

Edamame Variety Trial Report 1999

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Introduction

In 1999, we conducted two on-farm edamame variety trials in Thurston County, Washington. One trial was located at Stoney Plains Organic Farm and the other at Zenflora Farm. Both of these small, organic farms are located in Tenino, Washington. We chose these sites because the owner/operators of the farms were interested in evaluating the production and market potentials of edamame in our region. The trial at Stoney Plains included all of the varieties we had available for testing, in addition to breeding lines from the Asian Vegetable Research and Development Center (AVRDC). The trial at Zenflora included ten varieties.

Procedures and Methods

Large Variety Trial (Stoney Plains) The large edamame variety trial was planted at Stoney Plains Farm on May 31, 1999. Prior to planting, blood meal was applied and incorporated as a source for nitrogen at a rate of 50 pounds of nitrogen per acre. Also prior to planting, edamame seed was inoculated with *Bradyrhizobium japonicum*. Thirteen varieties and 21 breeding lines were planted in this trial. [Table 1](#) is a complete listing of varieties and breeding lines included in our trials.

The experiment had a randomized complete block design with four replications. Plots were double-row beds, 3 m (10 feet) in length, and the distance between bed centers was 1.5 m (5 feet). Seeds were spaced 7.5 cm (3 inches) apart in the row, and rows were spaced approximately 0.6m (2 feet) apart in the bed. The trial area at Stoney Plains Farm was 0.06 hectare (0.2 acre).

Plots were mechanically cultivated for weed control once a month throughout the growing season. Hand weeding was performed to control in-row weeds once in June, twice in July, and once during the month of August. Plots were irrigated once a week with overhead sprinklers. The irrigation was done with the rate of one inch of water per application. Irrigation was dependent on the amount of precipitation received during the growing season.

Small Variety Trial (Zenflora) A small variety trial of ten varieties was planted at Zenflora Farm on June 8, 1999. The field was tilled and harrowed prior to seeding. Seeds were inoculated with *Bradyrhizobium japonicum* before planting.

The experiment had a randomized complete block design with four replications. Plots were double-row beds, 3 m (10 feet) in length, and the distance between bed centers was 1.5 m (5 feet). Seeds were spaced 2.5 cm (1 inch) apart in the row, and rows were spaced approximately 0.6 m (2 feet) apart. Plants were thinned to a 7.5 cm (3 inch) spacing on July 29, 1999. The trial area at Zenflora was 0.05 acre (0.02 hectare).

Plots were cultivated between rows with a mechanical wheel hoe twice a month throughout the growing season, once in July, and once in August. In-row weeds were controlled by hand. Plots were irrigated at least twice a week with a low pressure, trickle tape system for a maximum of six hours a day. The field received 0.32 inch/hour of irrigation (about 2 inches/6 hours). Irrigation was dependent on the amount of precipitation received during the growing season.

Data Collection

Edamame stand counts were recorded at both trial locations July 29, 1999. Flowering dates and pod fill were observed throughout the growing season.

Harvest

Plants from the center 1.5 m (5 feet) of each double-row plot were harvested for a total harvest area of 3 m (10 feet) per plot. Harvest began on September 20, 1999, and continued through September 29, 1999. Plots were harvested at optimum vegetable maturity. Damage due to frost was observed at the last harvest date.

Plants were pulled by hand and pods were stripped from plants. Pods were sorted into three categories:

- 1) pods with two or more beans
- 2) pods with one bean
- 3) unmarketable

Each category of pods was weighed. [Table 2](#) and [Table 4](#) are summaries of harvested pods. Category 1, pods with two or more beans, is the most desirable pods for marketability. Category 2, pods with one bean, is marketable but not desirable. Pods with one bean will contribute to total yield if the marketable product is a shelled bean. Category 3, unmarketable, includes those pods that were immature or damaged.

One hundred pods were taken from category 1, pods with two or more beans, and these 100 pods were weighed. From these 100 pods, 25 pods were selected at random and the beans were removed. These individual beans were then weighed and counted. [Table 3](#) and [Table 5](#) illustrate the quality of beans from category 1.

Results

Stoney Plains

Varieties In 1999, the varieties White Lion, Butterbeans, Sayamusume, and Kitanozuzu produced marketable pod yields greater than 200 grams (0.44 lb.) per 3 meters (10 feet) of row. The varieties Lucky Lion, Sayamusume, and Kenko produced large pods where 100 pods weighed greater than 200 grams. The weight of 25 beans should be greater than 20 grams for the fresh vegetable market. In 1999, all varieties except Kitanozuzu met this criterion. The varieties Kegen and Sayanishiki did not mature, thus they were not harvested.

