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BUSH SNAP BEAN YIELDS AS INFLUENCED BY ROW SPACING AND WEED POPULATION[1]

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Abstract. **'Sprite' bush beans (Phaseolus vulgaris L.) were planted in the fall of 1980 at 12, 18, 24, and 36-inch rows with 1.5-inch in row spacings. Beans were either cultivated once or left uncultivated. Total and marketable pod yields increased as plant density increased. A single between row cultivation 21-days after planting resulted in a doubling of yield, however, yields in general were low due to heavy in row weed pressures. In the spring 1981 season, 12, 18, and 36-inch rows and 1.5-inch in row spacings were used in combination with 4 weed control treatments (weed free, DCPA (dimethyl tetrachloroterephthalate) broadcast preemergence, DCPA 8 inch banded preemergence over the row, and weedy check) and 3 cultivation levels (0, 1 and 2). Highest yields of marketable and total pods were associated with closer spaced rows (high plant population) and lowest weed densities (weed-free growing area). Cultivation was effective in reducing weed levels and increased yields at wide row spacings, but decreased yield at 12-inch row spacing.**

Increased plant populations to obtain higher yields has received a lot of attention in recent years. Pod quality characteristics have been affected only slightly (6), or not at all (3), by the increased plant density.

Mack and Hatch (2) found that bush bean yields were highest when the distribution of plants was uniform. The highest average yield was obtained with a 5 x 5-inch spacing for all varieties tested. However, because of cultural or economic considerations (4), a less than optimum plant density and/or plant arrangement is often used.

The weed control variable in closely spaced snap beans has been investigated only recently (1, 5, 8). Some researchers suggest narrow row snap beans should not be cultivated, however, cultivation should not be ruled out as an effective weed control method until further investigation is completed. Wax and Pendleton (7) recommend narrow rows for soybeans to obtain higher yields but cultivation is necessary for effective weed control.

If early season weed control is effective bush beans provide late season weed control by shading. Williams *et al.* (8) found that 3 weeks of cultivation after emergence of bush snap beans were required to eliminate losses due to weed competition.

This study was begun to investigate row spacing, herbicide, and cultivation variables on bush snap bean yield and weed growth.

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Materials and Methods

Studies were conducted during the fall 1980 and spring 1981 seasons on a St. John's fine sand near Gainesville, Florida. The fall experiment consisted of 18, 24, 30 and 36-inch row spacings all with 1.5-inch in row plant spacing and were either cultivated once or uncultivated.

'Sprite' green bean (*Phaseolus vulgaris*) seeds were planted with a hand planter on September 16. The soil had been treated for nematodes with 6 gpa ethylene dibromide and had received a broadcast application of 1500 lb/A 6-8-8 with fritted micronutrient prior to planting. The plots were 9′ by 60′ with 4 replications.

Half of each plot was cultivated with a hand cultivator approximately 21 days after planting. The cultivation was done to within 2 inches of the bean row and to a depth of about 2 inches. Weeds were left in the plant row. Pesticides for the control of insects and diseases were applied as needed. Plants were harvested on November 13, (58 days). Beans were hand harvested from 20′ sections of 2-inner rows in each plot. All pods were stripped from the plant and passed through a pin bean eliminator-sizer. Pods sieve size 3 and larger were considered marketable and those smaller as culls. Weeds from the harvested area were cut at the soil level and counted.

The spring 1981 treatments were arranged in a 3 x 4 x 3 factorial arrangement with 4 replications. The factors were 3 row spacings (12, 18, and 36 inches), 4 weed control treatments (weedfree, DCPA at 10.5 lb/acre broadcast, DCPA in an 8-inch band over the row, and a weedy check), and 3 cultivation levels (0, 1 or 2 cultivations).

The beans were planted April 2, on a site previously fumigated and fertilized as above. Cultivations were done on April 22 and May 13. Insect and disease control measures were used as necessary. Beans from the 36-inch row treatments were harvested on May 28 (56 days) and the other treatments on June 1, (60 days).

