

# **Mechanical Harvest of 'White Half Runner' Beans, Plateau Experiment Station, 2000**

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## **Interpretative Summary**

Chemical and mechanical pruning treatments had little effect on changing plant characteristics of 'Volunteer White Half Runner' for improved mechanical harvest potential. Trash was slightly excessive, and pod breakage of mechanically harvested pods was more than double the expected levels for bush snap beans. The harvester was run at a desirable speed for less breakage. The excessive growth habit and more firm pods of 'Volunteer White Half Runner' and regular strains of Half Runner observed in commercial harvest conditions indicate that Half Runner type beans are not well adapted to mechanical harvest.

## **Introduction**

'White Half Runner' beans are typically hand harvested. Some growers use a trellis to support the plants and obtain larger yields. Other growers use black plastic mulch, drip irrigation, and fertilizer injection in the irrigation to further enhance yields with the trellis system. Inputs are large, but so are returns. 'White Half runner' plants have a semibush type of growth habit which makes mechanical harvest difficult. Some producers machine harvest 'White Half Runner' but have a difficult job of sorting broken pods and plant refuse from the usable pods. Modification of plant growth habit was expected to have potential to improve the machine harvest possibility of 'White Half Runner'.

Several strains of 'White Half Runner' bean, are available. The most widely grown strains are State and Mountaineer. Recent breeding projects were conducted with 'White Half Runner' by USDA and The University of Tennessee plant breeders. It was hoped that less vigorous selections could be made, but no selections with 'White half Runner' pods and a bush type plant growth habit were observed in the breeding lines. One of the breeding lines with 'White Half Runner' plant and pod characteristics and resistance to rust and possibly viruses was selected and released as a breeding line. Asgrow Vegetable Seeds made seed selections and named the release 'Volunteer White Half Runner' type. An experiment was conducted at the Plateau Experiment Station at Crossville in 2000 to evaluate mechanical harvest potential of 'Volunteer White Half Runner' with and without plant modifications by chemical and cultural methods.

## **Materials and Methods**

The site was prepared for planting using conventional tillage in late April. Fertilizer was broadcast at 300 lb/A of 15-15-15 before final disking on May 5. Plots were direct seeded on May 5. Plot size was one row, 20 ft long and each row contained 160 plants.

Rows were spaced 60 inches apart for test purposes, mainly to avoid spray drift among rows. Experimental plot design was a randomized complete block with eight replications. Metolachlor (Dual II) was applied at 2.0 lb ai/A for weed control on May 5. Esfenvalerate (Asana) was applied at 0.05 lb ai/A on June 22 for insect control. Test treatments were (1) natural growth, (2) plant runners trimmed on June 19 when runners were 20 to 22 inches above ground, (3) plant runners trimmed on June 19, June 27, and July 3, (4) an application of daminozide (B-Nine WSG) at 2500 ppm on June 19, and (5) an application of B-Nine WSG at 10000 ppm on June 19.

Plant stand was measured on May 31. Plant height, width, lodging, and runner development were measured or rated prior to harvest. A one row Pixall bean harvester was used to harvest the mature pods on July 19. Harvester reel speed of 150 rpm was used and ground speed was 0.75 mph. Harvested yields were recorded. A 2 lb sample of harvested pods from each plot was separated into trash, broken pods, rotten pods, small pods (unmarketable), and marketable pods. Clusters per lb were counted. Approximately 20 pods from each plot were measured for length and rated for shape, curvature, smoothness, and color. These ratings were on a scale of 1 to 5 with 5 meaning round pods, straight pods, smooth pods, or a dark pod color. An 85 gram sample of the most mature pods were measured for firmness using a Food Technology texture press.

All data were analyzed by Analysis of variance methods, and means were separated by Duncan's multiple range tests at the 0.05 level probability.

### **Results and Discussion**

Plant height averaged 14 inches and plant width averaged 25 inches and these measurements were not different due to treatment ( Table 1). Plants lodged less when trimmed once or thrice as compared to the untreated check. Plant stand was slightly over 5 plants per foot of row, and was not different due to treatment. Yields of marketable pods were higher with the treatment of B-Nine at 10,000 ppm than with any other treatment except pods trimmed twice. The wide spacing of 60 inches was used for movement through the plots for trimming and to prevent spray drift among rows. Plants could have been spaced much closer for optimum yields, and probably 30 to 36 inch row spacing would have been very practical with the growth obtained in this planting. A reasonable row spacing for plantings with more ideal growing conditions would be 36 to 40 inches. It has been observed over the years that plant growth and yields are relatively lower in the early growing season than later in the season. This is probably due to shorter days and cool night temperatures.

