

3. "Single gene" heterosis

Spontaneous non-allelic mutations to dwarfism have been found in inbreds Illinois Hy2, Wisconsin W8, and Ohio 07. Each of the mutants was crossed with the parent inbred. The F₁'s and the parent lines were planted in a replicate split plot design at Urbana in 1992. Certain data were collected, and are summarized in Table 1.

Table 1. Comparisons of inbreds and inbred x dwarf mutants.

	Plant height in.	Days to half silk	Corrected field weight* lb.
Hy2 x Hy2 dwarf	78	64	6.8
Hy2	73	66	5.4
Difference	5	-2	1.4
W8 x W8 dwarf	73	62	5.7
W8	63	60	4.0
Difference	10	2	1.7
07 x 07 dwarf	90	66	6.1
07	84	68	5.6
Difference	6	-2	0.5

*Corrected to uniform stand and moisture.

A parallel experiment was also conducted at the same location and the same year involving sub-strains and the official stocks of each of the long-established inbred lines Indiana WF9 and USDA CI. 187.2. The "sub-strains" were established by maintaining selfed families within official stocks of these lines. Data from this trial are summarized in Table 2.

Table 2. Comparisons of sub-strains and sub-strain crosses.

Pedigree	Plant height in.	Days to half silk	Corrected field weight* lb.
187-1	69	69	4.1
187-1 x 187-10	67	66	5.0
187-10	64	66	4.3
187-3	69	65	4.4
187-3 x 187-8	68	66	4.9
187-8	70	66	4.3
WF9-5	76	66	5.7
WF9-5 x WF9-30	82	62	6.9

WF9-30	82	61	6.4
WF9-36	82	65	6.5
WF9-36 x WF9-35	80	63	5.5
WF9-39*	69	62	3.8

*Seed of WF9-35 was not available for this trial.

Statistical treatment of the data is summarized below:

Character	Significant at 5% level	Significant at 1% level
Dwarf x normal vs. normal		
Yield (grain)		yes
Plant height	yes	
Days to half-silk	yes	
Sub-strain F ₁ 's vs. standard inbred		
Yield		yes
Plant height	no	
Days to half-silk	yes	

There is no question that hybrids between mutant dwarfs and normal stocks of the same inbred were more vigorous than the non-mutated self-pollinated plants. In addition, crosses between sub-strains of inbreds were usually higher-yielding than selfed sub-strains. To attribute the higher yield of the F₁ alone to heterozygosity of the dwarf gene is inconsistent since similar differences exist between selfed sub-strains and hybrids between sub-strains within an inbred.

Critical evidence for single-gene heterosis must come from experiments involving crosses between lines that are isogenic, except for the locus under study. It is doubtful that this sort of evidence has ever been obtained in corn.

D. E. Alexander