Results and Discussion

Yields were not influenced by row spacing in the fall 1980 experiment. (Table 1). The weed pressure was extremely heavy in the experimental area and consisted mostly of goosegrass (*Eleusine indica*). Weed densities in numbers of weeds per linear foot of row were not affected by row spacing. (Table 1). Cultivation treatments restricted weeds to in row locations and at wide row spacings large vigorous weed plants were prevalent. As row spacing decreased, weed plant size was markedly diminished in closer spaced rows. The main effects of cultivation versus no cultivation are shown in Table 1. Bean yield was increased significantly by a single cultivation 3-weeks after planting. Weed density for cultivation also was significant.

The marketable yield and weed density data was transformed to log values and regression analysis performed. The response best fit a straight line with negative slope and is shown in Figure 1.

Marketable and total yields increased *with decreasing*

Table 1. Main effects of row spacing and cultivation number on weed density and yield of 'Sprite' bush bean in the fall season of 1980.

Treatment	Marketable yield (bu/acre)	Total yield (bu/acre)	Weed density (no./ft row)
Row spacing			
18 inches	41.3	60.6	20.9
24 "	47.0	65.3	21.5
30 "	33.3	46.0	22.9
36 "	29.0	40.3	23.2
F value[z]	ns	ns	ns
No. of cultivations			
0	17.7	27.6	28.7
1	42.3	57.3	15.6
F value	**	**	*

[z]Treatment effects not significant (ns) or significant at the 5% (*) or 1% (**) level.

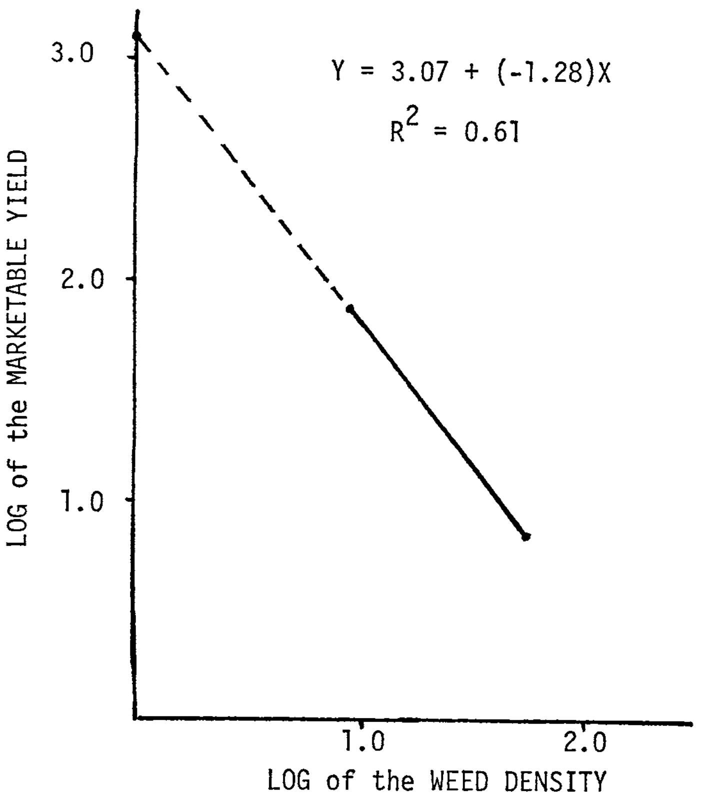

Fig. 1. Regression line for the effect of weed density upon marketable yield of 'Sprite' bush bean during the fall season 1980.

row spacing in the spring 1981 trial (Table 2). As contrasted to the fall season experiment weed pressures were not as great in the spring and yields were 3 times greater among spacings. In the spring 1981 a single cultivation approximately 21 days after planting reduced weed competition sufficiently to allow increased yields over no cultivation (Table 2). A second cultivation 6 weeks after planting did not increase yield over beans that received 1 cultivation. However, the cultivation x spacing interaction was significant. Bean yields increased with each cultivation for 18 and 36-inch rows but decreased with 12-inch rows (Fig. 2). Perhaps root pruning of beans became a factor with the close row spacing.

