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Growth and mineral contents of aromatic vegetable soybean (*Glycine max*) genotypes in acidic soil and its potential in combating the malnutrition

R S PAN[1], S K NAIK[1], RESHMA SHINDE[1], BIKASH DAS[2], MEENU KUMARI[1], RAKESH KUMAR[3]*, A K SINGH[1] and ANUP DAS[3]

ICAR-Research Complex for Eastern Region, Farming System Research Centre for Hill and Plateau Region, Ranchi, Jharkhand 834 010, India

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ABSTRACT

Vegetable soybean (*Glycine max* L.) stands out as a nutritious source, capable of fulfilling a substantial portion of daily nutritional requirements (RDA) for individuals, particularly those with limited resources. A field experiment was conducted during 2019 to 2021 at ICAR Research Complex for Eastern Region, Farming System Research Centre for Hill and Plateau Region, Ranchi, Jharkhand to evaluate the nutritional potential of seven aromatic vegetable soybean genotypes (AGS-447, AGS-456, AGS-457, AGS-458, AGS-459, AGS-460 and AGS-461) and one non-aromatic variety Swarna Vasundhara in acidic soils of Jharkhand. Results showed that AGS-458 emerged as the most promising in protein (11.28 g/100 kg FW), phosphorus (230 mg/100 kg FW), potassium (680 mg/100 kg FW), sulphur (92.3 mg/100 kg FW), iron (5.22 mg/100 kg FW) and zinc (1.71 mg/100 kg FW) content. Highest amount of Ca content (161 mg/100 gm FW) was found in genotype AGS-461, while AGS-459 had highest amount of Mg content (118 mg/100 FW). Among genotypes, average nutritional value was ~9.81 g protein, 199 mg P, 609 mg K, 107.4 Ca, 84.6 mg, 81 mg S, 4.5 mg Fe and 1.57 mg Zn/100 g of fresh edible portion (shelled green beans). Thus, vegetable soybean can be successfully grown in nutrient deficient soil, offering a nutrient supplement potential of 13–30% RDA. Genotype AGS-458, which exhibited the highest minerals was best in Jharkhand for poor tribal community.

Keywords: Acidic soil, Aromatic vegetable soybean, Mineral, Nutrient, Recommended dietary allowance

Vegetable soybean (*Glycine max* L.), commonly known as edamame, is a nutrient-dense crop gaining the popularity due to its rich in protein content and bioactive compounds with health-promoting benefits (Sharma *et al.* 2013). Unlike grain soybean, vegetable soybean is harvested when their pods are still green, delivering sweeter flavour, tender texture, and higher consumer acceptability (Brar and Carter 1993). Internationally popular in countries like China, Japan, and Korea, edamame is also growing demand in India, where its potential remains underexplored. India, with its diverse agro-climatic zones, offers a great potential for cultivation of this crop, especially in regions with nutrient-deficient soil. However, in the state like Jharkhand, where the population faces severe nutritional challenge, including a lack of access to protein-rich foods, role of vegetable soybean is particularly crucial. Jharkhand's tribal communities, reliant on small landholdings and forest produce, often experiences low vegetable intake and protein deficiency, which exacerbates the malnutrition among vulnerable groups such as children, pregnant women, and nursing mothers. Vegetable soybean with its rich content of essential nutrients like protein, iron, calcium, and vitamins (Nair *et al.* 2023), can address these deficiencies and improve overall health in region.

In Jharkhand, cultivation of vegetable soybean is still in its infancy, but its potential as a nutritionally superior crop is evident. One of the key factors determining the crop's success is suitability of genotypes to region's acidic soils. Research on this topic is limited, though studies have shown that immature green soybeans can be a valuable addition to diets in nutrient-poor areas (Beckmann and Ames 1997). To date, there has been little focus on assessing how vegetable soybean genotypes perform in acidic soils of Jharkhand, particularly in terms of their nutrient composition. Hence, objective of the present study was to evaluate the nutrient profiles of promising vegetable soybean genotypes grown in acidic soils of Jharkhand. The study aims to identify the genotypes with superior nutrient content that can be promoted for wider cultivation in the region, ultimately enhancing food security and nutritional well-being for tribal communities. By exploring this crop's full potential,

[1]ICAR Research Complex for Eastern Region, Farming System Research Centre for Hill and Plateau Region, Ranchi, Jharkhand; [2]ICAR National Research Centre on Litchi, Muzaffarpur, Bihar; [3]ICAR-Research Complex for Eastern Region, Patna, Bihar. *Corresponding author email: rakeshbhu08@gmail.com

vegetable soybean can play a significant role in addressing malnutrition and improving health of vulnerable populations in India.

