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Thirty First

Annual Meeting 1995

Barbados

Vol.XXXI

EVALUATION OF BEAN GERMPLASM FOR YIELD CHARACTERISTICS IN THE US VIRGIN ISLANDS

J.A. Kowalski, S.M.A Crossman and M.C. Palada

*Agricultural Experiment Station, University of the Virgin Islands, RR02,
Box 10,000, Kingshill, St Croix, US Virgin Islands, 00850.*

ABSTRACT

Two green bean (*Phaseolus vulgaris* L.) germplasm evaluation trials were conducted during the spring of 1994. Cultivars evaluated in the first trial were 'Blue Lake 274', 'Contender', 'Green Crop', 'Top Crop' and 'Tenderpod'. Stem diameter of plants did not differ significantly among cultivars. 'Tenderpod' plants had a mean height of 33.7 cm and were significantly taller than 'Contender' plants (25.5 cm). The widest pods were produced by 'Top Crop' (0.83 cm), significantly wider than pods from the other cultivars. The longest pods were produced by 'Green Crop' (14.4 cm), and the mean pod weight was significantly superior to 'Tenderpod'. 'Green Crop' was also significantly superior in total yield (7.37 t/ha) to 'Top Crop' and 'Green Pod' with yields of 4.46 and 4.27 t/ha, respectively. Cultivars evaluated in the second trial were 'Contender', 'Derby', 'Dandy', 'Honey Gold', 'Kentucky Wonder' and 'McHarvest'. Plant height and stem diameter were similar for all cultivars. 'Contender' produced pods that were significantly longer (10.9 cm) than those obtained from all other cultivars. Pods from 'Contender' and 'McHarvest' had the highest mean weight (2.7 g), significantly heavier than 'Honey Gold' (2.0 g) and 'Derby' (1.7 g). 'Dandy', 'McHarvest' and 'Contender' produced the largest quantity of pods. The highest yields were produced by 'Contender', 'McHarvest', and 'Dandy' with 2.3, 2.3 and 2.0 t/ha, respectively.

INTRODUCTION

Green beans are important vegetables in the US Virgin Islands. However, there is very little local production. It is one of the top imported vegetable crops in the Virgin Islands. In 1987, it ranked eighth in importance with over 70,000 kg being imported (Bureau of Economic Research, 1987).

Although green beans are capable of excellent response under wide soil conditions, one of the biggest constraints is identifying cultivars that do well in tropical areas (Nonnecke, 1989). Studies have shown that green beans are sensitive to high temperatures which results in poor plant growth and low pod set (Navarro, 1982). Soil types may range from light sands to clay loams provided irrigation is available as required and drainage is good (Nonnecke, 1989). Poor drainage increases the potential for root rots. Beans are day neutral plants – both flowering and pod set are unaffected by daylength (Nonnecke, 1989).

There have been two green bean germplasm evaluation trials at the UVI Agricultural Experiment Station. The first bean germplasm trial was performed in 1978/79. Two green bean cultivars, 'Commodore Improved' and 'Fordhook Bush' were evaluated for yield and pest and disease problems. Both cultivars produced low yields and were susceptible to leaf miners (Ramcharan, 1980).

In the second germplasm trial (1980/81), nine cultivars were evaluated for yield, days to flowering, days to harvest and time of planting. It was found that plants produce the highest yields during the cooler time of the year. The cultivars that did the best in those trials were 'Asgrow 4117', 'Contender' and 'Asgrow 4091G' (Narravo, 1982).

To serve the needs of local farmers new cultivars need to be evaluated and recommended (Crossman and George, 1993; Palada et al., 1993). Over the past 15 years many new cultivars have been introduced and most of these are adapted to temperate and subtropical areas (Narravo, 1982). This study was conducted to evaluate the performance of 11 cultivars of green beans for yield and quality. Disease and pest resistance was also considered in selecting appropriate cultivars.

MATERIALS AND METHODS

The experiments were conducted at the Agricultural Experiment Station, University of the Virgin Islands on St. Croix (Lat. 17 42'N and Long. 64 48'W). The soil is Fredensborg loamy, fine carbonatic, isohyperthermic, shallow, typic calciustolls (Lugo-Lopez and Rivera, 1980). The initial soil analysis showed a soil pH of 7.98, organic matter content of 4.15%, 19 ppm P, 345 ppm K, and a CEC of 25 meq/100g. The average annual rainfall is 1,016 mm.

