

Winged Bean Variety Trial

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Keywords: winged bean, legume, variety trial

Abstract. A comparison trial of winged bean varieties was conducted at the ECHO farm in North Fort Myers (zone 9a/10b), Florida. Seven varieties of *Psophocarpus tetragonolobus* were evaluated for pod production, pod length, and seed production. Winged bean plants were planted on August 18th, 2006. Pods were harvested six times between the twentieth and thirty-first week after planting. 'Ribbon' and 'Bogor' were the highest pod and seed producers. The large, crimson-red pods of 'Chimbu' may give it extra market appeal. Pods of 'Flat' and 'Square' are shaped as their names imply; with these varieties, shipping-related damage to the pod wings would probably be minimal.

Introduction and Purpose

Winged bean (*Psophocarpus tetragonolobus*), an amazingly productive and multi-purpose legume, grows as a vine typically staked on 1.5 to 2 m (5 to 6.5 ft) poles or trellises. Likely originating in the Asian tropics, it thrives in hot, humid areas and grows at elevations up to 2000 m (6562 ft).

In 1975, the US National Academy of Science published a study of winged bean. An incredible amount of interest and research followed. The reasons for this were many:

- Nearly all parts (pods, beans, leaves, flowers, and tubers) of the plant are edible to humans. Note that tubers must be cooked, and leaves should be cooked if eaten in quantity.
- Productivity of leaves [8 t/ha (7137 lb/acre)], pods [10 to 40 t/ha (8922 to 35,687 lb/acre)] and seed [usually 2 t/ha (1784 lb/acre)] is high.
- Leaves are exceptionally high in vitamin A, and both the leaves and pods are fair sources of vitamin C.
- Seeds contain up to 37% protein (or more, according to some sources), with a nutritional value similar to that of soybean.
- Seeds are a source of low-cholesterol, edible oil (about 17% can be extracted).
- Seeds in storage have shown resistance to bruchid beetles.
- Tubers contain an average of 20% protein, several times the protein of potatoes.
- After harvesting pods to eat as a vegetable, the stems and leaves can be used as animal fodder.
- The plant thrives in hot, humid areas and tolerates many plant diseases and pests.
- If residue is added to soil, winged bean can improve soil fertility, as it is highly effective in fixing nitrogen.



Figure 1. Winged bean pod with pen to demonstrate relative length. Source: ECHO Staff

When ECHO first wrote about winged bean (*Amaranth to Zai Holes*, pages 70-71), we had been distributing winged bean seeds for 14 years. At that time, our overall impression from our network was that there had been no major success introducing winged bean outside of countries where they were already popular. Harvest trial reports since 1995 indicate no change in that assessment. Several attributes of winged bean limit its potential:

- The hard seeds take a lot of time—and firewood—to cook.
- Seeds may need to be soaked in water or nicked before planting for optimum germination. [Note: ECHO has obtained excellent germination without nicking the seeds.]
- Special recipes are usually needed to make the seeds and tubers tastier.
- Staking is required for maximum pod production.
- It is adversely affected by waterlogged (extremely wet and poorly drained) soil.
- Short days are required in order for most varieties to flower. [ECHO carries a day-neutral type that flowers regardless of day length.]
- Not all varieties produce tubers.
- Plant roots are badly damaged by root knot nematodes [as are most beans].

Yet, we continue to receive numerous requests from overseas for winged bean seeds. Thus, it merits thought as to how this crop might be of benefit.

In finding a niche for winged bean, determine which part(s) and attributes of these plant parts will be of greatest benefit to farmers. Varieties differ in how much of a particular plant part they produce.

Materials and Methods

Among seven varieties evaluated in a trial at ECHO Global Farm in North Fort Myers, Florida (Table 1). Varieties also differ with respect to pod color, size and shape. The large, crimson-red pods of 'Chimbu' may give it extra market appeal. Pods of 'Flat' and 'Square' are shaped as their names imply; with these varieties, shipping-related damage to the pod wings would probably be minimal.



