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Nutritional Quality Evaluation of Locally Collected Genotypes of *Solena amplexicaulis* (Lam.) Gandhi

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ABSTRACT

As a nutritious and under exploited cucurbitaceous vegetable, *Solena amplexicaullis* can be a promising alternative to provide nutritious food for billions, while also serving as a potential source for developing abiotic stress resilient varieties. To evaluate its potential as a wonder crop in the tropical and sub-tropical regions of India, the present study was carried out to know the yield and nutritional quality of eighteen collected genotypes of *Solena amplexicaulis* lam (Gandhi) at Central Horticultural Experiment Station, Bhubaneswar. The collected genotypes were planted in Randomized Block Design with three replications. The nutrient profiling of fruits of *Solena amplexicaullis* revealed higher accumulation of nutrients viz. protein, ascorbic acid, potassium, phosphorus, magnesium, calcium and zinc. The result pertaining to nutrient profiling of fruits provide valuable insights into the nutritional importance and genetic potential of this neglected crop for future breeding program.

Keywords *Solena amplexicaullis*, Nutrient, Unexplored, Vegetable, Genetic potential.

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INTRODUCTION

Solena amplexicaulis (Lam.) Gandhi is a perennial climber popularly called creeping cucumber with tuberous roots found widely in dry deciduous forests of tropical zones in Asia. *Solena amplexicaullis* is grown for their immature tender fruits which consumed in raw form like cucumber and also cooked like ivygourd. *Solena amplexicaulli*s belonging to family cucurbitaceae is a potential source of many medicines. This dioecious crop is widely distributed in Sri Lanka, Pakistan, India, Nepal, Bangladesh, Myanmar, Indonesia, Vietnam and China at an altitude of up to 2,600 m (Peter 2007). The entire plant part i.e. leaves, fruits and tubers posses anti-oxidant property and used for the treatment of diabetes (Karthika *et al.* 2012). The leaf extract of *Solena amplexicaullis* is traditionally prescribed as a medicine to cure inflamation related diseases and jaundice by the tribal people of Tamil Nadu (Krishnamoorthy and Subramaniam 2014 and

Peter 2007). The tuber extracts especially chloroform extract inhibits the growth of all human pathogens (Karthika and Paulsamy 2015). Presence of active chemical compounds such as forskolin and isoquercetin showed good anti-inflamatory and anti-diabetic property (Karthika *et al*. 2016). Inspite of having numerous potential, *Solena amplexicaulli*s is completely obscure and neglected. A detailed screening is required for the discovery and development of novel bio-active agents that would help in reducing human suffering. Climate change and global degradation is threatening the existence of this vegetable crop which served as a basis of livelihood for poor tribal people over multiple years. To the best of our knowledge this is the first study in India to comprehensively analyze the nutritional composition of this underutilized and neglected crop.

MATERIALS AND METHODS

This experiment was conducted at Central Horticulture Experiment Station, IIHR, Bhubaneswar, Odisha, India during *kharif* season, 2022-2023. Eighteen genotypes of were collected from different parts of Odisha, India. The experiment was laid out in Randomized Block Design with three replications. Fresh leaves and fruits were collected from these planting materials and were examined for various analyses. Different parts of *Solena amplexicaulli*s plant are shown in Figure 1. For estimation of various nutrient level in a single digestion, sulphuric acid-selenium digestion process was utilized (Sahrawat *et al.* 2002). Five randomly collected fruits were selected from the preselected plants from each plot and moisture content was estimated using AOAC (1984). Fresh weight of selected fruits was recorded and then they are oven dried at 100-105^{0}C. Moisture loss of the sample is calculated from the weight loss during drying.

$$\text{Moisture content (\%)} = \frac{\text{Fresh weight of fruits (g)- Oven dry weight of fruits (g)}}{\text{Fresh weight of fruits (g)}} \times 100$$

