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RESEARCH NOTE

Evaluation of seed quality in relation to consumer acceptability of vegetable soybean

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Present study was aimed to investigate the seed composition of vegetable soybean genotypes at green pod stage and consumer acceptability through organoleptic test. The study included 10 vegetable and two grain soybean genotypes. The mean value of seed protein content, oil content and total soluble sugars (TSS) varies from 39.17-44.13%, 12.47-15.30% and 6.46-29.21 mg/g respectively. The genotypes with higher oil content and TSS scored higher consumer acceptability. The acceptability test for pod and seed characters indicated significant variation among the genotypes. The genotypes AGS 447 and AGS 457 recorded maximum mean acceptability score and had highest oil and soluble sugar content at green pod stage and these genotypes may be promoted.

Key words: Acceptability, Green pod, Vegetable soybean

The protein energy malnutrition is a major public health problem in India. It is exemplified by the recent survey reports that, in India, 50-60% of the children below the age of 5 and 51% of the pregnant and lactating mothers are affected by protein deficiency. The protein based production of food in the country is becoming less and the possible avenues of getting rich source of protein need to be investigated and explored. The vegetable soybean is a leguminous crop with high protein content, dietary fibre, unsaturated fats, phosphorus, thiamine and riboflavin but it is not very expensive. The averages protein content of the most of beans varies from 20-25%, whereas the protein content of vegetable soybean is about 40%. Soybean protein is equivalent in quality to animal protein (Mateos-Aparicio *et al.,* 2008). In this context vegetable soybean is emerging as a potential protein rich vegetable, which a common man can use in his routine diet. Compared to the grain soybean, it has a more pleasant flavour, sweeter, easier to cook and are rich in protein, iron and calcium (Keatinge *et al.,* 2011). In India soybean is mainly cultivated as an oilseed crop and vegetable soybean is not yet popularly accepted either for domestic consumption or in the farming systems, mainly because of non-availability of suitable genotypes fitting into narrow windows in a crop rotation and lack of awareness. However, considering its nutritive value as vegetable crop, it is now being realized to identify and release vegetable soybean types. Hence, an attempt has been made to identify the suitable vegetable genotypes based on their seed composition and consumer acceptability.

Ten vegetable soybean genotypes (AGS 339, AGS 380, AGS 406, AGS 447, AGS 457, AGS 459, AGS 460, AGS 461, AGS 610 and Swarna) collected from AVRDC-The World Vegetable Center, ICRISAT Campus, Hyderabad, India, and two grain type soybean (DSb-21 and JS- 95-60) were used. These soybean genotypes were grown in *kharif* 2014 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad, in randomized complete block design with three replications with a spacing of 30 × 10 cm. All the recommended agronomic practices were for grain soybean were followed to raise a good crop. The pods from all the genotypes were harvested at green pod (R6) stage for the estimation of seed protein content, total soluble sugars (TSS) and seed oil content. The nitrogen was estimated by subjecting 0.5 g seed powder to digestion with acid by following standard Kjeldahl method (Kjeldahl, 1883) using the KELPLUS nitrogen estimation system. The seed protein content was calculated by multiplying nitrogen per cent with 6.25 factor. The TSS content was estimated by standard procedure of anthrone method (Sadasivam and Manickam, 2008). The seed oil content was estimated by Nuclear Magnetic Resonance (NMR) spectrophotometer and expressed as oil content in per cent. The Fresh pods harvested at R6 stage were subjected to consumer acceptability analyses by using 1-5 point hedonic scale Watts *et al.* (1989) (1=poor, 2=fairs, 3=good, 4=very good, 5=excellent). A panel of 20 members was used for sensory analysis. The data of the seed quality parameters and acceptability test was subjected to statistical analysis using the statistical package for social sciences (SPSS) and the results were presented as mean ± standard deviation (SD).

Quality of vegetable soybean and consumer acceptability depends on seed freshness, juiciness, nutritional composition and taste. In the present study, genotypic differences with respect to seed quality traits *viz.,* seed protein content, total soluble sugars, seed oil content and their influence on consumer acceptability was noticed. The protein content at green pod stage differed significantly between the genotypes. Among the vegetable genotypes, maximum protein content was recorded AGS 380 (44.13%), followed by AGS 406 (43.02%), AGS 339 (42.44%) and lowest in AGS 447 (39.17 %). Among the grain type DSb-21 had least protein (36.19 %) in contrast to JS-95-60 (41.92%) which was on par with the vegetable soybean genotypes (Table 1). The oil content significantly varied among the genotypes. Swarna (15.3 per cent) recorded the highest oil content and lowest by AGS 460 (12.47%) and AGS 447 (12.80%). In all other genotypes oil content varied between 13 to 14 per cent (Table 1). The total soluble sugar content was maximum in AGS 457 (29.21 mg g^{-1}), followed by AGS 610 (20.65), AGS 459 (18.26) and AGS 339 (16.12). The rest genotypes had less than 10 mg g^{-1} (Table 1). In this study, there was positive correlation between total soluble sugar (TSS) and oil content and similar finding was reported by Liener *et al.* (1978).