MATERIALS AND METHODS

The field experiment was conducted during 2019 to 2021 at ICAR Research Complex for Eastern Region, Farming System Research Centre for Hill and Plateau Region, Ranchi (latitude 23.35º N and 85.33º E at 629 m altitude), Jharkhand, by taking seven aromatic vegetable soybean genotypes, viz. AGS-447, AGS-456, AGS-457, AGS-458, AGS-459, AGS-460 and AGS-461 and one non-aromatic variety Swarna Vasundhara in Alfisols for their nutritional and mineral content. Experimental soil was acidic in nature with *p*H 5.6, low level of organic carbon (4.2 g/kg), cation exchange capacity (CEC) [14.3 c mol (p+)/kg], available N (161.0 kg/ha) and phosphorus (9.54 kg/ha). Available potassium (278.3 kg/ha) was medium in level. Field was ploughed two times before bed preparation and fertilizer was applied @40:60:40 NPK kg/ha uniformly to all genotypes through urea and 19:19:19 NPK. Fertilizer scheduling was done through drip irrigation on weekly basis. Laterals were spaced at 100 cm apart and drippers provided at 40 cm distance in lateral. Accordingly, plant spacing was adjusted to design of drip irrigation. Size of plot was 600 m^2 consisting of 24 ridges of 25 m length. Experimental trial was conducted using randomized block design (RBD). Each genotype was replicated three times in an area of 75 m^2. Green pods were harvested from different genotypes separately and seeds separated from pod. Fresh seed of each genotype weighed about 100 g and dried under shade and then in hot air oven at 60°C. All dried seeds of different genotypes were grinded to powder form for nutrient analysis.

Plant samples were subjected to digestion using a Di-acid mixture (HNO_3:$HClO_4$ in a ratio 9:4), following method outlined by Jackson in 1973. Total phosphorus was determined using Vanodomolybdophosphoric yellow colour method (Jackson 1973). Total potassium was quantified through flame photometer method (Jackson 1973). Total Calcium and Magnesium were assessed by Versanate titration method (Hesse 1971). Determination of total sulphur was carried out by using turbidity method (Cottenie *et al.*1979). Concentrations of total iron (Fe), manganese (Mn), Copper (Cu) and zinc (Zn) was estimated using Atomic Absorption Spectrophotometer (ECIL; model-AAS4141). Another separate portion of plant sample (1.0 g) was digested using concentrated sulphuric acid (H_2SO_4) and digestion mixture containing copper sulphate ($CuSO_4$) and potassium sulphate (K_2SO_4) for determination total N content using Micro-Kjeldahl method (Jackson 1973) and protein content was calculated from total N content by multiplying with a conversion factor of 6.25 (AOAC 2005).

RESULTS AND DISCUSSION

Growth and yield parameters of different genotypes: Performance of different soybean genotypes for flowering and yield traits is presented in Table 1. The genotypes AGS-456 and AGS-457 were the earliest to flower, while the non-aromatic Swarna Vasundhara required the maximum time. Aromatic genotypes flowered earlier compared to non-aromatic soybean genotypes. Number of branches/plant varied between 4 and 6 among the genotypes (Table 1). Genotypes AGS-460 and AGS-459 had highest number of branches. Plant height varied from 33.34 cm to 54.63 cm among the different genotypes with highest in Swarna Vasundhara, while AGS-461 was the shortest. Number of pods/plants ranged from 20–51, with Swarna Vasundhara showing the maximum and AGS-461 the lowest. The weight of 100 green seeds ranged from 39.87–63.25 g, with AGS-456 recording the maximum and AGS-459 minimum seed weight. Shelling percentage varied from 44.5–52.53%, with the highest shelling percentage was recorded in Swarna Vasundhara, followed by AGS-447, AGS-458, AGS-456, AGS-457, AGS-460, and AGS-461, which were all at par with each other. Fresh green pod yield varied between 8.0 t/ha (AGS-460) to 14.84 t/ha (Swarna Vasundhara) and difference amongst genotypes was significant. Genotype Swarna Vasundhara (14.8 t/ha) and AGS-458 (13.54 t/ha)

Table 1 Growth attributes of different genotypes of aromatic vegetable soybean (Pooled data)

