

### 3. Variability in length and arm ratio of pachytene chromosomes.

Absolute length measurements of all chromosomes from each of 271 pachytene microsporocytes from 89 anthers of 31 related corn plants have been made in the course of various studies over a period of two years. Arm ratios were calculated where centromeres could be identified. These data are listed below:

Chromosome	Mean length ( $\mu$ )	Standard deviation	Mean arm ratio	No. observations of arm ratio	Standard deviation
1	83.5	19.4	1.33	52	.200
2	69.2	14.9	1.42	56	.251
3	64.5	14.9	2.16	48	.558
4	59.8	12.6	1.59	73	.259
5	58.4	12.9	1.16	56	.145
6	48.3	12.0	3.10	20	.841
7	49.6	10.8	2.83	57	.587
8	46.3	10.1	3.06	52	.584
9	44.5	10.7	1.86	63	.375
10	37.0	8.8	2.70	55	.498

Statistical studies indicate that longer chromosome arms have greater variances but smaller coefficients of variability and that chromosomes with larger arm ratios have inherently more variable arm ratios. These greater variabilities in arm ratio are not correlated with corresponding greater variabilities in length of the chromosomes involved. The results are consistent with the interpretation that the chromosomes have two kinds of variability: one which seems to contribute approximately uniformly per unit length to variability throughout the genome while the other kind of variability may be a characteristic property of each chromosome unrelated to length in any consistent way. Chromosome knobs do not appear to influence variability in length of chromosome arms in which they occur. *Tripsacum* chromosome material does not appear to differ in its length variability from corresponding corn chromosome material for which it has been substituted.

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### 4. Further studies on pachytene pairing failure.

Pairing failure in pachytene chromosomes was studied against a genetically constant background. Very significant negative correlations were found between total chromosome length per cell on the one hand and number of terminal pairing failures and their total extent (percent length) on the other, and between number of terminal failures and their average extent (percent length). No significant correlation was found, however, between total chromosome length per cell and the average extent (percent length) of pairing failure. If the pairing failures are dissociations increasing in extent and number during the pachytene stage studied, the simplest reconciliation of the results requires that the average rate of their extension be roughly proportional to total chromosome length or that certain constants be related to each other in specific ways. An alternate interpretation, that the pairing failures were present before pachytene and that chromosomes

shorten faster in cells containing them, is favored by the finding that heterogeneity is low between anthers in number of failures per cell and that no significant correlation was found between anthers in total chromosome length and number of pairing failures. The possibility also exists that the pairing failures are a complex combination of both initial synaptic failure and later dissociation.

Distributions of chromosomes containing pairing failure at both ends and of those containing both terminal and intercalary pairing failures generally follow expectations of randomness.

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1. Fourth cycle reciprocal recurrent selection results.

Yield tests involving 4th cycle selections crossed on the appropriate composites were grown in 1961. Coefficients of Variation were 9.1 and 11.1 percent and yields were good. Composites and crosses among composites were compared also. Definite progress has been made in each cycle in increasing the yielding ability of the group of top crosses involving the Ferguson's Yellow Dent Selections x Yellow Surcropper testers or composites. The same trend was obtained by using as a check, either the Yellow Surcropper Variety or the mean of two Texas hybrids. In the other group, Yellow Surcropper selections x Ferguson's Yellow Dent testers or composites, progress has not been as consistent. Apparently the third cycle results were influenced by poor stands and unusual weather conditions to such an extent that selection was not very effective. This group of top crosses was grown a year later than the third cycle of the other group. However, if the first, second and fourth cycle results are compared, a steady shift toward higher yielding top crosses has occurred also in this group.

Mean yields of crosses among varieties and composites grown at two locations in 1961.

Crosses among testers	College Station	Temple
	bu. per acre	bu. per acre
YS variety x FYD composites	71.2	58.0
YS <sub>1</sub> composite x FYD composites	74.1	64.2
YS <sub>2</sub> composite x FYD composites	79.6	65.7
YS <sub>3</sub> composite x FYD composites	73.1	61.1
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FYD variety x YS composites	73.0	62.5
FYD <sub>1</sub> composite x YS composites	76.7	62.6
FYD <sub>2</sub> composite x YS composites	74.8	62.0
FYD <sub>3</sub> composite x YS composites	73.4	62.1
C. V.	15.5%	9.4%