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Edamame Variety Trial

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We have been conducting edamame variety trials in southwest Washington since 1995. Eight varieties (Butterbeans, Envy, Gion, Lucky Lion, Sapporo Midori, Sayamusume, Shironomai, and White Lion) have been included in our trial almost every year while new varieties have been included each year. Edamame grow well in western Washington and the keys to production success include early maturing varieties, fresh and healthy seed, and adequate fertilizer and irrigation. Each year we obtain new seed from companies to plant in our trial, yet a consistent problem we have found over the course of our studies is poor emergence. Emergence has varied dramatically for varieties from year to year and the problem has not been confined to any one variety. Edamame seed does not appear to store well beyond one year, and fresh seed may be essential for good emergence and plant establishment.

Materials and Methods

In 2001, 18 varieties from 7 seed companies were included in an edamame variety trial at WSU Vancouver Research and Extension Unit (REU) (Table 1). The trial had a randomized complete block design with four replications. The field was tilled in mid-May and edamame were planted on May 18. Plots were 2 rows wide and 10 feet long, spacing between rows was 2 feet, and seeds were spaced 2 inches apart in the row.

Table 1. Eighteen edamame varieties planted at WSU Vancouver REU, the companies that supplied seed, and the color of pod pubescence.

Entry No.	Variety	Seed Company	Pubescence color
1	White Lion	American Takii	White
2	Lucky Lion	American Takii	White
3	Gion	American Takii	White
4	Envy	Johnny's	Brown
5	Butterbean	Johnny's	Brown
6	Shironomai	Sakata	White
7	Kegon	Sakata	White to light brown
8	Kenko (SE-4)	Seedex, Inc	White
9	Shirofumi	Fedco Seeds	White
10	Sapporo Midori	Snow Brand	White on young and brown on mature pods
11	Yukimusume	Snow Brand	White
12	Sayamusume	Snow Brand	White and brown mixed
13	Misono-Green	Snow Brand	White
14	Kitanosuzu	Snow Brand	White
15	Sayanishiki	Snow Brand	White
16	Haruno-Mai	Snow Brand	White
17	Sayakomachi	Snow Brand	White
18	Bukers Favorite	Nichols	Light brown to white

The field was certified organic and was maintained accordingly. Plots were weeded as needed from June through August. Mechanical cultivation was used to control weeds between rows and hand weeding was used to control in-row weeds. Feather meal fertilizer (12-0-0) was applied in a side-dress application on July 5 at a rate of 375 lb/A (45 lb N/A). Overhead irrigation was applied once a week as needed, and total irrigation plus rainfall was 10 inches throughout the growing season. Plant stand was measured in 10 feet of row, and plant height was measured in mid-August, from 10 randomly selected plants in each plot. Measurements were taken from the base of the plant (soil surface) to the top node. Plants were harvested from the center 5 feet of two rows, for a total harvest area of 10 feet per plot. Pods were hand picked, sorted into categories (2-3 beans per pod; 1 bean per pod; and unmarketable), and weighed. 100 pods from the 2-3 beans per pod category were weighed, 25 pods were shelled, the number and weight of their beans were measured, and we calculated the weight of 100 beans.

Results and Discussion

All edamame varieties emerged 10-14 days after planting (DAP) (Table 2). Plant stand was recorded on July 10, 53 DAP, and varied significantly among all varieties. Stands of Kenko (0.7), Gion (5.7), Lucky Lion (9.2), and Shironomai (10.5) were extremely low. Mean DAP to first flower for all varieties was 63, and mean DAP to 50% flowering was 66.

Mean plant height for all varieties was 35 cm (13.8 in), and Gion produced the shortest plants (23 cm, 9.1 in) and Sayakomachi produced the tallest plants (44 cm, 17.3 in). Pod pubescence color was observed at early pod set and at harvest. Most varieties had white colored pubescence (fine hairs on the pods) and three varieties, Envy, Butterbeans, and Sapporo Midori, had brown colored pubescence. Asian consumers expect edamame pods to have white colored pubescence, while Americans who are unfamiliar with edamame have no expectations regarding pubescence color. Pubescence color does not appear to affect flavor, however it should be considered when selecting a variety for marketing due to consumer preferences.

