then investigated. Two trihybrid plants were obtained when the cross P. acutifolius x P. vulgaris var. Red Kidney x (F_1 P. vulgaris var. Seaway x P. coccineus) was made. The reciprocal cross was not successful. Petiole length of the primary leaves served as a genetic marker in this cross. P. acutifolius which was used as the female parent in the above cross has extremely short petioles of the primary leaves while the trihybrid plant has long petioles. One of the trihybrid plants developed into a vigorous plant while the other developed into a stunted plant. Pollen production was reduced in this trihybrid plant, and the plant was not self-fertile. It is thought that this barrier to the creation of a gene pool may be overcome by crossing varieties of P. vulgaris, P. coccineus and P. acutifolius other than those used in this study.

Inheritance of Growth Habit and Other Morphological Characters in True and Blue Lake Derived Bushes

D. W. Davis and W. A. Frazier

The sturdy, upright habit which characterizes most true bush snap bean varieties contrasts sharply, under western Oregon conditions, with the rangy, floppy habit of determinate breeding lines derived by recurrent backcrossing of determinate bush x pole derivatives to the FM-1 Blue Lake pole bean. This differential appears to be even more marked in warmer climates. During 1961 and 1962 comparison of true bushes with these Blue Lake derived bushes at Corvallis demonstrated the greater general sensitivity of the derived bushes to environmental change imposed by different times of planting, in-row plant spacings, locations (greenhouse versus field), and by short periods of shade. Derived bushes exhibited markedly greater stem elongation under winter greenhouse conditions and, in the field, with closer spacing, later planting, and shade. In all varieties the number of central stem internodes was not greatly sensitive to environmental change.

The inheritance of several morphological characters as well as of gross habit of growth was studied by using 4 parental stocks and the F_1 and F_2 progeny resulting from the 12 possible crosses among them. The two true bush varieties, White Seeded Tendercrop (from Geneva, N.Y.), Puregold Wax, and two Blue Lake breeding lines, OSU 836-9 and OSU 2466 were used as parental material. In the field parents and F_1 and F_2 progeny were grown in a mid-May and a late June planting. In addition, parents and F_1 progeny were grown in the greenhouse during the 1961-62 winter season. Approximately 160 and 480 F_1 and F_2 plants, respectively, from each of the 12 crosses were examined in the field. Except for height of plant, measured shortly prior to anthesis, all characters were measured or rated at the time of pod maturity for processing. Since gross habit of growth and height of pod placement were rated on a 0-9 basis (with 9 denoting better habit or higher pod placement than 0) results concerning these characters may not be absolutely repeatable.

In the greenhouse true bush varieties appeared to contain more of the recessive alleles for habit, height, length of the outstretched plant at maturity, mean internode length, number of central stem internodes, and number of branches. Over the field environments the tendency toward recessiveness in true bushes, while evident in the inheritance of habit and number of internoted was somewhat less certain for height, length, mean internode length and number of branches.

In all environments the net effect of the genes conditioning the expression of habit, height of pod placement, and number of internodes was largely additive. In the absence of pod quality considerations it appears as though fairly rapid progress can be made in selecting for improved habit. Further, the compressed, dwarfed, low internode segregates (exemplified by OSU 2466) which occasionally occur in backcrosses of derived lines to FM-1 do not offer great potential in habit improvement in outcrosses to true bushes. Outcrosses utilizing derived lines possessing more central stem internodes would seem preferable.

The net effect was largely a non-additive one in the expression of plant length, height, and mean internode length; in all environments marked heterosis (as measured by departure of the F_1 beyond the range of the parents) was seen for these three characters. A tendency for heterosis in number of branches under field conditions was reversed to a tendency for negative heterosis under winter conditions in the greenhouse.

Reciprocal differences were noted in the greenhouse for plant height, length, and mean internode length in F_1 progeny of crosses between White Seeded Tendercrop and OSU 2466.

During the winter season, selection in the greenhouse is effective for habit and related characters, except possibly for number of branches. Although the character, plant height, is greatly modified by environment and shows heterotic response in crosses between true and derived bush varieties, selection during an ancillary study of small F_3 families from crosses between White Seeded Tendercrop and various derived bush varieties was shown to be effective.

Association between pod color (wax versus green) and habit, length, height, internode length, and number of branches was demonstrated in F_2 families derived from Puregold Wax. Wax segregates tended to resemble Puregold Wax in possessing a greater number of branches, shorter height, length and mean internode length. The genetic basis of these associations was not established.

Use of Diethyl Sulfate as a Mutagenic Agent for Phaseolus Vulgaris

D. W. Davis and W. A. Frazier

In the previous note three bean mutants, secured through use of diethyl sulfate, were described.

We modified to our needs a method described by R. E. Heiner, Agronomy Department, Washington State University, Pullman, Washington.

Scarified bean seeds were soaked for 40 minutes in a 0.214 percent solution, by volume, of the mutagen and then planted immediately.

The solution was prepared by diluting the diethyl sulfate with distilled water at 30° C and subsequently shaking for 30 seconds, or until sudsy. The solution was added to the seed immediately (the solution should not be allowed to stand). Approximately 3 parts of the solution, to 1 of seed, were used.