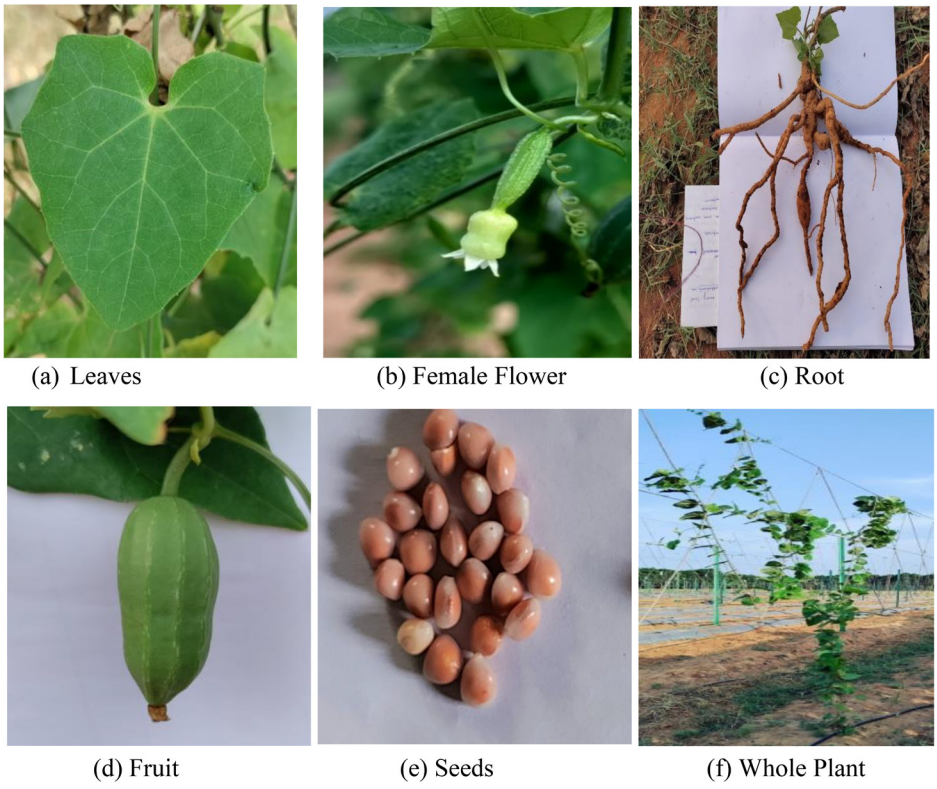

Fig. 1. Different parts of *Solena amplexicaulli*s plant.

The percentage of Total Soluble Solids (TSS) was determined by using a hand refractometer. Fruit juice was extracted and strained through a muslin cloth. The mean value of the juice is expreseed as 0Brix. Ascorbic acid content was estimated by using Rangana method (1986). Na Zn, Cu, and K was analyzed by flame atomic emission spectrophotometer (Price and Roos 1970). Phosphorus was determined with spectrophotometer with 420nm using vanadium phosphomolybdate (vanadate) colorimetric method with KH2P04 as the standard (Ceirwyn 1995). The protein content was estimated using the method described by Fischer (1973). The fiber content was estimated using the acid-alkali digestion method, as suggested by Chopra and Kanwar (1978).

Statistical analysis

Analysis of variance (ANOVA), as outlined by Panse and Sukhatme (1985), was performed for statistical interpretation of data. The standard error of mean (SEm±) and critical difference (CD) at the 5% level of significance were calculated for each character under study.

RESULT

The results presented in Table 1 indicate that the fruits of *Solena amplexicaullis* possess a substantial reserve of moisture, total soluble solids (TSS), fiber, as well as macro and micro nutrients. Moisture content ranges from 91.597% to 94.430% with a mean value of 93.03%. Among the eighteen genotypes under study, maximum moisture content was recorded in G-10 (94.430%). Maximum fiber content was recorded in G-8 (3.553%) followed by G-3 (3.337%) and G-9 (3.337%). Fiber content in fruits of *Solena amplexicaullis* ranges from 2.40% to 3.553% with a mean value of 3.07%. Ascorbic acid content in various genotype ranges from 12.50 (G-4) to 18.91 (G-7). Maximum ascorbic acid content was recorded in G-7. TSS content ranges from 3.50 ^{0}Brix to 3.10 ^{0}Brix with a mean value of 3.26. Maximum TSS was observed in G-5 and G-7 that is 3.50 ^{0}Brix. A significant amount

Table 1. Nutritional composition of *Solena amplexicaullis* fruit.