Treatment had no significant effect on clusters per lb which averaged about 3, trash which averaged about 4.5 %, broken pods which averaged about 30%, rotten pods which averaged less than 1%, or marketable pods which averaged slightly less than 65% (Table 2). These results indicated that trash was a slight problem, but broken pods were

at excessive levels during mechanical harvest. Removal of these pods is time consuming and also greatly reduced the pod yield of 'Volunteer White Half Runner'.

Treatment had little effect on pod length which averaged 4.3 inches, pod shape which was rated at 5.0 (round pods), pod curvature ratings which averaged 3.9 (slightly curved), pod smoothness ratings which averaged 3.8 (slightly rough), and pod color ratings which averaged 3.9 (medium green) over all treatments (Table 3). Pods were firmer with the treatments of B-Nine than with the untreated check.

Table 1. Plant characteristics and mechanically harvested yields of 'White Half Runner' beans with plant modifications at The University of Tennessee Plateau Experiment Station at Crossville, 2000.

Treatment	Plant height - inches	Plant width - inches	Plant lodging - %	Plant stand - plants/ft.	Pod yield - bushels marketable
Standard	13.5 a <sup>z</sup>	26.2 a	50 a	5.3 a	79 bc
Plants trimmed once	13.9 a	24.8 a	40 b	5.2 a	68 c
Plants trimmed thrice	14.5 a	24.0 a	39 b	5.1 a	97 ab
B-Nine at 2500 PPM	13.8 a	24.8 a	42 ab	5.1 a	75 bc
B-Nine at 10,000 PPM	13.5 a	24.6 a	45 ab	5.6 a	100 a

<sup>z</sup> Means within a column followed by the same letter are not significantly different at the 0.05 level of probability. Duncan's Multiple Range Tests.

Table 2. Pod characteristics of mechanically harvested 'Volunteer white Half Runner' beans with plant modifications at The University of Tennessee Plateau Experiment Station at Crossville, 2000.

Treatment	Clusters - no./lb	Trash - %	Broken pods-%	Rotten pods-%	Small pods - %	Marketal pods - %
Standard	3.3 a <sup>z</sup>	4.4 a	26.7 a	0.9 a	5.1 a	63 a

Plants trimmed once	3.1 a	4.0 a	30.7 a	1.2 a	6.0 a	58 a
Plants trimmed thrice	3.0 a	4.0 a	23.3 a	0.0 a	4.5 a	68 a
B-Nine at 2500 PPM	2.0 a	5.0 a	22.7 a	1.2 a	7.0 a	63 a
B-Nine at 10,000 PPM	3.2 a	4.5 a	19.0 a	0.0 a	5.9 a	71 a

<sup>z</sup> Means within a column followed by the same letter are not significantly different at the 0.05 level of probability. Duncan's Multiple Range Tests.

Table 3. Pod characteristics of mechanically harvested 'Volunteer White Half Runner' beans with plant modifications at The University of Tennessee Plateau Experiment Station at Crossville, 2000.

Treatment	Pod length - inches	Pod firmness <sup>y</sup>	Pod shape <sup>y</sup>	Pod curvature <sup>y</sup>	Pod smoothness <sup>y</sup>	Pod cc
Standard	4.2 a <sup>z</sup>	1114 b	5.0 a	3.8 a	3.8 a	3.9 a
Plants trimmed once	4.2 a	1174 ab	5.0 a	3.9 a	3.7 a	4.0 a
Plants trimmed thrice	4.3 a	1167 ab	5.0 a	3.9 a	3.8 a	4.0 a
B-Nine at 2500 PPM	4.3 a	1225 a	5.0 a	3.9 a	3.8 a	3.9 a
B-Nine at 10,000 PPM	4.3 a	1238 a	5.0 a	3.8 a	3.7 a	3.8 a

<sup>y</sup> Ratings on a scale of 1 to 5; 5 is most desirable rating.

<sup>z</sup> Means within a column followed by the same letter are not significantly different at the 0.05 level of probability. Duncan's Multiple Range Tests.

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This research represents one season's data and does not constitute recommendations. After sufficient data is collected over the appropriate number of seasons, final recommendations will be made through research and extension publications.