2. Combining chromosomes for Tripsacoid effects.

In an earlier News Letter (No. 32) I reported the extraction, from varieties of maize from the countries of Latin America, of chromosomes with effects similar to those of teosinte chromosomes. These were incorporated into the inbred, A158, through repeated backcrossing.

We have now intercrossed a number of the modified strains of A158 and grown F_2 progenies to determine whether the introduced chromosomes from different varieties are alike or different in their effects. If essentially the same chromosomes are involved in a cross there should be little segregation in the F_2. If the chromosomes are different or carry different assemblages of genes, the F_2 should segregate and the F_2 population should include at one extreme ears quite similar to A158 lacking the introduced chromosomes and at the other extreme ears more Tripsacoid than either parent carrying both introduced chromosomes.

Of 31 F_2 populations involving extracted chromosomes from varieties from Mexico, Guatemala, Honduras, Nicaragua, Cuba, Venezuela, Brazil, Paraguay, Argentina, and Bolivia only two did not segregate. One of these was a cross of Argentina by Argentina which served as a control and the other a cross of Mexico by Honduras.

In a number of the F_2 populations the most Tripsacoid plants were barren, producing no ears or small cobs without grains, others had poorly formed ears which any practical corn breeder would immediately discard. Yet the F_1 plants from which these populations were derived were quite vigorous. Apparently this introduced germplasm, much of it probably originally from Tripsacum, is more or less beneficial when heterozygous but deleterious when homozygous. There is obviously a limit to the amount of foreign germplasm which can be introduced in a homozygous state into an inbred strain such as A158.

P. C. Mangelsdorf

3. Can proximity produce a heterosis-like effect?

Following a suggestion by J. B. S. Haldane, an experiment has been conducted to determine whether corn inbreds which produce marked heterosis when crossed together, can stimulate increased yield in one another when they are merely grown in close proximity. Haldane thought that such a reciprocal stimulation for higher yields between rice varieties grown together in a common flooded plot, as reported by S. K. Roy (1960), might have some relationship to heterosis.

Three types of plantings were made in four replications all involving two plant hills: (1) P39 alone; (2) A158 alone; (3) P39 and A158 together in pairs. The plantings were separated by adequate guard plots. The total yields of the two inbreds in the pure and mixed stands are shown below.

	Yield in grams			
	Pure stand	Mixed stand	Difference	t
P39	4245	6057	+1811	6.53* gain
A158	4460	3592	- 868	7.40* loss
Total	8705	9649	943	

*Both experimental t values are highly significant, being much larger than the tabular t at .01 of 2.71 (Snedecor Statistical Methods).

The results show that when P39 was paired with A158, the P39 component was more productive than when grown alone, but A158 with P39 was significantly less productive. Apparently P39 which has a tendency to tiller can compete more successfully than A158 which is single stalked. The net gain of 11 percent of the mixed stand over the pure stand is significant and may suggest an effect similar to heterosis, but the results are far from conclusive. A better experiment could probably be made by using two inbreds with similar or identical growth habits.

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4. Effect of natural selection on teosinte introgression.

Various teosinte derivatives of A158 were intercrossed and a blend of the resulting seed was grown in isolation for four generations (years). Reserve seed from each year was planted in a 4 X 4 latin square yield test with the following results:

Generation		Yield bu/acre	Shelling %
1 (1957)		67.2	80.1
2 (1958)		70.8	77.1
3 (1959)		69.8	78.5
4 (1960)		66.6	78.1
For Significance	0.05	8.7	0.7
	0.01	13.1	0.8

If the introgression of teosinte germplasm into corn causes evolution for increased yield, four generations of natural selection were inadequate to show it in the corn under the conditions involved in this experiment. The trial did show a significant drop in shelling percentage between the first and second generation.

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5. Colchicine induction of an amphidiploid of multiple tester corn X Tripsacum dactyloides.

Among the many techniques and dosages for colchicine induction of polyploidy which were tried, only one was successful in producing the desired amphidiploid of a WMT corn X T. dactyloides hybrid. The successful procedure was as follows: A tiller about 18 inches long with adventitious roots starting to develop near its base was cut and grown in a nutrient solution until well rooted. The plant was then transferred to a mixed solution of aqueous colchicine (1:1000) and a non-ionic wetting agent (Tergitol 1:500) for 72 hours. The plant which appeared to be almost dead after this severe colchicine treatment, was transferred to a soil-Sphagnum mixture. After two months of being nursed along, a fairly normal cluster of seven shoots had emerged.