Figure 2. Trellis and trial design in North Fort Myers, Florida. Source: ECHO Staff

Seven winged bean varieties were planted on trellises at ECHO on August 18th, 2006 (Figure 2) and harvested six times between the 20th and 31st week after planting (WAP). At each harvest event, grams of mature, dry pods (with seeds) per plant, grams per pod, timing of pod production, mature pod length, total dry seed yield, seed weight, and tuber attributes were collected.

Data from six plots were averaged.

Results and Discussion

Table 1. Total grams (g) of mature, dry pods (with seeds) per plant, grams per pod, timing of pod production, mature pod length, total dry seed yield, seed weight, and tuber attributes for seven winged bean varieties planted at ECHO on 18 Aug. 06 and harvested six times between the 20th and 31st week after planting (WAP). Data from six plots were averaged.

Variety	Pod yield and timing of production			Pod length	Seeds		Tubers
	g/plant	g/pod	WAP pods harvested	cm	g/plant	g/seed	
Bogor	132	4.7	22 nd to 28 th	16.1	58	0.28	none observed
Chimbu	41	8.7	20 th to 22 nd	26.0	16	0.33	small and thin
Day Neutral	61	3.3	20 th to 26 th	16.9	25	0.28	medium-sized
Flat	88	4.4	20 th to 26 th	18.6	36	0.25	none observed
Ribbon	122	6.6	22 nd to 31 st	18.2	51	0.38	none observed
Siempre	28	3.6	22 nd to 31 st	12.2	11	0.23	large roots/tubers
Square	68	5.2	22 nd to 31 st	20.4	24	0.27	thick roots
P value*	0.011	0.001	not applicable	<0.001	0.006	0.168	not applicable
LSD value*	62.4	1.47		2.63	26.5	N/A	not applicable

*For those interested in statistics, real (statistically significant as opposed to chance) differences between values within a column exist if the P-value for that column is less than 0.05. Within a column, any two numbers are statistically similar unless the difference between them exceeds the least significant difference (LSD) value given for that column.

Growing practices influence production of various parts of the plant. Tall stakes favor pod and seed production over tuber production. In Malaysia, seed yields were maximized to 6.26 t/ha by supporting vines on 2 m (6.6 ft) stakes, harvesting an initial crop of mature pods, and then ratooning at 19 weeks after seed germination. Ratooning involved cutting the plants 30 cm above the ground, resulting in regrowth of vines and pods.

Success introducing winged bean also requires careful thought as to how to prepare it for eating and then transferring that knowledge to local farmers. A few quotes from members of ECHO's overseas network of community development workers illustrate the point: "People don't like the taste although they did not prepare them correctly." "Locals do not really know this vegetable yet. We are still trying to promote it as part of their diet." "My experience...is that they prefer not to try new cultivars or vary their diet."

When growing winged bean for fresh pods to be eaten like green beans, the pods must be harvested while young and flexible enough to bend without breaking. When harvesting mature pods for dry bean production, consider ways to reduce the cooking time needed to soften the seed coats. A method suggested by Dr. Frank Martin and quoted in [Amaranth to Zai Holes](#) (page 279) reads as follows: "Measure the volume of beans to be cooked. Rinse and add 5 volumes of water. To the water add 1% sodium bicarbonate sold as soda or baking powder [about ½ teaspoon per cup of water]. Boil the beans and simmer for 3 minutes. Remove from heat and soak the beans in the solution overnight. The following day, discard the soaking water, rinse twice with fresh water and boil in double their volume of fresh water for 20 to 25 minutes." For other cooking hints, read *ECHO Technical Note "Winged Bean Recipes."*



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Cite as: Motis, T. 2006. Winged Bean Revisited. *ECHO Research Notes* 1(9).

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For further resources, including networking with other agricultural and community development practitioners, please visit our website: www.ECHOcommunity.org. ECHO's general information website can be found at: www.echonet.org.

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