Edamame were harvested from August 28 through October 9, 102-144 DAP, and mean harvest date for all varieties was 113 DAP. Six varieties were harvested 110 DAP or earlier: Envy (102), Haruno-Mai (104), Sapporo Midori (109), Sayamusume (110), and White Lion (110). Kenko had such poor emergence in this trial that it was not included in yield data. Sayanishiki did not mature and may be too late for western Washington. Mean yield of pods with 2-3 beans for all varieties was 727 g (1.6 lb) per 10-feet of row, and three varieties had yields greater than 1000g: Kitanosuzu (1285 g, 2.8 lb), Misono-Green (1228 g, 2.7 lb), and Butterbean (1088 g, 2.4 lb). Gion had the lowest yield (190 g, 0.4 lb) due to its very low number of harvested plants (4).

Mean weight of 100 pods for all varieties was 276 g (0.61 lb), and four varieties had 100-pod weights greater than 300 g: Kegon (337 g, 0.74 lb), Shironomai (317 g, 0.70 lb), Sayakomachi (312 g, 0.69 lb), and Lucky Lion (303 g, 0.67 lb) (Table 3). Mean weight of 100 beans for all varieties was 60.5 g, and the varieties with the largest beans were Lucky Lion (74.8 g), Sayakomachi (67.9 g), and Gion (64.2 g).

Table 4 summarizes the yield (g) of 2-3 beans per pod in 10 feet of row of edamame varieties included in our trial from 1995 to 2001. Mean yields were calculated where data is available for two or more years. The three highest yielding varieties on average were Kitanosuzu (811 g, 1.8 lb), Shironomai (743 g, 1.6 lb), and Butterbeans (661 g, 1.5 lb). Misono-Green was very high yielding in 2001 (1228 g, 2.7 lb) and repeated trials are necessary to determine if this high yield is consistent over years. Gion was high yielding most years, however yields were low in some

years due to low stand counts. Low stand count due to poor emergence significantly impacts yield and it the greatest problem that we have observed with edamame production in our trials.

Table 2. Days after planting (DAP) to emergence, first flower, 50% flower, and harvest; plant height (cm); plant stand in July and at harvest, and yield (g) in 10-feet row.

Variety	Emerg DAP	Plant Stand	First Flw DAP	50% Flw DAP	Hrv DAP	Plt Ht (cm)	No. Plts Hrv	Wt (g) 2-3 bn/pd	Wt (g) 1 bn/pd	Wt (g) Unmrkt pd
White Lion	13.0	38.0	57.7	62.5	109.5	36.3	36.7	644.3	189.5	163.6
Lucky Lion	13.5	9.2	60.7	64.0	118.0	27.9	10.7	569.6	180.1	61.3
Gion	11.5	5.7	65.7	69.5	117.0	22.8	3.7	189.9	62.9	63.5
Envy	10.5	33.7	55.5	61.7	102.0	-	28.3	755.1	260.1	160.6
Butterbean	11.7	35.0	64.0	65.7	115.5	38.1	29.7	1088.2	403.3	226.7
Shironomai	14.0	10.5	66.7	67.7	113.2	27.8	14.5	480.1	390.6	135.1
Kegon	12.2	23.5	73.5	75.0	141.7	28.1	21.0	845.6	409.4	130.3
Kenko (SE-4)	11.5	0.7	71.0	71.7	-	-	-	-	-	-
Shirofumi	13.2	24.0	62.0	62.7	110.2	37.6	20.0	648.9	270.4	116.5
Sapporo Midori	13.5	18.0	54.2	60.7	109.0	34.5	18.7	445.9	160.2	78.7
Yukimusume	11.5	29.5	59.0	64.2	110.7	36.3	26.2	741.6	299.6	211.0
Sayamusume	13.2	27.7	57.5	61.5	109.5	45.4	25.0	591.1	158.3	152.3
Misono-Green	10.7	34.2	61.0	63.5	112.0	40.0	42.0	1227.7	553.4	209.6
Kitanosuzu	11.5	50.5	57.7	62.7	116.0	33.7	40.0	1284.7	572.6	136.3
Sayanishiki	11.2	29.7	79.7	82.5	-	-	-	-	-	-
Haruno-Mai	14.0	25.7	54.5	60.5	104.0	31.9	22.2	603.1	130.0	158.5
Sayakomachi	11.5	29.7	59.0	63.2	112.0	43.9	21.5	790.7	329.80	137.8
Bukers Favorite	-	25.0	66.0	70.0	-	34.8	-	-	-	-
Mean	**12.2**	**25.0**	**62.5**	**66.1**	**113.4**	**34.6**	**18.6**	**727.1**	**291.33**	**142.8**
P-value	0.8714	0.0001	0.0001	0.0001	0.0001	0.0005	0.0001	0.0001	0.0001	0.0376

