

Evaluation of Heritage Beans in West Virginia

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Introduction:

Beans, corn and squash have been cultivated in the Appalachian Region for thousands of years starting with the Native Americans and pioneers. Heirloom beans (*Phaseolus* sp.), in particular, are considered heritage crops by many West Virginians. Selected varieties have excellent horticultural traits that allow them to be well adapted to the mountain environment.

Half-runner beans are very popular in Appalachia. Half-runner beans are semi-determinate with runners about 9 feet in length. The bean slightly swells within the pod at harvest, and the flavor and nutrition is greater than bush or snap beans. Half-runner beans are harvested as a fresh market bean and are not shelled or dried. While half-runner beans are popular in West Virginia, their commercial production is limited due to the need for hand harvest. Also, many commercial half-runner varieties have been exhibiting tough pods or hulls in hot weather.

Pole beans which include corn field beans, cut short beans and other types of indeterminate beans are also widely grown throughout Appalachia. Pole beans tend to have a slightly tougher pod with a more prominent string. However, pole beans have high yields and can be eaten as a fresh pod, shelled or dry, shelled bean.

The objective of this research project is to select superior phenotypes of half-runner and pole beans for potential commercial markets in West Virginia and Appalachia.

Materials and Methods:

Dry Bean Evaluations:

Evaluations began in early June 2015 when 12 varieties of West Virginia heirloom bean were planted at the WVU Organic/Horticulture Farm in Morgantown, West Virginia. Each seed was planted 4 inches apart in plots which were 5 feet long. Each variety was replicated 3 times in a randomized complete block experimental design. The varieties evaluated were indeterminate pole bean varieties with unique names and characteristics, such as *Turkey Crow*, *Rattlesnake*, *Logan Giant*, *Fat Man*, *October Tender Hull*, *Coal Camp*, *Williams River*, *Ground Squirrel*, *White Greasy Pole*, *Speckled Christmas*, *Aunt Glenda's Pole Bean*, and *Flood Bean*.

Many of the varieties were obtained from Flanagan's Farm in Nicholas County, West Virginia.

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Figure 1. Beans were trellised with cross-arm or vertical trellises in the field and high tunnel.

The beans were distinct colors ranging from black, brown and white to mottled seed coats (Figure 2). All varieties exhibited excellent growth and were easy to grow organically. All varieties were trellised using a mesh plastic hortonoa trellis supported by metal posts. Weed control was achieved by growing the beans in 4-mm-thick black ground cover mulch. The beans were fertilized at planting with an application of 4-3-4 pelletized organic poultry litter to apply a rate equivalent to 60lbs N/acre. No additional fertilizer was applied to the planting. Insects were controlled using *Pyganic* insecticide. The beans' vigorous vines rapidly covered the trellises and were harvested after drying. Then, the beans were mechanically shelled and bagged in early October. Dry weight and horticultural quality of the shelled beans was recorded.

Greenhouse Heritage Bean Phenotype and Flavor Testing:

Seventeen heritage bean varieties were grown within the greenhouse at WVU in 3 gallon pots filled with organic potting mix during spring, 2018. The beans were trellised with strings and clips and each variety was replicated four times. The mature fresh beans were harvested and were cooked for taste test evaluations.

Fresh Market Heritage Bean Evaluations:

Twelve heritage bean varieties were planted on May 29, 2018 at the WVU Organic Farm. Plants were seeded 6 inches apart in double rows on *Weedguard* paper mulch. Each plot contained approximately 28 plants (7 ft. length) and was replicated three times in a randomized complete block design. A modified slant or cross-arm trellis was used to angle the canopy in a v-shaped pattern to facilitate harvest (Figure 1). Sisal twine was used to support the plant canopy. A commercial bush bean was seeded as a control. The beans were harvested weekly as the pod began to swell. Fresh weight and quality were measured.



Figure 2. Heritage beans are diverse phenotypes and can be harvested as dry, shelled beans.

