required the least amount of pressure to crush a 2-inch section. The resistant single cross Mo 22 × K64 had the thickest rind and required more pressure for crushing the stalk, while the single cross WF9 × T8 with intermediate resistance to stalk lodging had thickness of rind and stalk-crushing values midway between the resistant and susceptible single crosses.

It was concluded from these preliminary studies that, from the standpoint of economy and practicality, the use of the thickness of rind as an indication of stalk strength appears to be more advantageous than measuring both thickness of rind and crushing strength. However, a more precise indication of stalk strength would be obtained using both thickness of rind and crushing-strength values.

The combined selection for stalk strength per se by measuring the thickness of rind and selecting for resistance to stalk rotting organisms offers an excellent opportunity to develop corn hybrids with superior stalk-lodging resistance.

THE NATURE OF HETEROESIS FOR A COMPLEX TRAIT IN A FIELD BEAN CROSS

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HETEROESIS for a complex trait is generally expressed as superiority of an $F_1$ hybrid over the better of its two parents. For purposes of this discussion a complex trait is one that has a physiological and/or morphological component structure. The point to be made in this note is that the heterosis of a complex trait can be shown to be, not an effect of overdominant loci nor of genic interaction at the intra-cellular level, but a result of component interaction at the level of integrated morphogenetic systems.

This point is not new, having first been made, in a particular sense, by Keeble and Pellew (3) in 1910 in their interpretation of height inheritance in peas, and not infrequently mentioned by later authors in discussions of the nature of heterosis. It has not been assigned a very prominent role as a heterotic mechanism, one reason being that its generality has never been adequately demonstrated. In recent months, however, Grafius (2) has clearly demonstrated the efficacy of a 3-dimensional component model in accounting for heterosis of grain yield in barley. Williams and Gilbert (4) have interpreted yield heterosis in tomato hybrids by recourse to the component interaction model. The case to be reported here further enhances the generality of the concept.

Yield of seed or fruit is a complex trait. So is total leaf area in two varieties of beans and their $F_1$ offspring. Data were obtained by measurements and leaf counts made two weeks after the onset of flowering and are presented in Table 1.

The $F_1$ coincides with the mid-parent (MP) suggesting additivity for the gene component. The $F_1$ did not differ significantly from the high leaf number of Michelite, non-alleles is not precluded by $F_1$. $F_2$, a portion of which is given in Table 1. This heterosis is clearly a consequence of the relationship that prevails between leaf number, which individually are influenced by the non-dominant gene system respectively.

Since the effect on total leaf area in the leaf size system depends on the joint action of two genes, one acting dominantly, is postulated and symbolized as $\alpha$ dominantly, is postulated and symbolized as $\alpha \cdot D$. Since $\alpha$ behaves in an additive way, there will be some variance defined by the symbol $\alpha^2 \cdot \alpha$.

The present case of heterosis is the joint action of two genes, $\sigma^2_{AD}$, except that the genes are acting at the nuclear or cytoplasmic but rather at the level of morphology of somatic interaction instead of gene.

The model is constrained by the fact that at least some of the variance in each component and that the components be uncorrelated.

The validity of the model is not an extension to biological systems of multigenic components nor by invoking multiplicative components whose genetic bases may be the same. In addition to dominance and