Turon: Bush Blue Lake growing habit, averaging 20" in height. The pods are dark green. Flowering commences approximately 38 days following sowing and is ready for picking in approximately 63 days.

Yanco: Averaging 22" in height, moderate foliage, very long moderately dark-colored pods. Exceptionally high yield. Flowering commences approximately 40 days following sowing and is ready for harvest in 61 days. The pods set mainly on the outside of the bushes.

Leeton: Bush size and foliage is similar to Yanco. The pods set well above ground and all at the same level. Very compact and erect-growing habit. Flowering and maturing occurs at the same time as Yanco.

Bland: Average bush height 22" with abundant foliage. The pods set on long laterals, situated mainly on the outside of the bushes. Flowering commences approximately 35 days following sowing, and harvesting approximately 60 days thereafter.

The following yields were obtained from four hand pickings in a randomized, replicated trial. (The beans were grown on 28" wide hills, 2" apart between plants and farrow irrigated.)

Variety	Yield	
	Ton/Acre	U.S. Ton/Acre
Turon	4.68	5.24
Yanco	7.05	7.90
Leeton	6.31	7.08
Bland	4.78	5.35
Processor (check variety)	1.45*	1.63*
L.S.D. P = 0.05	0.28	0.33

*Plants were affected by Root Rot Complex.

Small quantities of seed are available upon request for trial use.

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Root-Rot Notes

Donald R. Sumner and Marshall P. Evans
Green Giant Company, Le Sueur, Minnesota

Root-rot was a serious problem on Midwest beans in 1967. Stands were reduced by as much as 35% in some fields. Plants usually wilted and died 1-3 weeks after emergence before secondary roots were well developed. The fungi most commonly found associated with field- and greenhouse-grown plants were Rhizoctonia solani, Pythuim spp., Fusarium spp., and Trichoderma viride. All except Trichoderma viride were pathogenic on greenhouse beans grown in sterile soil. Infrequently Thielaviopsis basicola was isolated from blackened secondary roots.

Preliminary research with various mixtures of infested and non-infested soils indicates that root-rot is greatly reduced if the seedling does not have to emerge through infested soil. However, only one inch of infested soil on the surface is enough to cause severe root-rot even when the seeds are surrounded by non-infested soil.

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Bulk Breeding of Lima Beans in California

Carl L. Tucker
University of California, Davis, California

Lima beans have been grown in California for more than 100 years. As with many crops which are well adapted to a given area, probably progress toward higher yielding varieties is slow and tedious. Since only relatively small gains in yield can be expected, it is particularly important that all possible sources of combinations from hybridization be evaluated because through hybrids and their subsequent segregants high yielding breeding lines are uncovered.

The most common method of exploiting variability after hybridization is through pedigrees. However, this method has some limitations when applied to lima beans, and particularly to large seeded limas. In the first place, variability among lines or families is so subtly expressed at some growing locations in California that visual selection is virtually impossible or meaningless. Secondly, the number of seeds produced per plant is so low that testing is sharply limited. Finally, since lima beans are well adapted, a large number of pedigrees should be utilized in order to develop higher yielding lines. Only a limited number of pedigrees can be handled because of the space and time requirements of each.

An additional problem which limits the pedigree method for lima bean development relates to genotype-environment interaction. When a crop growing in a number of distinct environments evinces marked differences in adaptation of genotypes, a plant breeder may a) select at only one environment, as at an experiment station, where lines are randomly selected and followed by intensive testing programs; or b) select in each environment. Obviously, the more efficient alternative is selection in each environment. Lima beans are produced in at least six distinct areas in California, and these production areas cover approximately 500 miles. The growing of pedigrees in each production area would be prohibitive, and thus bulk population breeding should be considered as a reasonable alternative method for handling lima bean breeding lines.

The mechanics of bulk breeding are quite simple. A genetically variable population is developed by a cross or crosses and each generation following the F_1 or F_1s is then propagated in the environment where the crop is produced by planting a random sample from the previous generation. Although this method depends upon natural selection to sort out superior genotypes, artificial selection may be imposed on these populations to insure retention of good agronomic characters. After the F_6-F_9 generation, when the population is made up of many homozygous lines, then it may be handled as a pedigree or maintained