High Tunnel Bean Evaluations:

Two half-runner bean varieties were grown in deep (4 in.) or shallow (1.5 in.) cell transplant trays (1.5 inch diameter) for 3 weeks and transplanted in early May within a high tunnel at the WVU Organic/Horticulture Farm. The transplanted beans were compared with direct seeding of the same varieties. Each plot was 4 feet long and the beans were planted in a double row on black, embossed plastic mulch. Each transplant cell had 2 beans and the plants were planted 12 inches apart. A standard vertical trellis with hortanova netting was used to trellis the vines approximately 9 feet (Figure 1).

Results and Discussion:

Dry Beans:

Some pole beans can be dried in the pods and shelled for cooking, provided the pod does not shatter during drying. Most pole beans, bush beans and half runners are harvested fresh, and eaten, frozen or canned before the bean swells and the pods are still tender. The objective of the project in 2015 was to evaluate heritage pole beans as dry beans. Fresh beans could potentially yield more, but there would be significantly more harvest labor required. In addition, dry beans can be stored and sold over many months. The beans dried on the vines and were harvested in one picking. A mechanical sheller was used to shell the individual varieties. Fifty to sixty pounds of beans could be shelled in one hour. High-yielding varieties included *Logan Giant*, which produced a medium brown seed; *October Tender Hull*, which had a light brown seed with maroon streaks; and *Fat Man* and *White Greasy Pole*, which had high yields of white beans (Table 1). *Coal Camp* and *Williams River* were excellent black/brown beans.

Winter markets, such as farmers markets, CSA (Community Supported Agriculture) and restaurants, are viable market outlets for heirloom dry beans. Organic heirloom beans can be sold for \$3-4/lb.

Table 1. Evaluation of heritage West Virginia beans for dry, shelled beans.

Variety	Wt. (dry) oz.	Mkt. yield (lbs./acre)	Seed phenotype
Aunt Glenda's	16.4	2233	Brown/Red Mottled
Coal Camp	14.6	1987	Brown/Black
Fatman	19.6	2668	White
Flood	16.8	2287	Black
Greasy Pole	21.3	2900	White
Ground Squirrel	11.0	1497	Brown/Black Streaks
Logan Giant	17.3	2355	Brown
Oct. Tender Hull	20.5	2791	Light brown with maroon streaks
Rattlesnake	12.9	1756	Brown/Black Streaks
Speckled Christmas	4.1	558	Mottled
Turkey Crow	15.1	2056	Brown
Williams River	13.0	1770	White
<i>Average</i>	<i>15.3</i>	<i>2083</i>	
<i>Standard error</i>	<i>0.9</i>	<i>123</i>	

^aYield/20ft²

Fresh Market:

Pole beans and half-runner beans had similar yields per acre (Table 3). ‘Coal Camp’ pole bean had excellent yields with pods having a slight green/purplish cast (Figure 3). This variety was easy to hand-harvest and had excellent postharvest quality. When immature, the bean in the ‘Coal Camp’ pod is white but changes to black/brown when dry.

‘Mountaineer’, ‘Josephine Jackson’ and ‘Volunteer’ half-runners were high yielding beans with excellent quality. ‘Josephine Jackson’ variety was easy to hand-harvest and had the highest quality of all the half-runner lines (Figure 3). The ‘Jade II’ bush bean was harvested three times while the half-runner and pole beans were harvested 7 times resulting in a yield twice as high as the bush beans.



Figure 3. ‘Coal Camp’ pole bean (left) and ‘Josephine Jackson’ half-runner bean (right) had excellent flavor and marketable yield.

Table 2. Greenhouse heritage bean observations.

