59	(48-58 cm)	aaBBcc

Genotypic correlations of plant height with yield and yield components were positive but not large enough to hinder a breeder from combining semidwarfness and good yielding ability. In general, plant height was not highly genotypically associated with any other trait. It was concluded that merely selecting for the semidwarfness trait would not a priori result

in the retention of strains that were high in tillering and yield or produced large spikes. The relatively low or zero associations found in my crosses is gratifying because this indicates that breeders could produce any combination of these traits with relative ease.

Heritability percentages calculated in the broad sense were high for plant height (85%) and days to flowering (61%) and moderate for yield (44%), spikelets per spike (40%) and spikes per plant (26%). However, the greatest expected genetic gain from selection was for yield (41% of mean), whereas the relative gains for plant height, spikes per plant and spikelets per spike were 21%, 15% and 8%, respectively. Glume color and awn expression were each independent inherited monogenically with brown glume and awnlessness dominant.