Table 3. Weight (g) of 100 pods; weight and number of beans from 25 pods; and weight of 100 beans.

Variety	Wt (g) 100 pods	Wt (g) beans from 25 pods	No. beans from 25 pods	Wt (g) 100 beans
White Lion	248.2	35.2	56.7	62.1
Lucky Lion	302.9	41.9	56.0	74.8
Gion	294.0	29.2	45.5	64.2
Envy	218.9	30.4	52.3	58.1
Butterbean	264.5	33.3	58.2	57.2
Shironomai	316.8	32.8	55.7	58.9
Kegon	337.4	30.3	55.2	54.9
Shirofumi	259.6	32.7	56.2	58.2
Sapporo Midori	262.7	35.5	59.7	59.5
Yukimusume	245.3	31.6	56.5	56.0
Sayamusume	292.2	36.4	61.5	59.2
Misono-Green	278.2	37.7	59.2	63.7
Kitanosuzu	275.5	36.4	57.7	63.1
Haruno-Mai	225.0	29.9	61.2	48.9
Sayakomachi	311.8	39.4	58.0	67.9
Mean	**275.5**	**39.8**	**56.6**	**60.5**
P-value	0.0022	0.6381	0.0098	

Table 4. Marketable yield (g) from 10-feet row of edamame varieties included in WSU variety trials in southwest Washington from 1995 to 2001; mean for each variety for two or more years; and mean for all varieties each year.

Entry	1995	1996	1997	1999	2000	2001	Average
AGS91027-6-2-3	-	-	-	263	210	-	**237**
Bukers Favorite	-	-	-	-	-	-	**-**
Butterbeans	663	770	617	327	501	1088	**661**
Early Hakucho	495	120	468	-	-	-	**361**
Envy	332	-	379	-	478	755	**486**
Fiskeby V	631	61	-	-	-	-	**346**
Gion	687	321	735	198	753	190	**481**
Kegon	-	-	-	-	-	846	**-**
Kenko (SE-4)	-	-	-	95	778	-	**436**
Kitanosuzu	-	-	-	226	923	1285	**811**
Lucky Lion	614	736	593	183	625	570	**553**
Mikawashima 202	-	-	321	-	-	-	**-**
Misono-Green	-	-	-	-	-	1228	**-**
Sapporo Midori	-	408	397	138	431	446	**364**
Sayakomachi	-	-	-	-	-	790	**-**
Sayamusume	699	-	-	202	852	591	**451**
Sayanishiki	-	-	-	-	-	-	**-**
SB 1002 (Harunomai)	-	-	-	90	341	603	**345**
Shirofumi	-	-	-	-	-	648	**-**
Shironomai	743	728	931	-	835	480	**743**
White Lion	810	731	585	212	324	644	**551**
Yukimusume	-	-	-	154	529	742	**475**
Mean	**630**	**484**	**558**	**176**	**583**	**727**	**522**

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