Potential and Scope of Vegetable Soybean in India*

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Introduction

Vegetable soybeans being comparatively richer and better source of **human nutrition**, **dietary fibre** and health promoting **phyto-chemicals** than the other traditional vegetables, are a good source of vegetable and/or snack foods for Indians specially the vegetarians representing 65-70% of total population of over one billion. Efforts are being made to breed vegetable soybean under the aegis of Indian Council of Agricultural Research/National Agricultural Research System (ICAR/NARS). It is hoped that vegetable soybean would become popular in India in the near future. This paper reviews the development & use of vegetable soybean in India & abroad and suggests as to how it could be promoted in India for health and economic benefits of its people.

Role of Vegetables and Vegetable Soybean in Human Health

Vegetables are rich and comparatively an economical source of vitamins and minerals. They increase **appetite** and provide **taste, palatability** and **fibre** to the diet. They also contribute, carbohydrates, protein & fat. Vegetables are beneficial to human health specially against the degenerative diseases (Kale, et al, 1999) and also play a key role in neutralizing the acids produced during digestion and help in preventing constipation. Normally 300 g of vegetables consisting of root vegetables (90 g), green leafy vegetables (120 g) and legume vegetables (90 g) are required per person per day for maintaining a good health.

Vegetable soybeans are specialty beans harvested at about 80% maturity in green-yellow pod and used green. They normally have large pods with large size seeds (200-250 mg per seed or more) and sweet taste. At this stage, the seeds are still green, large and soft. Vegetable soybean varieties also offer innovative products such as green milk, green tofu, and green noodles (Shanmugasundaram and Yan,1999). Vegetable Soybeans are rich in protein, fat, phosphorus, calcium, iron, thiamin, riboflavin, vitamin-E and isoflavones. There is a more cost and risk in the production of soybean with **unique traits** than for commodity soybean.

Fresh soybean pods are harvested, cleaned & cooked with salt for 10-15 minutes until tender and then served. The fresh beans are often shelled, cooked like other beans and served as a seasonal vegetable. Shelled beans can also be cooked alongwith rice to add delicate taste and complementary protein to the cooked rice. The steamed fresh bean has the highest net protein utilization (NPU) value among all soyfood products (Wenyan, et al. 1996). Soysprouts are also eaten as vegetable.

Potential and Scope of Vegetable Soybean

Fresh vegetable legumes namely pea, chickpea, pigeonpea, cowpea and french beans (*Phaseolus Vulgaris)* are good and economical source of nutrition (Table 1) and these are consumed extensively in India. Since Indian people have been using fresh legume vegetables

and have acquired and developed taste for it, vegetable soybeans having no or negligible TI, may not have any difficulty in its acceptance as vegetable in India except the beany flavour caused by lipoxygenases. However, it could be overcome through successful adoption/breeding of vegetable soybeans and/or appropriate processing. Assuming 5-kilogram of vegetable soybean consumption per capita per year (@ 100 g/week for 50 weeks = 5 kg), there would be a requirement of **one million tonne of vegetable soybean** in India even when only **20% of the population prefer** it. It shows a great potential and scope of vegetable soybean in India.

Table 1 : Nutritional composition of some of the fresh legume vegetables (Gopalan, etal, 1974 and Yamaguchi, 1993)

Fresh legume vegetables (100 g edible portion)	***Moisture, g***	***Carbo-hydrates, g***	***Pro-tein, g***	***Fat, g***	***Mine-rals, g***	***Fibre, g***	***Ene-rgy, kCal***
Cowpea (pods)	91.4	4.5	1.7	0.1	0.5	1.8	26
French bean (pods)	85.3	8.1	3.5	0.2	0.9	2.0	48
Pea (seeds)	72.1	15.9	7.2	0.1	0.8	4.0	93
Pigeonpea (seeds)	65.1	16.9	9.8	1.0	1.0	6.2	116
Soybean (seeds)	73.0	6.9	9.0	5.0	3.3	2.8	106
Soybean sprouts	73.2	6.9	12.0	2.6	3.0	2.3	105

Research and Development Efforts

Soybean was known in India since a long time in the form of a marginal and traditional food plant. However, its feasibility as a crop was demonstrated through trials and experiments in the early 1900s and more systematic and vigorously in 1960s and onwards when a major initiative was taken through collaboration between USA and India. In the mid 1970s, soybean became a precious commodity and since then its area and production have been on the rise. So far, 65 improved varieties of soybean have been bred and released for cultivation (Anonymous, 2001). The present annual production of grain soybean in India is about 6 million tonne with an average yield of one tonne/ha.