Breeding Lines The line AGS 94027-18-1 produced the highest marketable yield. Lines AGS 91027-26-2, AGS 93037-15-1, AGS 329, AGS 91027-6-2-3, AGS 94027-3-1, AGS 94018-11-1, AGS 93028-25-1 all produced marketable pod yields greater than 200 grams (0.44 lb.) per 3 meters (10 feet) of row. The lines AGS 94028-12-1 and AGS 94035-21-1 produced the lowest marketable yield.

Zenflora

Varieties In 1999, the varieties White Lion, Butterbeans, Lucky Lion, Sapporo Midori, Gion, and Sayamusume produced marketable pod yields greater than 200 grams (0.44 lb.) per 3 meters (10 feet) of row. The varieties Yukimusume and Sayamusume produced large pods where 100 pods weighed greater than 200 grams. The weight of 25 beans should be greater than 20 grams for the fresh vegetable market. In 1999, White Lion, Gion, Misono Green, Yukimusume, and Sayamusume met this criterion. The variety, Sayanishiki did not mature, thus it was not harvested.

Seed Harvest

Plants at Stoney Plains were collected from early maturing AVRDC breeding lines on October 8, 1999. Plants were placed in the drying oven at 60°F for three days at the Washington State University Vancouver Research and Extension Station. On October 18th the seeds were cleaned, bagged, and placed in storage for the 2000 planting season.

Table 1. Edamame Varieties and breeding lines included in on-farm trials in Tenino, Washington in 1999

Variety	Supplier	Trial Location
1) White Lion	Takii	Stoney Plains and Zenflora
2) Gion	Takii	Stoney Plains and Zenflora
3) Lucky Lion	Takii	Stoney Plains and Zenflora
4) Kegon	Sakata	Stoney Plains
5) Shironomai	Sakata	N/A
6) Butterbeans	Johnny's	Stoney Plains and Zenflora
7) Sapporo Midori	Snowbrand	Stoney Plains and Zenflora
8) Yukimusume	Snowbrand	Stoney Plains and Zenflora
9) Sayamusume	Snowbrand	Stoney Plains and Zenflora
10) Misono-Greene	Snowbrand	Stoney Plains and Zenflora
11) Kitanosuzu	Snowbrand	Stoney Plains
12) Sayanisiki	Snowbrand	Stoney Plains and Zenflora
13) SB 1002	Snowbrand	Stoney Plains and Zenflora
14) Kenko	Seedex Inc.	Stoney Plains
15) AGS 329	AVDRC	Stoney Plains
16) AGS 340	AVDRC	Stoney Plains
17) AGS 94015-10-2-7	AVDRC	Stoney Plains
18) AGS 94016-14-1-1	AVDRC	Stoney Plains
19) AGS 94016-11-2-1	AVDRC	Stoney Plains
20) AGS 94017-8-1	AVDRC	Stoney Plains
21) AGS 94018-11-1	AVDRC	Stoney Plains
22) AGS 94018-53-1	AVDRC	Stoney Plains
23) AGS 94018-56-1	AVDRC	Stoney Plains
24) AGS 94027-18-1	AVDRC	Stoney Plains
25) AGS 94027-3-1	AVDRC	Stoney Plains
26) AGS 94028-12-1	AVDRC	Stoney Plains
27) AGS 94035-21-1	AVDRC	Stoney Plains
28) AGS 93028-25-1	AVDRC	Stoney Plains
29) AGS 93037-15-1	AVDRC	Stoney Plains
30) AGS 94043-1	AVDRC	Stoney Plains
31) AGS 93043-12	AVDRC	Stoney Plains
32) AGS 94043-14	AVDRC	Stoney Plains
33) AGS 94044-1	AVDRC	Stoney Plains
34) AGS 94044-5	AVDRC	Stoney Plains
35) AGS 91027-6-2-3	AVDRC	Stoney Plains
36) AGS 91027-26-2-5	AVDRC	Stoney Plains

N/A Variety not available at planting time and was not planted at either location.

Table 2. Weight (grams) of pods with 1 bean (standard deviation), pods with 2-3 beans, and the weight of unmarketable pods, from 3-meter-row of edamame grown at Stoney Plains Farm, western Washington, in 1999.

