

Adaptation and Utilization of AVRDC Vegetable Soybean Lines In Eastern and Southern Africa.

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Introduction and Methods

Asian Vegetable Research and Development Center (AVRDC), is implementing its Africa Regional Program (ARP) to reach out to a number of countries in Sub-Saharan Africa, a region with low vegetable production, consumption and rampant malnutrition. The mission of ARP is to conduct research, training and information activities for the benefit of the African national programs. AVRDC – Africa Regional Program in Arusha, Tanzania, serves as a bridgehead to extend AVRDC’s improved varieties and technology to Africa. It also facilitates South South cooperation-extending the success in Asia to Africa. In most African counties, farmers usually grow cereals as staple food crops. So for any legume crop to be included in the cropping system, it should be of short duration, provide a reasonable return on investment and sustain soil productivity. This legume crop should also complement the cereal-based diet and improve protein and micronutrient nutrition. Vegetable soybean has great potential in developing countries, especially in Africa, where it is as yet relatively unknown. Vegetable soybean can effectively diversify the cropping system, enhance soil productivity, improve farmer’s income and provide additional protein, vitamins and minerals to the diet. Vegetable Soybean (*Glycine max*(X) Merrill) is a very important crop in South East Asia but not well known in Africa. It can be cultivated in the tropics throughout the year with greater yields realized in summer. However, different accessions are adapted to different seasons and localities, which necessitates the cultivation of an appropriate line at a specific location. Significant interactions between genotypes and season have been observed for various agronomic characteristics (Hung and Shanmugasundaram,1980). This suggests a need to select genotypes for specific environments. In Africa, production and utilization of vegetable soybean is still not well known, as it is a relatively new crop. Evaluation experiments on yield adaptation were conducted at AVRDC Africa regional Program during 1997, 1998, and 2000 on AVRDC Vegetable Soybean lines. On the basis of fresh pod yield characteristics and organoleptic tests by various groups, four lines were selected. These lines namely AGS 339, AGS 329, AGS 338, and AGS 292 have been chosen for further evaluation, utilization and promotions.

Evaluation and Identification of Promising Vegetable Soybean Lines

Research work on the introduction and evaluation of vegetable soybean was initiated at AVRDC Africa Regional Program since 1997. Ten lines namely AGS 292, AGS 329, AGS 330, AGS 332, AGS 333, AGS 336, AGS 337, AGS 338, AGS 339, and AGS 340 were evaluated. On the basis of earliness and quality, 4 lines were identified. In 2000, more attention was paid to four promising lines and evaluation for both productivity and taste were carried out. On the

basis of evaluation done over three years, four lines namely AGS 292, AGS 329, AGS 338 and AGS 339 were selected

Table 1. Average Performance of Four Promising Vegetable Soybean Lines at ARP during 1997, 1998 and 2000.

Genotype	Fresh Pod Yield (t/ha)	Plant Height at Maturity (cm)	No. of Pods/ Plant	Pod Length (cm)	Pod Width (cm)	Pod No./ 500g
AGS 292	8.13	24.4	13.8	5.6	1.34	158
AGS 329	8.10	23.4	17.2	5.8	1.27	146
AGS 338	9.79	26.3	20.9	5.7	1.29	163
AGS 339	9.19	23.4	14.7	5.9	1.34	175
LSD _{.05}	4.64	2.42	4.40	0.55	0.18	61.73
F-Test	ns	ns	*	ns	ns	ns
CV (%)	26.4	3.1	8.3	4.8	4.3	12.1

Means followed by the same letter are not significantly different at 5% level based on DMRT.

The fresh pod yield ranged from 8 to 9.79 tons/ha while the number of pods per plant were significantly higher in AGS 329 and AGS 338 than the other two lines (Table 1). The taste analysis results were found to be acceptable in all lines (Fig. 1).

Seed Yield

A trial to assess the seed production potential of four promising lines was carried out during 2000 with the objective to produce good quality seed with purity and good germination. The seed yield ranged from 3270 to 4120 kg/ha. The number of seeds/plant was much higher in AGS 338 than the other lines.

Table 2. Seed Yield and Seed Characters of Vegetable Soybean Evaluated at ARP in Yr. 2000

Genotypes	Seed Yield (kg/ha)	Seed yield/ plant (g)	Dry matter yield/ plant (g)	No. of seed/ plant	No. of pods/ plant	No. of seed/ pod	Pod length (cm)
AGS 339	3511	21.07	11.69a	28b	21	2a	2.7c
AGS 329	3305	19.83	7.29b	28b	18	2a	3.4b
AGS 338	4123	24.74	10.10a	44a	19	2.33a	3.3b
AGS 292	3272	19.63	11.10a	28b	19	1.67a	4.0
F-test	ns	ns	*	ns	ns	ns	**
LSD _{0.5}	1500	9.10	2.63	13.79	3.54	1.10	0.42
CV (%)	21	21	13	21.5	9.2	27.64	6.18

Means followed by the same letter are not significantly different at 5% level based on DMRT.