A green seeded soybean variety named as *Harit Soya,* Himso-1536 has been developed (Sood, 2000) and recommended for release (Anonymous, 2001) for vegetable/culinary purpose. Varieties like JS-335 and JS-71-05 are also preferred for consumption at green pod stage when there are low levels of TI, polysaccharides and lipoxygenases in the green seed. The culinary purpose variety, Himso-1563 is the first variety that has been identified for release. The green pods of this variety can be used like green peas and also the dried beans as a pulse like dry peas. It has 100-120 days crop maturity period. **Himso-1563** has green coloured seeds, easy to cook, **attractive to look** at and remains green even after cooking. In addition, it is sweet in taste and has negligible beany flavour. It has 43.0 per cent protein and 19.0 per cent oil. It gives a fresh pod yield of about 5 t/ha and 15 t/ha green fodder. Grain yield is about 2.6 t/ha.

Soybean variety PK-472 was studied for its physico-chemical characteristics (Tripathi,

1997). The crop was harvested at 82, 89, 96, 103, 118 and 125 days after sowing (DAS). Pods were dehulled manually and grains were analysed for **physical** and **chemical** parameters. Soybean pods were **green-yellowish** and **immature** till 118 days after sowing. Weight of 100 pods harvested at 96, 103 and 118 days were 85.95 g, 88 g and 69.52 g, respectively. Grain/pod ratio (%) of immature crop varied between 42.3 to 58.8% and it was maximum (58.8%) at 103 DAS. Maximum 100-grain weight (21.53 g) was at 103 DAS and it ranged from 9.65 g to 21.53 g. Moisture content decreased continuously from 78.30% at 82 DAS to 8.63% at 125 DAS when the crop was fully matured. Protein content of grains increased progressively from 37.09% at 82 DAS to 42.42% at 125 DAS. Similarly the fat content, it increased from 12.44% at 82 DAS to 22.06% at 125 DAS. There was not much change in the ash content which varied between 5-6%. Trypsin inhibitor was maximum (22.80 mg/g) in the fully matured grain and it was less than **one mg/g** upto 103 DAS suggesting that immature grains in the yellowish-green pods, could be used safely for vegetable purposes.

In the **Himalayan** and **North-East Regions** of India, farmers grow soybean in the vicinity of their dwellings for culinary purposes. These beans are for direct food uses as green immature seed as well as after maturity. The green/matured grains are used for making various fermented & non-fermented foods.

Strategy and Infrastructures for Promotion

Since Indian people have been using fresh legume vegetables in their diet since a long time and these vegetable items are almost similar in physical & chemical compositions, method of preparations and mode of consumption, to that of vegetable soybean, acceptability of vegetable soybeans in India is there but it could be accelerated further by **creating an awareness** among the masses about the nutritional, health and economic benefits of vegetable soybean. The **second step** should be the development of vegetable soybean varieties, its cultivation practices and multiplication & availability of seeds to growers at a reasonable cost. The **third step** should be the development and availability of appropriate post-harvest technology and machinery for handling, storage, marketing and utilization of vegetable soybeans.

The infrastructural facilities and human resources available in India under the aegis of ICAR/NARS for production and utilization of soybean are extensively involved in development and diffusion of technology and have made significant achievements. However, regarding vegetable soybean, R&D and Technology Diffusion activities have been initiated at some of the units like HPKVV, **Palampur**; National Research Centre for Soybean, **Indore;** GBPUAT, **Pantnagar**; JNKVV, **Jablapur** and Soybean Processing and Utilization Centre, CIAE**, Bhopal**. It is expected that in near future, a good progress would be made in developing vegetable soybean varieties and technology for its production and utilization.

Conclusion

Use of vegetable soybeans not only provide good nutrition but also enhances human health and the longevity. It fits very well into the dietary habits/pattern of majority of India people who are vegetarian and have been using similar fresh legume vegetables. R&D and technology diffusion activities in this direction have already been started and one vegetable soybean variety, Himso-1536 has been developed and identified for release for commercial cultivation. People in Himalyan and North-East

regions of India grow and use soybeans in green as well as in matured forms. Good potential and scope for vegetable soybean is there in India. The present potential demand of vegetable soybean in India is about one million tonnes.

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