Varieties	Pods w/ 2-3 beans SD			Pods w/ 1 bean SD			Unmarketable pods SD		
White Lion	211.6	ab	(147.3)	35.8	c	(22.3)	5.0	a	(2.1)
Gion	197.7	ab	(233.3)	40.5	bc	(47.9)	5.3	a	(3.7)
Lucky Lion	183.2	ab	(140.9)	47.1	bc	(22.4)	10.5	a	(15.1)
Butterbeans	327.1	ab	(149.8)	86.1	abc	(45.9)	8.9	a	(7.2)
Sapporo Midori	138.3	b	(151.9)	34.7	c	(47.0)	8.4	a	(15.8)
Yukimusume	154.3	ab	(116.0)	47.7	bc	(59.9)	11.0	a	(7.2)
Sayamusume	202.2	ab	(109.2)	47.1	bc	(14.8)	3.4	a	(0.6)
Misono-Greene	154.9	ab	(80.1)	36.5	c	(20.7)	6.6	a	(5.8)
Kitanosuzu	225.9	ab	(108.3)	26.5	c	(12.1)	7.0	a	(4.0)
SB 1002	89.9	c	(55.2)	8.4	d	(5.8)	2.4	a	(0.2)
Kenko	95.3	c	(54.5)	30.2	c	(18.2)	3.6	a	(0.5)
Breeding Lines									
AGS 329	283.9	ab	(189.6)	61.8	bc	(44.7)	14.2	a	(11.3)
AGS 340	121.6	ab	(167.4)	25.0	c	(28.2)	6.3	a	(9.5)
AGS 94018-11-1	247.5	ab	(31.3)	105.2	abc	(38.1)	22.5	a	(4.4)
AGS 94018-53-1	158.2	ab	(53.4)	97.9	abc	(65.1)	20.2	a	(17.1)
AGS 94018-56-1	148.3	b	(77.8)	103.8	abc	(65.8)	31.9	a	(5.0)
AGS 94027-18-1	404.6	a	(188.1)	145.5	ab	(61.1)	52.2	a	(13.9)
AGS 94027-3-1	251.3	ab	(227.1)	155.4	a	(112.0)	51.5	a	(30.7)
AGS 94028-12-1	62.5			24.4			7.4		
AGS 94035-21-1	89.0			23.8			1.0		
AGS 93028-25-1	217.4	ab	(133.3)	77.7	bc	(50.8)	14.1	a	(13.6)
AGS 93037-15-1	299.5	ab	(161.2)	58.5	bc	(34.3)	9.8	a	(4.6)
AGS 93043-12	113.9			65.1			7.7		
AGS 94044-1	129.9			49.4			38.4		
AGS 94044-5	138.2	b	(100.7)	59.6	abc	(31.8)	51.3	a	(25.9)
AGS 91027-6-2-3	263.4	ab	(112.1)	78.4	abc	(33.5)	7.7	a	(5.0)
AGS 91027-26-2-5	305.1	ab	(246.1)	82.8	abc	(61.2)	9.2	a	(7.9)

Table 3. Weight of 100 pods that were selected at random (standard deviation), weight of beans from 25 pods, and number of beans from 25 pods, for edamame grown at Stoney Plains Farm, western Washington, in 1999.

