fasciation are common in modern maize but their expression is controlled or modified by teosinte introgression.

Effect of teosinte germplasm on fasciation. Our teosinte chromosome 9 stock causes a complete submersion of any phenotypic effects of heterozygous fasciation in its hybrids with Strawberry popcorn and with a fasciated sweet corn inbred, Iowa 5125. All teosinte chromosomes tested (1, 3, 4) caused some reduction in both fasciation and kernel row number as well as an increase in ear length in such hybrids. The teosinte chromosomes entered the hybrids from an isogenic background (A158). The data for the Strawberry popcorn hybrid follow:

Strawberry pop crossed by	Aver. Kernel Row No.	Aver. Ear Length Cm.	Type of Fasciation
A158 (control)	21.0	15.0	medium at butt
A158-Fla. 1	20.6	16.0	slight at butt
A158-Fla. 3	20.5	15.3	medium at butt
A158-Fla. 4	20.0	15.4	slight at butt
A158-Fla. 9	18.0	17.5	none

Inheritance of fasciation. In the absence of teosinte introgression, fasciation segregates as a single factor showing incomplete dominance as found in the F_2 generation from a cross between strawberry popcorn (fasciated) and Argentine popcorn (non-fasciated). In 200 plants, 23% showed the extreme "bears paw" type of fasciation derived from the strawberry popcorn parent; 55%, the apparent heterozygotes, had butt fasciation in which there is much drop-rowing as the ear tapers sharply to the tip; the remaining 22% had the cylindrical non-fasciated type of ear originating from the Argentine popcorn grandparent.

W. C. Galinat

11. Morphological and heterotic components of teosinte and "Tripsacum" introgression in maize.

Morphological components. On the basis of morphological effects described in a previous News Letter (35), it has been possible to identify four components of introgressed germplasm in teosinte derivative stocks of A158. For convenience, these are designated by numbers 1,3,4 and 9 which are probably the chromosomes responsible in whole or part for the various tripsacoid features.

The information obtained from the study of teosinte derivatives was applied to gain insight of the "Tripsacum" derivatives which were developed by introducing into A158, chromosomes or chromosomal segments extracted from tripsacoid races of maize which are not in sympatric

range with teosinte. It was found that some of the "Tripsacum" derivatives could be matched for certain components from teosinte derivatives. In other derivatives the dilute effect of one or more segments was apparent but in still others, the situation seemed to be more complex. It is assumed that tripsacoid components in South American tripsacoid races are derived from some species of Tripsacum as teosinte is unknown in South America. Tripsacoid features in "Tripsacum" derivatives could have been contributed by any of the chromosomes of Tripsacum which possesses the genes controlling these features. It is, however, remarkable that "Tripsacum" germplasm has quite similar although not completely identical effects at least on the internal morphology of the cob.

Heterotic components. A group of 16 teosinte and "Tripsacum" derivatives in addition to the control A158 were crossed in all possible combinations. Out of 136 combinations thus produced, 109 were included in the test. The F_1 plants were grown in the summer of 1961 and heterosis was measured in terms of (1) yield; (2) height of the plant from the ground level to the base of the central spike; (3) days to anthesis; and (4) length of the central spike.

Table I. Results of crosses between inbred A158, teosinte, and "Tripsacum" derivatives expressed on per plant basis as percent of control A158.

	Yield	Height	Days to Anthesis	Central Spike	No. of Crosses
Control A158	100.0	100.0	100.0	100.0	
Maize (A158) x Teosinte derivatives	116.4	102.4	98.5	102.8	6
Maize (A158) x "Tripsacum" derivatives	87.9	100.8	100.2	107.6	8
Teosinte derivatives x Teosinte derivatives	117.6	103.9	98.3	108.9	22
"Tripsacum" derivatives x "Tripsacum" derivatives	98.9	101.2	97.7	112.5	24
Teosinte derivatives x "Tripsacum" derivatives	108.1	101.1	97.4	112.1	49

It is obvious from the results given in Table I that: (1) Introgressed germplasm from teosinte produces heterotic effects for all the characters used as measures of heterosis in these studies. In various intercrosses the introduced teosinte chromosomes not only showed interaction with each other, but also with maize (A158) and "Tripsacum" components. Furthermore, there was indication of an additive effect of the components in some crosses and dominance in the others. (2) The "Tripsacum" derivatives, in crosses with A158, have shown heterosis only for central spike. In crosses among each other, improvement is observed for height, days to anthesis, and central spike. Some of the intercrosses, however, showed significant heterosis for all the characters suggesting the presence of some heterotic "Tripsacum" components. There was

indication of inter-component interaction in many crosses.

Heterosis in maize. The two principal hypotheses which have been advanced to explain the genetic basis of heterosis are dominance and overdominance. The available information on these seems to suggest that the two hypotheses are not mutually exclusive. Present studies definitely suggest that this situation would be expected if it is assumed that there are, in the genetic complex of maize, small heterotic segments of "Tripsacum" and teosinte, which confer selective advantage to the heterozygote, but are somewhat deleterious in homozygous condition. The pseudo-over-dominant effect of these segments may be due to any of the models of gene action. Some of the segments may show additive effect, others epistatic, and still others dominance. If this assumption is valid, as the experimental results described above indicate, then to compartmentalize the observed vigor to one or the other hypotheses, at least for a complex hybrid like maize, is a basic fallacy.

S. M. Sehgal

12. Field studies on teosinte in Mexico.

Guerrero Teosinte. Teosinte was studied on the mountains (700 m to 1650 m) that surround the Balsas Basin where it behaves as a weed on open sites. Teosinte is extremely common on road cuts, erosion gullies and forms dense local populations on sites where there is available more moisture than on the surrounding hillsides. There is widespread evidence that the natural vegetation has been cleared in the past and abandoned hillsides have returned to a dry semi-arid scrub forest. In some areas the cultivation of maize has been only sporadic, but in areas accessible by road, cultivation of maize is of an intensive milpa, shifting-field form, except where prohibited by excessively steep slopes. Collections were made of teosinte expressing all degrees of vigor depending primarily on the population density and quality of the site. Under intense competition from other grasses the plants were often less than a meter high with one or two tassel branches. The other phenotypic extreme were plants in or adjacent to maize fields which developed thrifty stalks of 3 meters. Locally teosinte is definitely one of the dominant grasses on slopes that have obviously been cleared in the past but have not been cultivated for several years. Natural hybrids are not common but they have been collected from a majority of the populations studied to date. Also included here as Guerrero teosinte are collections from the drainage of the Rio Papagayo (Mazatlán, Guerrero).