values for both \( F_2 \) families supported the hypothesis (table 1). A test of homogeneity made on the two \( F_2 \) families gave nonsignificant chi-square values, indicating that they were homogeneous populations. In the following discussion, these families are designated as descendants of \( F_1 \) number 1 and \( F_1 \) number 2.

Twenty \( F_3 \) and 24 \( F_4 \) families were selected from white-flowered \( F_2 \) and \( F_3 \) plants, respectively. All progeny in these 44 families had white flowers, indicating that the \( F_2 \) and \( F_1 \) parents were homozygous for white flower color.

Of the 32 \( F_2 \) families (descendants of \( F_1 \) numbers 1 and 2) from purple-flowered \( F_2 \) plants, 10 produced all purple-flowered progeny, indicating that these parents were homozygous for purple. Twenty-two segregated, purple and white, showing that these parents were heterozygous for flower color. Assuming one factor pair for flower color, it would be expected that of the 32 families one-third would be homozygous purple (PP) and two-thirds heterozygous (Pp). A chi-square test gave a good fit to the 1:2 genotypic ratio (table 1). A chi-square test on each of the 22 \( F_3 \) families that segregated for flower color supported the 3:1 phenotypic ratio.

Analyses of data from \( F_4 \) families further substantiated these hypotheses (table 1). Results indicate that white flower color in \( Vicia sativa \) is due to a single recessive gene and that purple is completely dominant to white.—E. D. DONELLY, Associate Plant Breeder, Department of Agronomy and Soils, Agr. Exp. Sta. of the Alabama Polytechnic Institute, Auburn.

**SOME TRACE ELEMENT RESPONSES OF SOUTH TEXAS SOILS**

The use of trace element fertilizers to stimulate growth of legumes and increase soil fertility has been studied intensively in Southwest Texas since 1954.

Agronomists for King Ranch, Inc., of Kingsville, Texas, discussed the problems relating to legume production and trace element fertilization with Australian agronomists during the Centennial Celebration of King Ranch in 1953. It was revealed that compounds of molybdenum, copper, and zinc had been used in Australia when trace element deficiencies were suspected. Niro Diaz, King Ranch agronomist, used this mixture with superphosphate to fertilize legumes in 1954 with definite positive responses.

Comprehensive tests conducted by this Institute show that trace elements are effective in increasing the production of legumes on some alkaline soils of the Rio Grande Plain. Responses were found on Orelia sandy loams, Beaumont clay loams, and Victoria clay and clay loam soils where sodium molybdate, copper sulfate, copper oxide, and zinc sulfate, together with superphosphate were used in fertility studies. Trace elements without superphosphate were ineffective.

The introduction of legumes to improve forage composition on pastures and range land of the Rio Grande Plain is believed to be a worthy goal. Introduced legumes such as bur clover (Medicago hispida), subclover (Trifolium subterraneum), crimson clover (T. incarnatum), hairy vetch (Vicia villosa), trefoil (Lotus corniculatus), alfalfa (M. sativa) and the sweet clovers (Melilotus spp.) seem to be the most promising when fertilized with superphosphate for pasture and range seeding. Important introduced forage grasses include oats (Avena sativa), annual ryegrass (Lotium multiflorum), blue panic (Panicum antidotale), weeping lovegrass (Eragrostis curvula) and alta fescue (Festuca elatior var. arundinacea). The above varieties along with many more have been used in the study of the trace elements (see tables 1 and 2). Native legumes and grasses also have an important place in any improvement program, but the value, if any, of trace elements for them remains to be demonstrated.

The following treatments with some variation generally have been used in trials conducted since 1954: (1) check-no fertilizer, (2) superphosphate at 60 pounds of \( P_2O_5 \) per acre, (3) phosphate plus 1 pound of sodium molybdate, (4) phosphate and molybdate plus copper sulfate and zinc sulfate at 9 pounds each per acre. Copper oxide has replaced copper sulfate with equal effect in some trials. Fertilizer usually has been placed in the drill with the seed at planting.

The data indicate that all legumes and grasses, except weeping lovegrass, made a pronounced response to superphosphate. The addition of molybdenum and of molybdenum, copper, and zinc, more often than not, brought about increases in the production of legumes but had no effect on the grasses. No nitrogen was applied to the grasses and it may have been the limiting factor. This confirms the results of earlier research under less controlled conditions on soils at widely distributed sites in South Texas.—CHARLES W. TRUE, JR., and C. L. SHREWSBURY, Southwest Agricultural Institute, San Antonio, Texas.