Genotype	DFF	NBP	PH (cm)	PL (3S) (cm)	PL (2S) (cm)	TPP	HGSW (g)	SP (%)	HI (%)	Yield (t/ha)
AGS 447	30.67c	3.89bc	41.36bc	6.32	5.50	30.07b	63.44a	51.84a	63.04	10.93^{c}
AGS 456	30.00c	3.55c	46.68b	6.69	5.48	29.77b	68.25a	51.30a	57.92	13.09^{b}
AGS 457	30.00c	4.55bc	35.81cd	6.48	5.27	28.60b	58.46a	50.39a	56.11	12.49^{b}
AGS 458	30.33c	4.66ab	37.66cd	6.41	5.29	34.73b	63.25a	51.55a	62.44	13.57^{ab}
AGS 459	33.33bc	5.55a	40.20bc	6.04	5.29	29.50b	39.87c	44.52b	54.99	12.00^{bc}
AGS 460	34.67b	5.66a	45.04b	6.19	5.40	32.50b	48.26bc	49.18a	54.54	8.00^{d}
AGS 461	36.00b	4.22bc	33.34d	6.21	5.40	20.47c	54.49ab	48.88ab	56.67	10.65^{c}
Swarna Vasundhara	46.00a	4.00bc	54.63a	6.23	5.42	51.00a	44.37bc	52.53a	46.89	14.84^{a}
CD (P=0.05)	3.41	1.08	5.47	N/A	N/A	6.81	13.97	4.52	N/A	1.53

DFF, Days to 50% flowering; NBP, No. of branches/plant; PH, Plant height; PL(3S), 3-seeded pod length; PL (2S), 2-seeded pod length; TPP, Total no. of pods/plant; HGSW; 100-green seed weight; SP, Shelling percentage; HI, Harvest index.

were found to be high in terms of green pod yield and was also statistically at par with each other. Next high-yielding genotypes were AGS-456 (13.1 t/ha) and AGS-457 (12.49 t/ha) which were also statistically at par with each other. Swarna Vasundhara also reported high pod and seed yield in a study for grain and fodder yield and organic matter digestibility in semi-arid tropical conditions of India (Nair *et al.* 2023). Malek *et al.* (2014) and Sharma *et al.* (2013) also evaluated vegetable soybean genotypes for yield and growth parameters and recorded similar range of pod yield in vegetable soybean.

Macronutrient composition of various aromatic vegetable soybean genotypes mainly crude protein, P, K, Ca, Mg, and S content is represented in Table 2 and Supplementary Fig. 1. Crude protein content of these genotypes ranged from 8.8–11.3 g/100 g fresh weight (FW) of seeds, with an average of 9.8 g/100g FW and genotypes, AGS-458 showed highest (11.3 g/100 g FW), followed by AGS-456 (10.5 g), AGS-460 (10.3 g), and AGS-461 (10.4 g), while Swarna Vasundhara had lowest crude protein content at 8.8 g/100g FW. On a dry weight (DW) basis, protein content varied from 27.5 to 36 g/100 g DW, with an average of 30.4 g/100g DW. Proximate analysis of nutritional composition of vegetable soybean conducted in Colorado, US, and Japan has revealed that vegetable soybean is nutritionally superior to green pea (Ponnusha *et al.* 2011). In this study, protein composition observed aligns with earlier research on vegetable soybeans (Nair *et al.* 2023). This investigation demonstrates that vegetable soybean possesses significantly higher protein content compared to other legumes, including common beans (16.7–27.2%), cowpeas (20.9–24.7%), peas (23.3–26% t), and lentils (25.6–28.9%) on dry weight basis (Agyenim-Boateng *et al.* 2023). Similar results were also observed by Salmani *et al.* (2012) and Sharma *et al.* (2013) in vegetable soybean genotypes which were analyzed. Accessibility and affordability of vegetable soybean make it a potentially crucial resource for meeting protein needs of many resources poor farmers and developing nations.