Variety	Type/Source	Seed phenotype	Comments
Brown Half-Runner bean	Half-runner ^z	light brown	Pale pods, good taste, nothing too special
Coal Camp bean	Pole ^z	brown	Favorite of taste test, darker green pods
Fat Man Pole bean	Pole ^z	white	Favorite of taste test, early
Ground Squirrel Pole bean	Pole ^z	striped	Early but unattractive pods and no special taste
Logan Giant Pole bean	Pole ^z	medium brown	Well-known but nothing special in taste or appearance
October Tough Hull bush bean	Bush ^y	marbling	Like a runt
Rattlesnake Pole bean	Pole ^z	stripes	Stunning size and good for those who like conventional snap bean taste
Turkey Crow bean	Pole ^z	brown/tan	Very attractive pod, well-known, sweet and flavorful
Williams River Hull bean	Pole ^z	white	Good but nothing special
Small Speckled Greasy Cut-Short	Cut-short ^y	brown/speckled	Flavorful and very unique size and appearance but late
Logan County Greasy Cut-short	Cut-short ^y		Less flavor than Small Speckled Greasy Cut-Short, slightly earlier
Humphrey Cut-Short	Cut-short ^y	white	Meaty flavor, quite early, bears all the way up the vine
Spangler Bean	Pole ^y	frosted	Huge pods may be a novelty, easy to locate, good flavor and appearance.
Old Joe Clark Bean	Half-runner ^y	reddish	Extra early half-runner, reddish pods may have special market, no special flavor
Valley Bean	Pole ^y	white	Poor flavor, quite early, pod thick like a snap bean
Non-Tough Half-Runner	Half-runner ^y	white	Not a favorite in taste test but very tender and meaty
Mountaineer Half-Runner	Half-runner ^x	white	Quite sweet and flavorful, quite early, but doesn't string very good
White Half-Runner	Half-runner ^x	white	Contaminated with tough pods, very viney
Kentucky Wonder	Pole ^w	brown	Very late, pods get tough later, check pole bean

Seed Source: ^zB. Flanagan; ^ySustainable Mountain Agric. Center; ^xSouthern States Coop.; ^jJohnny's Selected Seeds

Greenhouse evaluations of 17 pole and half runner beans were conducted to screen superior phenotypes and flavor (Table 2). 'Coal Camp', 'Fat Man' 'Turkey Crow', 'Rattlesnake' 'Mountaineer' half-runner, 'Brown' half-runner and 'Josephine Jackson' half-runner were evaluated to have very good flavor and texture when evaluated by a random panel of consumers.



Figure 4. Bean varieties were transplanted.

Table 3. Marketable yield of fresh beans in open field.

Variety	Marketable yield (t/acre)	Pod length (in.)	Quality ^z
Coal Camp Pole	14.5	6.0	4.9
Fat Man Pole	5.6	4.5	3.9
Rattlesnake Pole	11.1	8.0	4.5
Turkey Crow Pole	11.1	5.3	4.2
Josephine Jackson Half-Runner	16.9	5.0	4.6
Larry Phillips Half-Runner	8.7	4.5	3.8
Mountaineer Half-Runner	21.8	5.0	4.3
Non-Tough Half-Runner	7.0	5.8	4.3
Brown Half-Runner	9.4	5.0	4.5
Volunteer Half-Runner	16.7	4.8	4.2
Jade II Bush	9.4	6.5	3.2
<i>Significance: (P<0.05)</i>	<i>1.0</i>	<i>-</i>	<i>0.1</i>

^zQuality rating scale: 1-5; 1=poor; 5=excellent

Beans can be successfully transplanted for early harvest (Figure 4). In this experiment, the soil temperature for direct seeding was within the optimal range (65°F), so direct seeding and transplanting did not differ in days to harvest. There was also no difference in marketable yield between deep or shallow cell transplants (Table 4).

Table 4. High tunnel bean establishment experiment.

Variety	Marketable yield/ft. (lbs.)		
	Direct-Seeded	Transplanted-Deep Cell	Transplanted-Shallow Cell
Josephine Jackson Half-Runner	1.5	1.5	1.7
Non-Tough Half-Runner	0.9	1.0	-
<i>Significance:</i>			
<i>Variety</i>	*	*	
<i>Planting method</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>

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