

Edamame Soybean Production in North Dakota: 2003 Variety and Irrigation Experiment

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Objective:

The goal of this project is to assess the agronomic performance of several edamame soybean varieties grown in eastern North Dakota during two growing seasons, and to ascertain the necessity of irrigation in the production system.

Materials and Methods:

The first year of this field experiment was conducted at the North Dakota State University research site near Prosper, ND, on a Bearden silty clay loam (fine, silty, frigid, Aeric Calciaquoll) with 3.6% organic matter and 7.5 pH. Previous crop was spring wheat (*Triticum aestivum* L.) and trifluralin was applied in the fall at a rate of 0.5 lb ai/A. The plots were arranged in a completely randomized split plot design with four replicates. Main plots were two irrigation schedules (irrigation biweekly vs. no irrigation) and subplots were five soybean varieties (IA1010, IA2062, Butterbean, Sayamusume, and Envy) and one lima bean comparison. An experimental unit consisted of four 20-ft long rows spaced 30 in apart, and data was taken from the two middle rows.

Planting occurred on 11 June 2003, and the field was cultivated once midsummer for weed control. Seeding rates for the soybean varieties and lima bean were 100,000 plants/A and 45,000 plants/A, respectively. Stand counts were taken on 8 July. Irrigation occurred biweekly (as needed) beginning 21 July. Plots were hand harvested by collecting the aboveground biomass from 10 feet of each middle row on 12 September (Butterbean, Sayamusume, Envy, Lima) and 23 September (IA1010 and IA2062). All pods were removed from the plants, with damaged and unfilled pods discarded. Fresh weights were obtained for marketable pods. Additional data included number of pods on each of three randomly selected plants per plot, and fresh weights for 100 shelled seeds of three subsamples per plot. Data were subjected to analysis of variance. The means were separated by Student-Newman-Keuls LSD test at the 0.05 level of significance.

Results and Discussion:

There were significant differences among the stands of the soybean varieties and lima beans. Emergence was highest in IA2062 and Envy and lowest in Butterbean and lima beans. Sayamusume displayed the greatest variability in stand counts between its irrigated and non-irrigated plots, though supplemental irrigation was not a factor this early in the experiment. Plant populations were generally lower than average for typical Midwest edamame production.

The highest marketable pod yields were obtained from IA2062, followed by IA1010, and the highest percentage of 3-bean pods was also found in these varieties. Higher yields were generally found in the irrigated plots, though there were no statistical differences between irrigated and nonirrigated plots. Sayamusume had the greatest yield difference between irrigated and non-irrigated plots, with higher yields obtained under less irrigation.

There were significantly higher numbers of pods/plant on Envy than Sayamusume, IA2062, and the lima beans, though Envy also had the lowest percentage of 3-bean pods and a significantly smaller seed size than the other beans. Seed size for Sayamusume was statistically greater than the other varieties, and bean seed sizes overall appeared unaffected by irrigation.

Edamame yields (4451-7187 lbs/A) appeared similar to those in other parts of the Midwest, despite the lower plant populations. Yield differences between the irrigated and nonirrigated plots may not have resulted because of the wet first half of the growing season (6.49" rainfall from 1 May-10 June). Supplemental irrigation was not used until the fourth week in July, and the total rainfall received from 11 June-11 September was 5.21". Therefore, the slightly higher yields obtained in some of the irrigated plots was possibly due to the initial higher stand counts. Seedling emergence was generally low and rather variable (from 17-49%) between the edamame plots. This is a known problem in vegetable soybean production. Protein, oil, and moisture content for each soybean variety are still being analyzed.

Acknowledgements:

We would like to thank the Cooperative State Research, Education and Extension Service, USDA, for their financial support of this research. Planting equipment and extra assistance was provided by Burton Johnson and Carrie Schumacher. We greatly appreciated their help in this project.

Table 1. Vegetable soybean variety and irrigation experiment, 2003.
Prosper, ND

Bean	Emergence (plants/A)	Pods/ Plant	Pod Fresh Wt lb/A	3-Bean Pod % [‡]	100 Seed Wt oz
IA 1010-I*	24,285de [†]	88ab	6900ab	39	1.59b
IA 1010-NI	22,869de	84a-d	6242abc	36	1.62b
IA 2062-I	49,441a	60cde	7187a	35	1.59b
IA 2062-NI	39,313abc	57de	6770ab	29	1.48b
Butterbean-I	23,849de	101a	4787bc	33	1.59b
Butterbean-NI	14,266e	86abc	4451c	26	1.55b
Sayamusume-I	31,304cd	65b-e	4757bc	18	2.47a
Sayamusume-NI	17,424e	65b-e	6877ab	17	2.50a
Envy-I	44,322ab	108a	6746ab	6	1.38c
Envy-NI	36,046bcd	92a	5713abc	5	1.34c
Lima-I	15,028e	62b-e	5337abc	58	1.58b
Lima-NI	11,326e	50e	5451abc	51	1.62b
LSD 0.05	9233	18	1277		0.11

* I = irrigated, NI = nonirrigated

[†] Within a column, means followed by the same letter are not significantly different at $P = 0.05$.

[‡] Percentage of total pod fresh weight.