9. Nature of the grass coleoptile and the ac, hc, and "bikeel" genes.

Studies on hc gene expression and information gathered on the ac and bikeel mutants suggest the construction of hypothetical stepwise stages involved in the evolution of the coleoptile from one or two leaves in Zea mays.

Thus ac action allows a green leaf blade like expression on one side of the coleoptile due to marginal meristematic activity while a spur-like outgrowth on the first true leaf of the bikeel mutant represents an intermediate stage. Bikeeled and hornlike coleoptiles represent still another stage toward the normal coleoptile. A single outgrowth may be considered as equivalent to an underdeveloped leaf blade. It may be underdeveloped because of altered position and reduced growth activity of the basal meristem regularly present at the base of the normal leaf blade above the collar region.

Thus, the coleoptile is proposed to be an incompletely developed leaf which has evolved via fusion and modification to undertake a protective function. The question remains as to the number of leaves which go to make up the coleoptile. At present, it may be suggested that there are two leaves fused along marginal sheath regions. Such a suggestion is supported by (1) the presence of a leaf blade in ac stocks along margins on one side, (2) the frequent occurrence of two hornlike leaf blade rudiments in hc stocks, and (3) the presence of more than two regular vascular strands in the "bikeel" plants from Bianchi.

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1. Comparison of normal vs. restored commercial hybrids.

Data below compares the performance of normal vs. restored (R) version of commercial hybrids for yield, moisture, and stalk quality (the lower the number the better the quality). These results are from 7x7 latin squares in which each entry appeared seven times. Each latin square was replicated four (three *) times. These figures, therefore, are the average of twenty-eight (twenty-one *) 2x5, four kernel per hill plots.

Hybrid	Maturity	Yield bu/acre	Moist. %	Stalk Qual. Rating
# 1	400	95.0	26.4	15.8
# 1 R		100.3	27.3	15.6
# 2	400	96.7	24.8	9.7
# 2 R		103.8	25.7	10.3
# 3	400	95.7	28.8	9.7
# 3 R		105.7	27.7	9.1
# 4 *	400	98.2	23.6	9.9
# 4 R *		97.0	21.9	10.0

Hybrid	Maturity	Yield bu/acre	Moist. %	Stalk Qual. Rating
# 5 •	400	99.4	23.7	8.8
# 5 R •		99.8	23.5	7.9
# 6 •	40(	103.4	22.8	5.8
# 6 R •		107.3	22.7	6.0
# 7	(00	108.2	22.1	23.2
# 7 R		102.6	23.9	21.9
# 8	600	116.1	22.0	25.3
# 8 R		112.2	22.6	23.7
# 9	600	109.0	22.5	23.8
# 9 R		105.7	23.1	22.6
# 10	600	114.7	19.2	8.1
# 10 R		117.1	19.5	8.2
# 11	600	106.9	21.7	3.0
# 11 R		110.6	20.6	3.2
# 12	600	119.2	21.0	4.9
# 12 R		120.8	20.9	6.3
# 13	800	90.0	22.2	5.7
# 13 R		88.9	21.8	4.0
# 14	800	86.1	22.8	3.8
# 14 (		88.2	22.3	5.2
# 15	800	99.9	22.5	3.6
# 15 R		97.0	23.4	5.5
# 16	800	76.0	18.7	3.7
# 16 R		80.8	18.4	3.3
# 17	800	84.2	19.4	5.0
# 17 R		82.9	19.5	7.8
# 18	800	85.7	18.7	4.6
# 18 R		83.5	19.9	6.8

Some significant differences at the 5% level were found between hybrids within individual 7x7 latin squares. In the yield category, nine significant differences were in favor of the restored version, two in favor of the normal. For moisture %, five significant differences were in favor of the restored, four were significant for the normal version. With respect to stalk quality, no significant differences favored restorer versions, whereas, five favored the normal versions.

All of the experimental, restored versions of the commercial hybrids above have one restorer line in the pollinator side. Hybrids # 8, 9, and 10 are 3-way crosses. In all of the hybrids included in these

7x7 tests the restorer inbred line had at least five backcross generations.

The data indicate that although general performance is quite comparable between normal and restored versions, more than five or six backcross generations are needed for adequate conversion to the recurrent parent.

Details on fertility restoration of commercial hybrids under different environmental conditions will appear in later editions of M. G. C. N. L.

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1. Chromosome knob frequency distribution and frequencies of B-chromosomes in races of maize in Peru.

Progress has been made during the past year on these studies which are almost completed at this time. They will be reported in detail elsewhere.

Table 1 gives a summarized account of the studies on knob frequency distribution and ranges of B-chromosomes in the several races. Additional information is available on size, relative position, and on homo- or heterozygosity of knobs. These data represent an average of three plant samples of pollen mother cells, over a number of collections ranging from 2 to 17 per race.

Two distinct groups of coastal races are obtained on the basis of chromosome knob frequencies: those with high knob numbers, ranging from 4 to 14 knobs per 10 chromosome pairs, such as Alazán, Perla, Jora, Arizona, and Rienda, which can be shown to be either exotic introductions or introgressed with exotic fore-races, and those with low knob numbers: Chancayano, Huachano, Pagaladroga, Mochero, Chaparreño, Arequipeño, which are likely to be races, whose precursors descended from the Peruvian highlands.

The position of the knobs is primarily on chromosome 7, and secondarily in races with high knob numbers, on chromosomes 9, 8, 6, 4, 3, 2, 1, 5, in that order. Race Jora exhibits an extraordinary high frequency of abnormal-10 chromosomes.

The highland races are all low in knob numbers, ranging from 0 to 3 per ten chromosome pairs. Chromosome 7 had a small sub-terminal knob on its long arm in almost all of the plants of this group of races, that were studied. Some definitely lacked it. The second most common position was that of a small sub-terminal knob on the long arm of chromosome 6.

Consistent with previous reports, is the observation reported here that in races with high knob number the frequency of B-chromosomes tends to be low, while the reverse situation of high number per plant cell, and high frequency of B-chromosomes in races with low average knob number, is also true, regardless of geographical altitude distribution range.

The results of these studies suggest that high or low chromosome knob numbers in maize are not associated with respective low or high geographical altitude distributions, as is implied in previous reports. Races of the coastal region derived from highland races, and which have been prevented from