The experiments were established using a randomized complete block design with four replications. The cultivars evaluated in the first trial were 'Blue Lake 274', 'Contender', 'Green Crop', 'Green Pod', 'Top Crop' and 'Tenderpod'. The cultivars evaluated in the second trial were 'Contender', 'Dandy', 'Derby', 'Honey Gold', 'Kentucky Wonder' and 'McHarvest'. The experiments were direct seeded. The planting dates were 2 February 1994 for the first and 28 March 1994 for the second trial. Beans were planted in plots 3.65 m long and 60 cm wide with 60 cm between plants and 60 cm between rows. Superphosphate at 100 kg/ha and sulphate of potash at 300 kg/ha were applied approximately 2 wk after planting. All plots were drip-irrigated as needed.

Each trial was harvested four times. Total yield samples were taken from the middle rows. Five pods were measured for length, width and individual weight. Plant height and diameter was measured once, using the middle 10 plants. All data were statistically analyzed using the Statical Analysis System (SAS) GLM procedure. Significant differences among cultivars were determined using Duncan's Multiple Range Test.

RESULTS

Trial 1

Stem diameter did not differ significantly between cultivars (Table 1). 'Tenderpod' plant height at 33.7 cm was significantly greater than 'Contender' which had a mean height of 25.5 cm (Table 1). 'Greencrop' produced the longest pods (14.4 cm) and had the highest mean pod weight (6.0 g) (Table 1). The cultivar with widest pods was 'Top Crop' (Table 1). 'Green Crop' (7.37 t/ha) was significantly superior in total yield to 'Top Crop' and 'Green Pod' with yields of 4.46 and 4.27 t/ha, respectively (Table 2).

Trial 2

Stem diameter and plant height were similar for all cultivars (Table 3). The data in Table 3 show that 'Contender' produced pods which were significantly longer (10.9 cm) than those obtained from all other cultivars except 'Kentucky Wonder' (10.3 cm). Pods from 'Honey Gold' and 'Contender' (7.9 cm) were significantly wider than all other cultivars. Pods from 'Contender' and 'McHarvest' had the highest mean weight (2.7 g), significantly heavier than 'Honey Gold' (2.0 g) and 'Derby' (1.7 g). The highest yields were produced by 'Contender' (2.3 t/ha), 'McHarvest' (2.3 t/ha), and 'Dandy' (2.0 t/ha) (Table 4).

Table 1 Trial 1 – Plant height, stem diameter, pod length, pod width and fruit size of green bean varieties

Cultivar	Plant height (cm)	Stem diameter (cm)	Pod length (cm)	Pod width (cm)	Fruit weight (g)
Blue Lake 274	30.7 ab	0.71	11.6 b	0.80 ab	4.9 ab
Contender	25.5 b	0.63	11.6 b	0.74 b	4.8 ab
Green Crop	29.1 ab	0.70	14.4 a	0.60 c	6.0 a
Green Pod	29.9 ab	0.58	9.0 d	0.78 ab	5.2 ab
Top Crop	30.5 ab	0.74	10.8 bc	0.83 a	5.1 ab
Tender Pod	33.7 a	0.65	9.8 cd	0.79 ab	4.2 b

In each column, means with common letters are not significantly different, P=0.05

Table 2 Trial 1 - Total yield of green bean varieties

Cultivar	Total yield (t/ha)
Blue Lake 274	5.9 ab
Contender	6.1 ab
Green Crop	7.3 a
Green Pod	4.3 b
Top Crop	4.5 b
Tender Pod	6.9 ab

Means with common letters are not significantly different, P=0.05

Table 3 Trial 2 – Plant height, stem diameter, pod length, pod width and pod weight of green bean varieties

Cultivar	Plant height (cm)	Stem diameter (cm)	Pod length (cm)	Pod width (cm)	Fruit weight (g)
Contender	31.6	0.58	10.9 a	0.79 a	2.7 a
Derby	31.2	0.63	10.0 b	0.67 c	1.7 c
Dandy	32.1	0.64	9.6 bc	0.69 bc	2.1 abc
Honey Gold	30.2	0.63	9.1 c	0.79 a	2.0 bc
Kentucky Wonder	33.6	0.62	10.3 ab	0.66 c	2.6 ab
McHarvest	31.7	0.59	9.7 bc	0.73 b	2.7 a

In each column, means with common letters are not significantly different, P=0.05

Table 4 Trial 2 – Total yield of green bean varieties

Cultivar	Total yield (t/ha)
Contender	2.3 a
Derby	0.5 b
Dandy	2.0 a
Honey Gold	1.4 ab
Kentucky Wonder	0.4 b
McHarvest	2.3 a

Means with common letters are not significantly different, P=0.05

DISCUSSION

The superior cultivar in the first trial was 'Greencrop'. It produced the heaviest pods and the highest total yield. 'Contender' was the key cultivar in Trial 2. It produced the largest and heaviest pods. Very low yields and small pods were experienced in Trial 2. A severe mite infestation plus higher day and night temperatures affected plant growth and fruit set. Beyond the mite infestation, no other disease or pest problem was evident.

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