Table 1. Nutritional composition of vegetable soybean genotypes

Genotype	Protein content (%)	Oil content (%)	TSS Content (mg/g)
AGS 339	42.44^{abc}	13.30^{d}	16.12^{b}
AGS 380	44.13^{a}	14.10^{c}	6.46^{c}
AGS 406	43.02^{ab}	13.50^{d}	10.22^{c}
AGS 447	39.17^{c}	12.80^{e}	7.74^{c}
AGS 457	40.40^{bc}	14.77^{b}	29.21^{a}
AGS 459	41.74^{abc}	14.00^{c}	18.26^{b}
AGS 460	40.98^{abc}	12.47^{f}	9.02^{c}
AGS 461	40.31^{bc}	14.30^{d}	6.89^{c}
AGS 610	41.97^{abc}	13.40^{d}	20.65^{b}
Swarna	40.40^{bc}	15.30^{a}	6.97^{c}
JS-95-60(C)	41.92^{abc}	14.00^{c}	8.01^{c}
DSb-21(C)	36.19^{d}	12.50^{ef}	7.97^{c}
Mean	41.05	13.70	12.29
S.Em	1.00	0.10	1.55
LSD 5%	2.93	0.30	4.55

Means followed by the same letter/s in a column do not differ significantly by the DMRT (P = 0.05)

The data on sensory evaluation and overall consumer acceptability indicated significant differences between the genotypes (Table 2). The genotype AGS 447 and AGS 457 recorded maximum values for pod characters indicating these genotypes had more appealing pod appearance, colour and texture. For seed characters like appearance, colour, texture and taste, genotypes AGS 447, AGS 457 and AGS 459 showed highest value for (Table 2 and Fig 1). Among the seed characters taste is very important which had maximum influence on consumers. Taste value was maximum with AGS 447 (3.35) followed by AGS 457 (3.22) and AGS 610 (3.14) possibly because of high soluble sugars. However, on overall acceptability as per mean rank was highest (3.36) with two genotypes AGS-447 and AGS-457 (Fig 1). The least mean rank acceptability was with grain type check, JS-95-60 (1.64) which had lower sugar and oil content. However, all the vegetable genotypes had higher acceptability over the grain types (DSb-21 and JS-95-60). As per consumer preferences, AGS- 447 and AGS-457 ranked first for overall acceptability which may be mainly because of taste contributing factors such as sugar and oil composition. These results are in confirmation with results of Izzy Esler (2011) and Poornima *et al.* (2014). In colclusion, two vegetable soybean genotypes AGS-447 and AGS 457 are found to be best from the consumer acceptability which may be promoted for yield improvement and popularization to increase dietary protein intake.