The main effects of weed control treatments for the Spring 1981 season are shown in Table 2. The bean yields were in general inversely related to weed growth. Yields were highest from the weed free treatment, intermediate

Table 2. Main effects of row spacing, weed control treatment and number of cultivations on weed growth and yield of 'Sprite' green beans in the spring season of 1981.

Treatment factors	Marketable yield (bu/acre)	Total yield (bu/acre)	Weed growth (lbs/ft of row)
Row spacing			
12 inches	247.8	280.1	0.4
18 "	179.8	203.8	0.4
36 "	130.5	151.5	0.4
F	**	**	ns
Weed control			
Weedfree	212.8	242.4	0.0
Broadcast herbicide (10.5 lbs a.i. DCPA/A)	178.2	201.1	0.5
Banded over the row Herbicide (10.5 lbs a.i. DCPA/A)	173.8	197.5	0.5
Weedy check	160.8	185.8	0.8
F value[z]	*	*	**
No. of cultivations			
0	159.2	182.2	0.5
1	198.1	226.8	0.4
2	200.8	226.8	0.4
F	**	**	**

[z]Treatment effects significant at the 5% (*) or 1% (**) level.

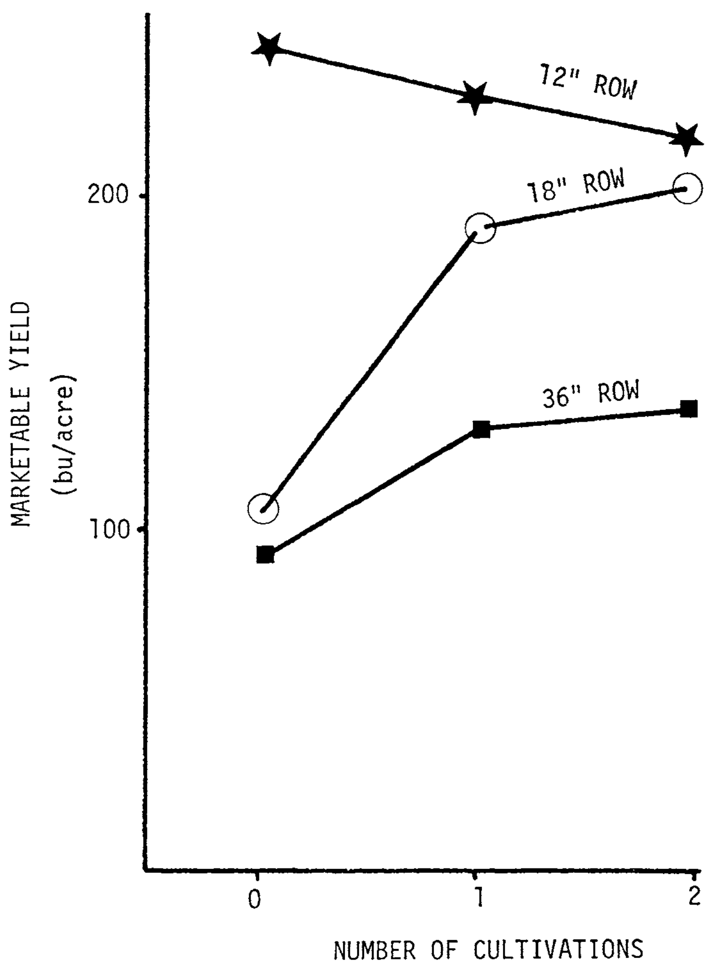

Fig. 2. The effect of row spacing on the marketable yield of 'Sprite' bush bean in the spring season 1981.

with the 2 DCPA treatments and lowest with the weedy check. The weed control treatments and cultivation number interactions were not significant, however, their effect on bean yield is shown in (Fig. 3). Yield increased with each cultivation only with the weedy check. Cultivation number had very little effect on the weed free treatment. With the 2 DCPA treatments, cultivation increased yield over 0 cultivations but a second cultivation decreased yield. The three way interactions were not significant.