Varieties	Wt. of 100 pods SD			Wt. of 25 beans SD			No. of beans/25 pods SD		
White Lion	197.6	ab	(31.8)	22.3	bc	(2.5)	52.5	ab	(3.9)
Gion	188.6	ab	(9.9)	23.2	bc	(1.1)	53.3	ab	(2.5)
Lucky Lion	214.4	ab	(34.4)	22.1	bc	(3.2)	53.8	ab	(1.3)
Butterbeans	193.5	ab	(10.4)	23.5	bc	(1.9)	56.5	ab	(3.3)
Sapporo Midori	193.0	ab	(38.1)	22.7	bc	(9.4)	53.3	ab	(13.8)
Yukimusume	196.6	ab	(5.2)	32.6	a	(20.9)	54.6	ab	(3.8)
Sayamusume	266.7	ab	(59.3)	29.2	a	(2.2)	53.3	ab	(2.1)
Misono-Greene	198.3	ab	(36.2)	22.0	bc	(1.1)	54.8	ab	(2.2)
Kitanosuzu	121.4	b	(68.2)	17.9	c	(1.4)	56.0	ab	(2.9)
SB 1002	185.2	ab	(12.3)	25.7	abc	(2.2)	54.3	ab	(2.9)
Kenko	208.3	ab	(46.9)	24.6	bc	(1.3)	51.6	b	(0.6)
Breeding Lines									
AGS 329	225.6	ab	(1.3)	21.5	bc	(1.3)	51.6	b	(2.1)
AGS 340	184.5	b	(18.1)	24.0	b	(4.5)	49.5	bc	(8.6)
AGS 94018-11-1	230.3	ab	(55.7)	15.4	c	(2.5)	48.3	bc	(4.6)
AGS 94018-53-1	309.5	a	(177.2)	16.1	c	(3.9)	50.5	b	(3.0)
AGS 94018-56-1	226.6	ab	(25.6)	16.4	c	(3.5)	49.5	bc	(0.6)
AGS 94027-18-1	213.7	ab	(23.2)	17.1	c	(3.5)	54.3	ab	(2.5)
AGS 94027-3-1	232.0	ab	(38.1)	17.2	c	(1.2)	52.0	b	(2.2)
AGS 94028-12-1	178.6			13.5			51.5		
AGS 94035-21-1				25.5			51.0		
AGS 93028-25-1	239.2	ab	(6.5)	22.1	bc	(2.8)	50.5	a	(1.7)
AGS 93037-15-1	201.6	ab	(19.1)	23.6	bc	(4.1)	47.3	c	(6.3)
AGS 93043-12	259.3			17.0			49.0		
AGS 94044-1	145.3			15.1			54.0		
AGS 94044-5	156.5	ab	(21.7)	15.5	c	(1.0)	60.5	a	(0.7)
AGS 91027-6-2-3	251.3	ab	(46.6)	22.2	bc	(1.2)	53.5	ab	(0.6)
AGS 91027-26-2-5	202.0	ab	(11.2)	21.0	bc	(1.1)	54.5	ab	(1.7)

Table 4. Weight (grams) of pods with 2-3 beans (standard deviation), pods with 1 bean, and the weight of unmarketable pods, from 3-meter-row of edamame grown at Zenflora Farm, Western Washington, in 1999.

Varieties	Pods w/2-3 beans	SD	Pods w/ 1 bean	SD	Unmarketable pods	SD
White Lion	399.7	a (183.1)	78.8	a (43.5)	13.5	a (0.2)
Butterbeans	225.9	ab (115.0)	75.2	a (44.0)	20.9	a (13.0)
Lucky Lion	255.6	ab (108.2)	63.3	a (36.0)	8.3	a (3.3)
Sapporo Midori	261.8	ab (136.4)	58.0	a (27.7)	10.6	a (2.6)
Gion	202.7	b (85.8)	60.2	a (9.7)	14.8	a (6.8)
SB1002	197.5	ab (144.9)	37.7	a (32.8)	5.3	a (5.4)
Misono Green	129.7	b (96.2)	43.5	a (12.1)	8.0	a (4.7)
Yukimusume	119.2	b (55.2)	38.2	a (6.6)	10.2	a (3.3)
Sayamusume	220.0	b (91.3)	64.9	a (33.8)	9.2	a (4.2)

Table 5. Weight of 100 pods that were selected at random (standard deviation), weight of beans from 25 pods, and number of beans from 25 pods, for edamame grown at Zenflora Farm, western Washington, in 1999.

Varieties	Wt. of 100 pods	SD	Wt. of 25 beans	SD	No. of beans/25 pods	SD
White Lion	126.8	a (66.7)	36.6	a (36.9)	57.8	a (4.6)
Butterbeans	161.1	a (54.4)	16.2	a (5.1)	54.5	a (1.3)
Lucky Lion	161.7	a (47.5)	19.1	a (6.9)	53.5	a (2.6)
Sapporo Midori	140.0	a (70.1)	17.1	a (7.9)	55.3	a (3.9)
Gion	177.8	a (21.8)	21.2	a (3.1)	53.0	a (1.4)
SB1002	112.0	a (23.6)	14.1	a (11.2)	51.2	a (13.7)
Misono Green	190.3	a (7.0)	22.9	a (0.7)	55.3	a (1.0)
Yukimusume	200.9	a (7.4)	24.3	a (2.0)	54.3	a (2.1)
Sayamusume	236.0	a (7.8)	27.1	a (1.9)	50.7	a (1.2)



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