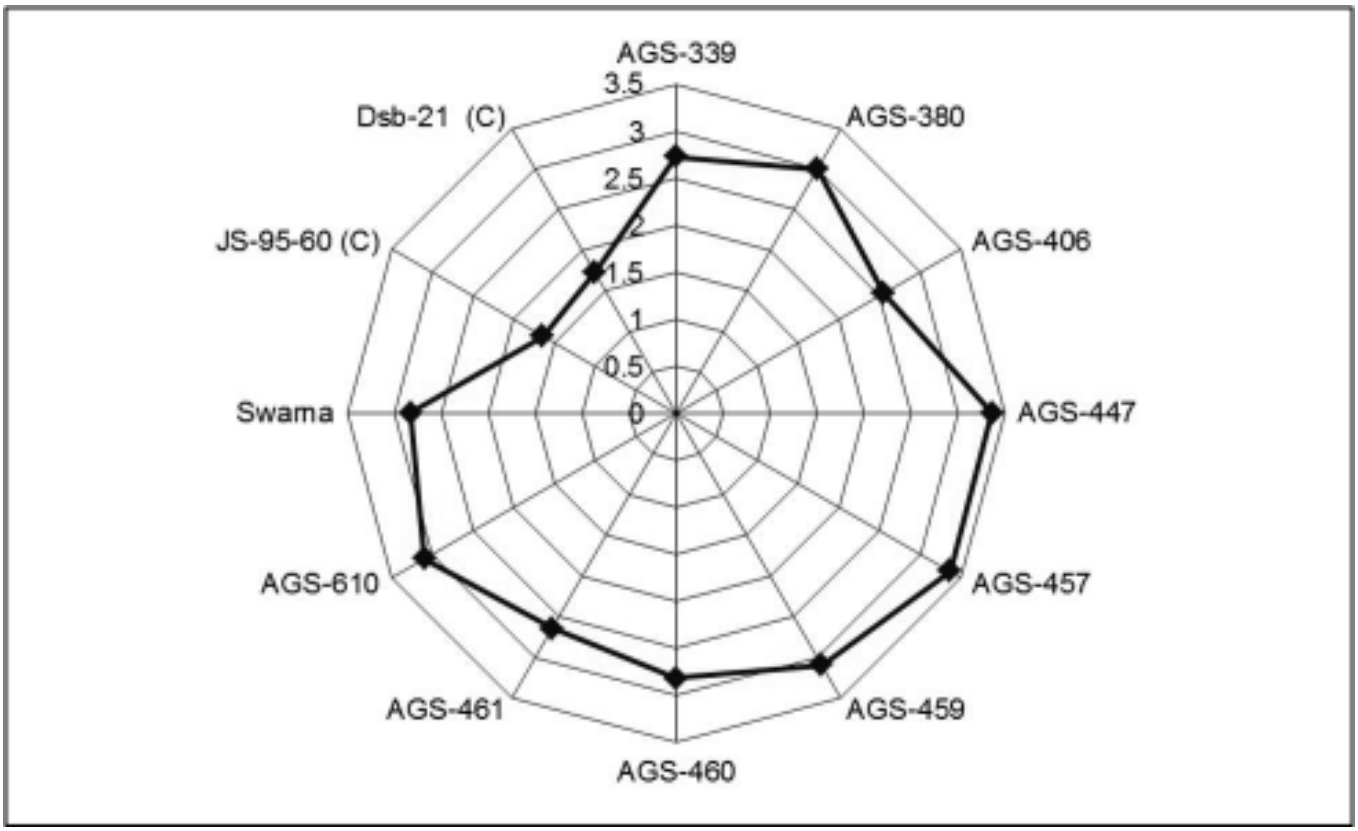

Fig.1. Radar chart with score of overall consumer acceptabilty of vegetable soybean genotypes in comparision with grain types

Table 2. Mean score of consumer acceptability in vegetable soybean genotypes

Genotype	Pod characters seed characters							Overall
	Appearance	Colour	Texture	Appearance	Colour	Texture	Taste	
AGS 339	2.88^{bc}	2.65^{ef}	2.76^{c}	2.80^{c}	2.63^{fg}	2.66^{d}	2.62^{ef}	2.73^{cd}
AGS 380	3.05^{ab}	2.92^{cd}	3.01^{b}	3.09^{b}	2.93^{d}	2.91^{c}	3.01^{cd}	3.00^{bc}
AGS 406	2.45^{d}	2.36^{g}	2.40^{d}	2.48^{e}	2.38^{b}	2.41^{e}	2.65^{ef}	2.55^{d}
AGS 447	3.40^{a}	3.52^{a}	3.46^{a}	3.41^{a}	3.34^{a}	3.473^{a}	3.35^{a}	3.36^{a}
AGS 457	3.35^{a}	3.43^{a}	3.34^{a}	3.37^{a}	3.26^{a}	3.398^{a}	3.22^{ab}	3.36^{a}
AGS 459	3.08^{ab}	3.13^{b}	3.10^{b}	3.06^{b}	3.14^{bc}	3.118^{b}	3.02^{cd}	3.09^{ab}
AGS 460	2.66^{cd}	2.72^{ef}	2.69^{c}	2.54^{de}	2.71^{ef}	2.64^{d}	2.83^{de}	2.82^{bcd}
AGS 461	2.68^{cd}	2.80^{de}	2.74^{c}	2.72^{cd}	2.80^{e}	2.75^{d}	2.61^{f}	2.64^{d}
AGS 610	2.99^{bc}	3.08^{bc}	3.03^{b}	2.91^{bc}	3.03^{cd}	3.02^{bc}	3.14^{bc}	3.09^{ab}
Swarna	2.84^{bc}	2.54^{fg}	2.69^{c}	2.76^{c}	2.56^{g}	2.67^{d}	2.77^{ef}	2.82^{bcd}
JS-95-60(C)	1.57^{e}	1.74^{h}	1.66^{e}	1.60^{f}	1.76^{i}	1.673^{f}	1.59^{g}	1.64^{e}
DSb-21(C)	1.65^{e}	1.60^{h}	1.63^{e}	1.48^{f}	1.62^{j}	1.648^{f}	1.73^{g}	1.73^{e}
Mean	2.71	2.70	2.70	2.69	2.67	2.69	2.71	2.72
S.Em±	0.11	0.06	0.05	0.06	0.04	0.04	0.06	0.10
LSD 5%	0.33	0.18	0.17	0.19	0.12	0.12	0.19	0.30

Means followed by the same letter/s in a column do not differ significantly by the DMRT (P = 0.05)

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