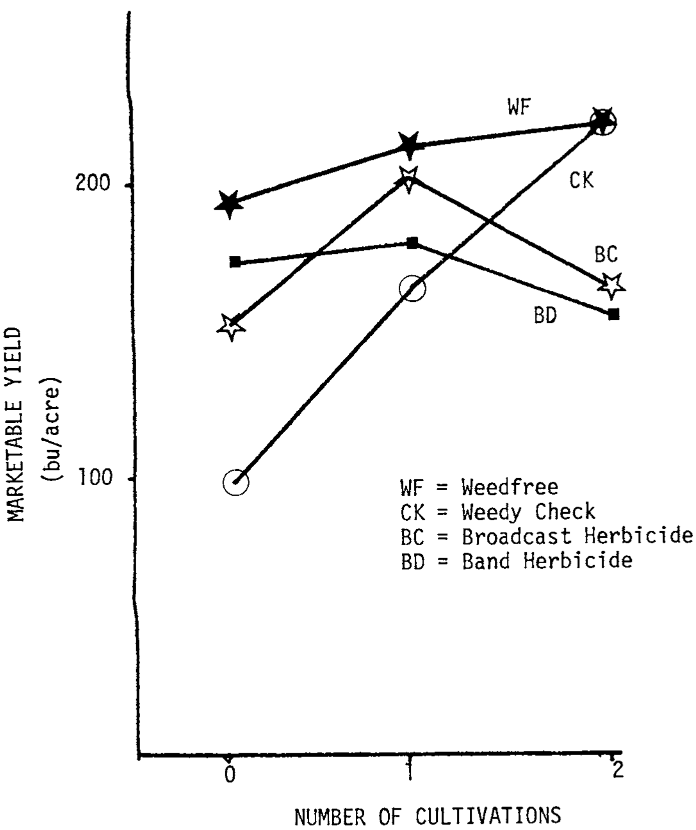

Fig. 3. The combined effects of cultivation number and weed control treatments on the marketable yield of 'Sprite' bush bean in the spring season 1981.

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EVALUATION OF HERBICIDES FOR WEED CONTROL IN TOMATO[1]

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Abstract. **Various herbicidal treatments were applied in an unmulched planting of transplanted 'Hayslip' tomato** (Lycopersicon esculentum **Mill.) in the spring of 1981. Herbicides evaluated were acifluorfen, bifenox, diphenamid, metribuzin, napropamide, pebulate, pendimethalin, sethoxydim, thiobencarb, trifluralin, Hoe 00661, and MC 10108. Good season-long grass control was provided by napropamide (1.0 lb. ai/acre pretransplant) in combination with metribuzin (0.25 lb. ai/acre post directed). Post directed applications of metribuzin (0.25 lb. ai/acre) alone and in combinations with napropamide (1.0 lb. ai/acre pretransplant) and with Hoe 00661 (0.50 and 0.75 lb. ai/acre) post directed resulted in acceptable broadleaf weed control and the highest total yields of fruit. No herbicide provided adequate control of purple nutsedge** (Cyperus rotundus **L.). Tomato plant vigor was good to excellent with all treatments, except acifluorfen post transplant which was very phytotoxic. The best overall herbicide treatments based on weed control and total yield were metribuzin (0.25 lb. ai/acre) post directed + napropamide (1.0 lb. ai/acre) pretransplant and metribuzin (0.25 lb. ai/acre) + Hoe 00661 (0.50 and 0.75 lb. ai/acre) post directed.**

Weed control is a major problem in tomato production on sandy soils in Florida. The long growing season and production under different environmental conditions during spring and fall result in considerable diversity of weed species present and their severity of infestation. Lack of weed control increases harvest costs, while reducing yield and grade of marketable fruit and effectiveness of pesticides. A number of effective herbicides are available; however, need continues to exist for testing of new compounds due to problems with some existing compounds and lack of adequate season-long weed control with any single compound. Trifluralin provides erratic grass control on low organic matter sands (2). Metribuzin, although providing good to excellent weed control, can be phytotoxic under certain environmental conditions (1). Failure of any single

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