in height, the normal plants from 142-196 cms. The higher variability of the dwarfs as compared to the normal plants is a close counterpart of the variability of the unstable defective endosperm mutant described above as compared to normal seeds on the same ear.

The majority of the dwarfs do not produce ears but some ears were obtained from plants throughout the range of variation with respect to height. The cobs of the dwarfs were on the average more lignified than the ears of the normal plants and those of the short dwarfs were more lignified than those of the tall dwarfs. The extreme variant in ear type, an ear produced by a short dwarf, was flattened and almost distichous and had prominent, highly lignified glumes.

These characteristics suggest that the unstable dwarfs, like the unstable defective seeds are the product of a block of teosinte genes which has been transposed to a new position in which it has a deleterious effect upon development and which is variable as result of crossing over. The fact that the cobs of the dwarfs are more lignified on the average than the normal plants suggests that this possibly transposed block of genes is an addition to, rather than a substitution for, the previous complement of teosinte genes in the genom.

4. An unstable gametophyte mutant involving preferential segregation.

In one of the stocks mentioned above in which there had been 14 recognizable mutations in the population not exceeding 195 plants, a gametophyte factor affecting the Mendelian ratios has been studied and has proved to be unstable.

This mutant was first discovered in 1954 in an ear segregating for sugary endosperm which had only 15% of sugary seeds instead of the 25% theoretically expected. Among the progeny of this ear, one ear was obtained which segregated normally (22.2% sugary) and five were low sugary ranging from 9.2% to 18.9% sugary. The five low-sugary ears combined had an average of 14.2% sugary in a total of 963 seeds.

When the original stock was crossed with an unrelated sugary inbred the starchy seeds when selfed produced nine normal sugary ears (25.8% sugary in 1552 seeds of six of these ears) and two high sugary ears (37.4% sugary in 447 seeds). These results indicate that the original low sugary ears were the product of aberrant segregation resulting from a deleterious gametophyte factor linked with sugary. The normal sugary ears in the progeny of the original ear (1 in 6) and the high sugary ears in the crosses (2 in 11) are crossovers and represent 18% of the ears tested.

Heterozygous sugary plants producing low sugary selfed ears, when backcrossed on homozygous sugary, produce 26.1% of sugary seeds (total

of 721); when backcrossed reciprocally by sugary they produced 49.4% sugary seeds (total of 987). These data prove that the aberrant segregation is largely if not completely confined to the male gametophyte.

In backcross experiments with the stock of low sugary which had been outcrossed to a second unrelated sugary inbred, eight normal sugary ears (48.9% sugary in 2415) and two high sugary ears (55.3% sugary in 653) were obtained. The deviation from normal segregation in these two high sugary ears is so much less than that found in previous selfs and backcrosses that a change of "state" was suspected. Consequently in 1957 a comparison was made between two high sugary stocks, one called "strong" high sugary (35.4% sugary seeds in selfed ear) the other called "weak" high sugary (55.6% sugary in the backcross which is equivalent to 27.8% in the self). Both stocks were selfed and backcrossed to row 274, an F_1 sweet corn hybrid. In addition the "strong" high sugary was backcrossed to row 270 which was planted to sugary seeds from a high sugary ear.

Six facts emerge from the data set forth in the accompanying table.

(1) Self-pollinations in the two stocks yield approximately the same results: 26.0 and 25.9% respectively of sugary seeds. However two of the eight ears in the "strong" stock deviate significantly from normal segregation while all of the nine ears in the "weak" stock are within the normal range.

(2) The backcrosses on 274 from the "strong" high sugary stock have a significantly higher percentage (55.4%) of sugary seeds than the backcrosses (49.3%) from the "weak" high sugary stock.

(3) The backcrosses to row 270 have a significantly higher percentage of sugary seeds (66.0%) than the backcrosses to row 274 (55.4%). This indicates that the behavior of the male gametophyte is influenced by the genetic constitution of the styles.

(4) Omitting the backcross involving Plant 273-2 which is clearly exceptional (71.1% sugary) the average percentage of sugary seeds in the backcrosses is 47.8 which is significantly lower than the 50% expected from random segregation. This suggests that the factor which in this stock is linked with Su is now conferring an advantage rather than a disadvantage on the gametophytes which carry it.

(5) The backcross involving 273-2 with 71.1% sugary seeds is significantly different from all of the other backcrosses in this population and is apparently a reversion to the "strong" high sugary state characteristic of the original stock as exemplified by the plants in row 272.

Selfed and Backcrossed Progenies of "Strong" (272) and "Weak" (273) High Sugary Ears

Plant	Selfs			Backcrosses on 274			Backcrosses on 270		
	Total	No. su	% su	Total	No. su	% su	Total	No. su	% su
272-1	149	26	17.4	218	126	57.8	286	168	58.7
2	416	111	26.7				269	161	59.9
3	332	70	21.1	27	16	59.2	178	134	75.3
4	no selfed ear			429	254	59.2	340	263	77.4
6	281	68	24.2	285	128	44.9	442	262	59.3
8	411	130	31.6	216	135	62.5			
9	226	44	19.5	199	117	58.8	299	180	60.2
10	393	106	27.0	39	26	66.7	304	253	83.2
11	265	87	32.8	178	79	44.5	368	221	60.0
Totals	2473	642	26.0	1591	881	55.4	2486	1642	66.0
273-1	309	89	28.8	349	159	45.6			
2	no selfed ear			349	248	71.1			
3	341	87	25.5	407	185	45.5			
4	310	85	27.4	349	152	43.6			
5	231	49	21.2	424	198	46.7			
6	271	73	26.9	831	394	47.4			
7	no selfed ear			322	160	49.7			
8	282	71	25.2	284	160	56.3			
9	339	84	24.8	432	202	46.8			
10	de linked with su			679	347	51.1			
11	311	87	28.0	373	178	47.7			
12	426	105	24.6	730	342	46.8			
Totals	2820	730	25.9	5529	2725	49.3			

(6) Although the data in the table do not themselves reveal it, it can be said that this gametophyte factor is associated with a block of genes from teosinte which affects the lignification of the glumes. Cobs of the two high sugary ears in 1956 were more lignified than those of the 9 normal sugary ears. The cobs of row 272, the "strong" high sugary stock, were more lignified on the average than the stocks of the "weak" high sugary ears in row 273 with the exception of the plant 273-2 which had a very strongly lignified cob and which, as already noted, had a very marked deviation from normal segregation. Thus it appears that the variations in the expression of this gametophyte factor, like that of the defective endosperm and dwarf plant described above, are due to the effect of crossing over within a block of teosinte genes.