Phosphorus (P) content in fresh soybean seeds ranged from 172–233 mg/100 g FW, with AGS-458 showing highest P content (233 mg/100 g FW), and AGS-457 lowest (172 mg/100 g FW). On DW basis, P content ranged from 515–743.5 mg/100 g, with AGS-458 again leading (743.5 mg/100 g DW). Potassium (K) content in fresh seeds averaged 609 mg/100g FW, with AGS-458 having highest (682 mg/100 g FW) and AGS-447 lowest (553 mg/100 g FW). On a DW basis, AGS-458 also had highest K content (2176.3 mg/100g DW). Calcium (Ca) content ranged from 63.2–161.2 mg/100 g FW, with AGS-461 being the highest (161.2 mg/100 g FW) and AGS-460 the lowest (63.2 mg/100 g FW). On DW basis, AGS-461 also showed the highest Ca (460.5 mg/100 g DW). Magnesium (Mg) content varied from 57.1–118.5 mg/100 g FW, with AGS-459 having the highest (118.5 mg/100 g FW) and Swarna Vasundhara the lowest (57.1 mg/100 g FW). Sulfur (S) content ranged from 58.1–100 mg/100 g FW, with AGS-456 having highest S content (100 mg/100 g FW) and AGS-459 the lowest (58.1 mg/100 g FW). Calcium, phosphorus, and iron levels in vegetable soybean were found to be higher than those in most other vegetable legumes, including green peas, cowpeas, and pigeon pea. Specifically, in green peas, content of calcium, phosphorus, and iron was reported as 20, 139 and 1.5 mg/100 g, respectively (Gopalan *et al.* 2007) while in vegetable pigeon pea, Rashmi (2008) documented calcium, phosphorus, and iron content across nine varieties, with values falling within ranges of 20.9–32.2 mg, 127.3–169.5 mg, and 0.53–1.31 mg/100 g, respectively.

Micronutrient composition, Fe, Mn, Cu, and Zn content in fresh edible portion of different aromatic vegetable soybean genotypes is presented in Table 3. Fe content in fresh seeds varied from 3.95–5.22 mg/100 g FW, with an average of 4.5 mg/100 g FW. AGS-458 had highest Fe content (5.22 mg/100 g FW), followed by AGS-456 (4.62 mg/100 g FW), while AGS-460 had lowest Fe content (3.95 mg/100 g FW). On DW basis, AGS-458 had highest Fe content (16.7 mg/100 g DW), followed by AGS-447 (14.41 mg). Mn content in different genotypes ranged from 0.47–0.67 mg/100 g FW, with an average of 0.56 mg/100 g FW.

Table 2 Macronutrient content in different genotypes of aromatic vegetable soybean (expressed per 100 g fresh and dry weight)

Genotype	Protein (g/100 g)		Phosphorus (mg/100 g)		Potassium (mg/100 g)		Calcium (mg/100 g)		Magnesium (mg/100 g)		Sulphur (mg/100 g)	
	Fresh weight	Dry weight	Fresh weight	Dry weight	Fresh weight	Dry weight	Fresh weight	Dry weight	Fresh weight	Dry weight	Fresh weight	Dry weight
AGS-447	8.9^{b}	29.5^{b}	213.0^{b}	699.3^{b}	553.0^{d}	1815.6^{d}	97.9^{d}	321.4^{de}	93.60^{b}	307.3^{b}	74.7^{c}	245.4^{b}
AGS-456	10.5^{ab}	30.8^{b}	175.0^{e}	515.0^{f}	627.0^{b}	1845.0^{cd}	122.1^{b}	359.3^{c}	82.50^{c}	242.7^{c}	100.0^{a}	294.0^{a}
AGS-457	9.0^{b}	29.3^{b}	172.0^{e}	558.5^{e}	590.0^{c}	1915.6^{bc}	123.2^{b}	400.0^{b}	65.30^{d}	212.0^{d}	94.1^{a}	305.6^{a}
AGS-458	11.3^{a}	36.0^{a}	233.0^{a}	743.5^{a}	682.0^{a}	2176.3^{a}	91.9^{d}	293.3^{ef}	97.40^{b}	310.8^{b}	92.3^{a}	294.5^{a}
AGS-459	9.3^{b}	28.5^{b}	207.0^{bc}	638.5^{c}	641.0^{b}	1977.2^{b}	88.3^{d}	272.4^{f}	118.50^{a}	365.5^{a}	58.1^{d}	179.1^{c}
AGS-460	10.3^{ab}	32.3^{ab}	196.0^{cd}	629.8^{c}	588.0^{c}	1851.8^{cd}	63.2^{e}	199.0^{g}	103.40^{b}	325.6^{b}	80.6^{bc}	253.9^{b}
AGS-461	10.4^{ab}	29.6^{b}	212.0^{b}	605.6^{cd}	558.0^{d}	1593.9^{e}	161.2^{a}	460.5^{a}	58.70^{d}	167.7^{e}	83.7^{b}	239.2^{b}
Swarna Vasundhara	8.8^{b}	27.5^{b}	186.0^{de}	579.4^{de}	636.0^{b}	1981.2^{b}	111.4^{c}	347.0^{cd}	57.10^{d}	177.8^{e}	65.4^{d}	203.6^{c}
CD (*P*=0.05)	1.52	4.80	13.56	43.05	27.03	83.1	9.97	30.87	9.44	29.16	7.87	24.66

