Vieira, C. and R.E. Wilkinson. 1972. The importance of field resistance and genetical diversity in bean breeding programs. An. Rep. Bean Improv. Coop.:94-97.

Tulmann, Neto A., A. Ando and J.O.M. Menten. 1979. Obtainment of improved lines of beans (Phaseolus vulgaris) as a first step of the studies on mutation induction. Energ.Nucl.Agri., Piracicaba, 1(2):102-107.

*****

RESPONSE OF CLIMBING BEANS TO STAKING HEIGHT

O. T. Edje and Y. P. Rao
Bunda College of Agriculture
P.O. Box 219, Lilongwe, Malawi

INTRODUCTION. Earlier experiments (Edje and Mughogho, 1978) have shown that staking climbing beans (Phaseolus vulgaris L., Savi) increased both seed yield and quality. They attributed yield increases to better leaf distribution leading to more efficient light utilization and higher foliage efficiency. If foliage distribution is an important factor in climbing bean production, one way of increasing seed yield would be to provide them with tall stakes, hence this field trial was initiated.

MATERIALS AND METHODS. The experiment was conducted at Bunda College of Agriculture during the 1978/79 crop season (November 1978 to April 1979). Two climbing bean cultivars '336' and '1039' were used and four trellis heights (0,1,2 and 3 meters tall) were evaluated. Trellises were constructed using strings. The strings were tied vertically between two horizontal bamboo poles and bean plants were trained along these strings. Beans were planted on 91-cm ridges and the intra-plant spacing on the ridge was 15 cm. All treatments received 300 kg/ha of a compound fertilizer 20-8.7-0 (N-P-K) at planting.

RESULTS AND DISCUSSION. Data for seed yield and yield components and other agronomic parameters, pooled over two cultivars, are presented in Table 1.

Yield increased significantly ($P = 0.01$) with increase in trellis height with the 1-, 2-, and 3-meter tall trellises, when pooled over cultivars, yielding 108%, 140% and 154%, respectively, than the treatment without trellis (check); indicating the importance of better leaf distribution in harvesting solar radiation. There were no significant differences between cultivars being 2,444 and 2,280 kg/ha for cultivars '336' and '1039', respectively, when averaged over trellis heights. Seed quality, as determined visually by the intensity of disease infection, discolouration and shrivelled condition of seeds, also increased with trellis height. This was attributed to high pod clearance above the ground which reduced the number of pods resting on the ground and thereby reducing the susceptibility of seeds and/or pods to microbial growth from water and soil splashing on them.

At harvest, pods were separated into empty, 1-, 2-, 3-, ... and 8-seeded ones. Two-seeded pods occurred most frequently in control plots while in the 1-, 2-, and 3-meter tall trellises, 4-, 5-, and 6-seeded pods occurred most frequently, respectively; with each of these pod frequencies,

in each trellis height, contributing over 20% of the total crop yield.

Dry matter (DM) and leaf area index (LAI), taken at 75 days after planting, increased with trellis height but declined slightly after the 2-meter tall trellises.

Leaf senescence was much more rapid and physiological maturity was earlier in taller than in shorter trellises. Perhaps the better leaf display, the general increase in DM, LAI and seed yield with increase in trellis height might have increased resource demand on factors of production resulting in rapid defoliation and earlier maturity.

Literature cited

Edje, O.T. and L.K. Mughogho. 1978. Effect of staking on yield and quality of indeterminate beans. Turrialba. 28:51-55.

Table 1. Yield and yield components and other agronomic parameters of climbing beans at four trellis heights.

Trellis heights (meters above ground)	Yield (kg/ha)	Pods/m^2		Branches/m^2	DM g/m^2	LAI
		Empty	Seeded			
0	1158	7.4	148.9	61.2	283.6	1.74
1	2409	4.8	104.8	63.4	305.4	1.88
2	2782	2.9	127.6	41.8	365.0	3.28
3	2944	2.9	137.1	37.4	352.8	2.47
Mean	2323	4.5	129.6	51.0	326.7	2.34

*****

FROST TOLERANCE OF THE PHASEOLINAE OF THE SOUTHWESTERN UNITED STATES

Russ A. Buhrow
Department of Plant Sciences
The University of Arizona, Tucson, AZ

A series of several radiation frosts in November and early December 1979 presented a unique opportunity to evaluate the frost tolerance of several species of wild beans growing in a germplasm nursery at the University of Arizona Campbell Avenue Farm, Tucson, Arizona. The identification of frost tolerance in wild species may provide breeders with sources of frost resistant germplasm. Of the species studied, *Phaseolus acutifolius* and *P. filiformis* have been successfully crossed with *P. vulgaris* (1,3). *P. wrightii* is closely related to *P. filiformis* and may be conspecific. *P. ritensis* has been crossed with *P. lunatus* and the F_1 plants were semi-fertile (2). *P. metcalfei* is closely related to *P. ritensis* and should be similarly crossable.

Overall results of the field observations are shown in Table 1. The most impressive frost resistance was found within *P. wrightii*. Although less than one percent of the plants survived the most severe frosts, the remaining