Variety Release and Evaluation

In Mauritius, AGS 292 and AGS 339 were released as VSS1 and VSS2, respectively, in April 1999. Their yield potential range is 8-10 t/ha of green pods. Farmers produce their own seed and market soybean themselves. Whole fresh pods vegetable soybean is popular among consumers in Mauritius, where it sells for US\$2/kg, making it a highly profitable crop for farmers. In Tanzania the seeds of lines AGS 338, 339, 292 and 329 have been given to National Research Institutes for further evaluation and future release. In an experimental trial in Swaziland in 1998-99, AGS 346, AGS 344, AGS 345, and AGS 335 produced 16.8, 11.5, 10.5,

and 9.75 t/ha respectively. In the other hand, In Malawi, Vegetable Soybean line GC87020-205-b-5 produced 3.47t/ha

Seed Production and Promotion

Vegetable soybean can generate farm, family income, improve nutrition and productivity of farmland. 500 kg seed of new lines have been produced at AVRDC Africa Regional Program and have been distributed to our national partners and farmers for promotion of this crop.

Mid-Day School Meal in Sudan

A program to provide vegetable soybean as supplemental meal is being initiated in Sudan, especially schools.

Quality and Tests

Because of the complexity of analyzing overall quality, panel tests are the most frequently used evaluation method (Tsou and Hong, 1991). Major quality requirements of vegetable soybean in terms of palatability are appearance, taste, flavor, and texture. Tests on taste were conducted involving representatives from 19 African countries and 45 percent of the test panel members were women. Results showed that these lines are well accepted (Table 3, Fig 1.). In order to fetch a good price at the market the pods should be bright-green, have a good shape and a spotless surface. The primary requirement is good appearance (e.g yellowing reflects freshness decline and degradation of sugars, amino acids and ascorbic acid).

Table 3. Composition of Vegetable Soybean Taste Panel From 1997-2001

Country	1997	1998	1999	2000	2001
Angola	2	3	2	–	–
Botswana	3	3	3	2	1
Kenya	2	1	2	–	1
Malawi	3	2	3	2	1
Mozambique	2	1	3	1	–
Namibia	2	2	2	2	1
Swaziland	3	1	2	1	1
Zambia	3	2	2	2	1
Zimbabwe	3	1	2	1	–
Tanzania	6	83	70	199	20
South Africa	–	–	3	–	1
Ethiopia	1	–	–	–	–
Lesotho	1	2	1	2	2
Sudan	1	–	–	71	97
Mauritius	–	1	2	1	1
Seychelles	–	–	1	2	1
Senegal	–	–	–	1	–
Uganda	–	–	–	–	1
Rwanda	–	–	–	–	1
Total	32	102	98	277	130

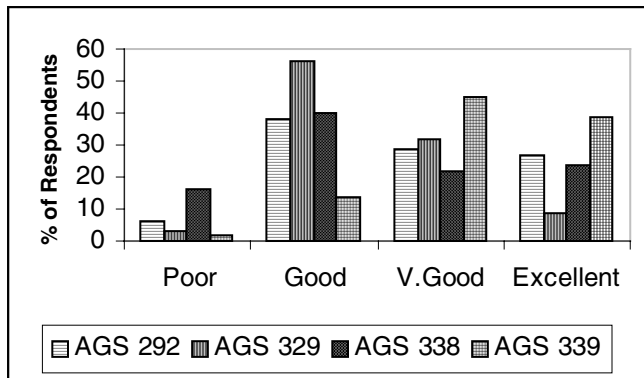


Fig. 1. Organoleptic test results on vegetable soybean lines.

Utilization of Vegetable Soybean.

Vegetable soybean is boiled in salt water and served as hot pods, only seeds are eaten. Vegetable soybean curry: curry is eaten with local dish ugali. Vegetable Soybean can also be used as fodder for animals

Cultivation

Vegetable soybean is cultivated as a green manure crop and can also be intercropped with okra and maize. Experiments conducted at AVRDC has shown that growing vegetable soybean rather than green manure crops such as crotalaria and sesbania was more beneficial to the farmers. Growing vegetable soybean is also helpful to sustain the productivity of farmland.

Future Research

Research work is required on vegetable soybean to find answers to several existing issues such as: 1) incorporation of vegetable soybean into the existing cropping systems; 2) identification of suitable production areas, seasons and cropping system for vegetable soybean in different countries in Africa; 3) achieving high yield and good quality; 4) improving the total productivity of a given piece of land and the total profit to the farmer 5) diversification of uses and improving quality standards for vegetable soybean products; 6) seed production and storage studies; and 7) crop, disease, insect and weed management.

Summary

Vegetable soybean is a new crop for Africa. Four lines of vegetable soybean namely AGS292, 329, 338 and 339 have been identified as the promising lines which can be grown in Southern and Eastern Africa. Taste panel tests involving over 600 consumers from various groups such as scientists, extensionists, NGOs, private sector and farmers have proved that the new vegetable soybean crop and new lines are acceptable for both cultivation and utilization. In Africa, there is still a need to explore acceptance of vegetable soybean, especially in areas where nutritional deficiency is prevalent. Vegetable soybean although a new crop can surely go a long way towards generating farm family income, improve nutrition and sustain the productivity of farmland.

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