Table 3 Micronutrient content in different genotypes of aromatic vegetable soybean (expressed per 100 g fresh and dry weight)

Genotype	Iron (mg/100 g)		Manganese (mg/100 g)		Copper (mg/100 g)		Zinc (mg/100 g)	
	Fresh weight	Dry weight	Fresh weight	Dry weight	Fresh weight	Dry weight	Fresh weight	Dry weight
AGS-447	4.39[bc]	14.41[b]	0.52[b]	1.71[b]	0.22[ab]	0.72[a]	1.41[b]	4.63[b]
AGS-456	4.62[b]	13.59[bc]	0.60[ab]	1.77[b]	0.18[ab]	0.53[a]	1.58[ab]	4.65[b]
AGS-457	4.39[bc]	14.25[b]	0.67[a]	2.18[a]	0.22[ab]	0.71[a]	1.50[ab]	4.87[ab]
AGS-458	5.22[a]	16.66[a]	0.58[ab]	1.85[ab]	0.23[ab]	0.73[a]	1.71[a]	5.46[a]
AGS-459	4.41[bc]	13.60[bc]	0.55[ab]	1.70[b]	0.19[ab]	0.59[a]	1.65[a]	5.09[ab]
AGS-460	3.95[c]	12.44[c]	0.47[b]	1.48[b]	0.17[ab]	0.54[a]	1.40[b]	4.41[b]
AGS-461	4.55[b]	13.00[bc]	0.60[ab]	1.71[b]	0.25[a]	0.71[a]	1.67[a]	4.77[b]
Swarna Vasundhara	4.39[bc]	13.68[bc]	0.51[b]	1.59[b]	0.10[b]	0.31[a]	1.43[b]	4.45[b]
CD (P=0.05)	0.43	1.38	0.12	0.37	0.12	0.38	0.20	0.62

AGS-457 had highest Mn content (0.67 mg/100 g FW), followed by AGS-461 and AGS-456 (0.6 mg/100 g FW), while AGS-460 had the lowest Mn content (0.47 mg/100 g FW). On a DW basis, AGS-457 had highest Mn content (2.18 mg/100 g DW) and was on par with AGS-458 (1.85 mg).

Copper (Cu) content in fresh seeds varied from 0.1–0.25 mg/100 g FW, with an average of 0.20 mg/100 g FW. AGS-461 had highest Cu content (0.25 mg/100 g FW), followed by AGS-458 (0.23 mg/100 g FW), while Swarna Vasundhara had lowest Cu content (0.10 mg/100 g FW). On DW basis, Cu content ranged from 0.31–0.72 mg/100 g DW, with an average of 0.61 mg. Zinc content in different genotypes varied from 1.4–1.71 mg/100 g FW with a mean of 1.57 mg/100 g FW. Zn content was found highest in genotype AGS-458 (1.71 mg/100 g FW) being at par with AGS-461 (1.67 mg/100 g FW), AGS-459 (1.65 mg), AGS-456 (1.58), AGS-457 (1.5) with a least content in AGS-460 (1.4 mg/100 g FW). On DW basis, Zn content was recorded highest significant value of 5.46 mg/100 g DW in genotype AGS-458 and at par with AGS-459 (5.09 mg) and AGS-457 (4.87 mg). Concentrations of Zn and Fe in vegetable soybean germplasm were lower than levels reported by Odumodu (2010) in grain soybean germplasm, where Zn was recorded at 8.4 ± 0.2 mg/100 g, Fe was documented at 9.3 ± 0.2 mg/100 g.

Vegetable soybean stands out as a valuable reservoir of essential minerals, vitamins, proteins, and carbohydrates (Nair *et al.* 2023) crucial for human growth and development. The current study also aimed to assess nutritional attributes of various vegetable soybean genotypes, with goal of identifying promising lines with favourable nutritional profiles for further cultivation and varietal development. Our investigation revealed a significant impact of genotype on key nutrients, including protein, P, K, Ca, Mg, Fe, Cu and Zn. This observation underscores presence of genetic diversity within test germplasm which, in turn, holds great promise for enhancing selection of desirable traits. Among the genotypes, AGS-458 genotype consistently exhibited the highest concentrations of all nutritional elements, underscoring its exceptional nutritional quality and potential contribution to addressing nutrition-related concerns. Findings also indicate that lines under investigation are rich sources of vital minerals such as Fe, Cu, Mn, and Zn, signifying their capacity to significantly contribute to meeting daily recommended dietary.

Nutrient supplements to recommended dietary allowance (RDA): RDA by ICMR (2010) of different nutrients is depicted in the Supplementary Table 1. About 300 g of vegetables is required for normal human consumption/day to meet out the various nutritional requirements. Vegetable soybean is consumed in the form of green seeds and added to various food dish preparation. Average nutrient composition of 100 g of fresh edible seeds of different genotypes of vegetable soybean contributed ~13–30% of RDA; while 40–90% RDA is contributed through 100 g vegetable soybean on DW basis. Daily protein requirement for a human being is 60 g and findings of this work revealed that enough protein is available in vegetable soybean. Fresh edible portion of vegetable soybean (100 g) can supplement 16% of protein requirement. Protein is required for maintenance and repairing of cells. It serves as foundation material for hormones, enzymes and antibodies. According to Roger *et al.* (2005), protein-calories malnutrition deficiency has identified as significant contributor in nutritional pathology. Thus, vegetable soybean can serve as good source of protein. Similarly other essential macro minerals like P, K, Ca, and Mg were rich in vegetable soybean. Daily P requirement for a human being is 700 mg and fresh edible portion of vegetable soybean (100 g) can supplement 28.3% RDA. K is the third most abundant mineral in body and plays vital role in upholding bodies' fluid equilibrium. It also participates in carbohydrate metabolism as well as for protein synthesis and to transmit nerve impulses. RDA for K is 2000 mg and fresh vegetable soybean (100 g) supplemented 31% of RDA. Ca is most vital and abundant mineral, is essential for formation of robust bones and teeth. It performs vital role in transmitting nerve signals, aiding blood clotting, assisting in contraction of smooth muscles, thereby contributing to regulation of heart rhythm. RDA for Ca is 600 mg and fresh vegetable soybean (100 g) supplemented 18% of RDA. Magnesium aides in promotion of muscles relaxation, supports metabolism of carbohydrates and protein and plays crucial role in activating over 300 different enzymes. RDA for Mg is 340 mg and fresh vegetable soybeans (100 g) supplemented 25% RDA.

Furthermore, essential microminerals like Fe, Mn, Zn, Cu constituted a major share in vegetable soybean. Fe, an indispensable trace element, is vital for haemoglobin production, normal central nervous system function, oxidation of carbohydrates, protein, and fats (Singh *et al.* 2021). RDA for Fe is 17 mg and fresh vegetable soybean (100 g) supplemented 26% RDA. Zn is second most abundant trace mineral, plays a pivotal role in aiding liver's alcohol detoxification, fortifying immune system, promoting healthy skin cells, contributing taste, vision, and wound healing FAO's food balance data indicates that ~20% of global population might be vulnerable to Zn deficiency, with an average daily intake of less than 70 mg/day (Hall and King 2022). RDA for Zn is 12 mg and findings from this work on fresh vegetable soybean (100 g) supplemented 13% RDA. Mn is essential for glucose metabolism, synthesizing cholesterol, fatty acids as well as building strong bones. RDA for Mn is 3.5 mg and fresh vegetable soybean (100 g) supplemented 16% RDA. Cu is a prerequisite to produce RBC and collagen, aiding absorption and transport of iron. RDA for copper is 1.5 mg and fresh vegetable soybean (100 g) supplemented 13% RDA. Thus, 100 g of fresh edible seeds of vegetable soybean is able to contributed ~13–30% of RDA which is more than other legume crops.

Tribal community in Jharkhand traditionally have limited access to vegetables and protein rich foods, as organized markets are scare, making difficult for them to afford nutritious foods. Their primary food source relies on forest produce; they cultivate very few vegetables in their small agricultural landholding. The findings of this study indicates, aromatic vegetable soybean can effectively be grown in nutrient deficient soil, offering a nutrient supplement potential of 13–30% RDA; among different aromatic vegetable soybean genotypes evaluated, AGS-458 exhibited the highest mineral supplement. Cultivating vegetable soybean in nutrient deficient acidic soils of Jharkhand holds great promise for poor farmer. Thus, it can significantly contribute to meet daily nutritional requirement for growth, maintenance and overall well-being of children, pregnant and nursing women.

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