Number of genotypes	Moisture (%)	Fibre content (%)	Ascorbic acid (mg/100g)	TSS ^{0}Brix	Protein content (%)	Carbo-hydrate content (%)	Na content (mg/100g)	Zn content (mg/100g)	Cu content (mg/100g)	Potassium content (mg/100g)	Phosphorus content (mg/100g)
G-1	92.137	2.400	17.343	3.253	1.343	3.237	2.27	0.18	0.78	86.317	34.380
G-2	93.170	2.520	16.550	3.310	1.380	3.523	2.12	0.31	0.81	85.623	31.423
G-3	91.597	3.337	12.590	3217	1.530	3.223	2.25	0.35	0.76	84.303	33.597
G-4	93.483	3.227	12.503	3.110	1.283	3.307	2.38	0.34	1.20	87.413	31.310
G-5	93.967	2.510	15.357	3.50	1.513	3.487	2.38	0.62	1.26	86.447	33.490
G-6	92.770	2.550	15.317	3.287	1.340	3.420	2.13	0.57	1.53	88.410	34.560
G-7	92.393	2.613	18.913	3.500	1.230	3.287	2.56	0.30	1.03	85.580	34.310
G-8	93.153	3.553	15.240	3.410	1.470	3.560	2.54	0.42	0.55	88.613	35.413
G-9	93.653	3.337	16.220	3.150	1.450	3.450	2.45	0.36	1.21	89.413	33.377
G-10	94.430	3.277	14.377	3.223	1.360	3.280	2.37	0.29	1.66	84.490	35.743
G-11	92.333	3.207	16.487	3.200	1.310	3.380	2.55	0.63	1.62	86.383	36.407
G-12	92.523	3.403	17.583	3.100	1.207	3.603	2.30	0.35	0.49	88.560	31.453
G-13	93.557	3.113	16.397	3.167	1.437	3.327	2.38	0.59	1.31	89.613	33.380
G-14	92.387	3.310	17.527	3.283	1.267	3.737	2.14	0.49	0.70	87.433	33.473
G-15	92.80	3.310	18.413	3.267	1.340	3.450	2.45	0.63	0.71	85.537	34.600
G-16	92.770	3.203	18.343	3.283	1.227	3.597	2.52	0.46	1.41	86.193	32.480
G-17	93.427	3.237	16.380	3.167	1.247	3.533	2.48	0.30	1.66	89.443	35.613
G-18	94.150	3.223	17.633	3.367	1.203	3.347	2.55	0.58	0.52	89.570	35.083
Mean	93.03	3.07	16.28	3.26	1.34	3.43	2.38	0.43	1.07	87.19	33.89
SE(m)	0.249	0.105	0.089	0.059	0.042	0.126	0.08	0.05	0.11	0.11	0.14
SE(d)	0.0.35	0.14	0.12	0.08	0.06	0.17	0.12	0.08	0.16	0.16	0.20
CV(%)	0.463	5.905	0.945	3.134	5.469	6.353	6.16	21.67	18.22	0.22	0.733
CD	0.71	0.30	0.25	0.17	0.12	0.36	0.24	0.16	0.32	0.32	0.41

G-Genotype

of protein was found in the fruits of creeping cucumber which ranges from 1.20% in G-12 to 1.53% in G-3 with a mean value of 1.34%. Potassium content ranges from 84.30 in G-3 to 89.57 in G-18. Mean value for Potassium content in the fruits is 87.17. Maximum phosphorus content was observed in G-10 (35.74) and minimum in G-4 3.31. The mean value for Potassium content is 33.89. Carbohydrate content ranges from G-3 (3.223%) to G-14 (3.737%) with a mean value of 3.43%. The result revealed non-significant variations among genotype for carbohydrate content. Maximum Na content was observed in G-7 (2.56) and ranges from 2.56 to 2.12 (G-2). The mean value was 2.38. Zn content was maximum in G-15 (0.63) and minimum in G-1 (0.18). The mean value recorded was 0.43. Cu content ranges from 1.66 (G-10 and G-17) to 0.55 (G-8) with a mean value of 1.07.

DISCUSSION

The result of this finding revealed that *Solena amplexicaullis* fruits are a good source of Moisture, Fiber, Ascorbic acid, TSS, Protein, Carbohydrate and minerals like Na, Zn, Cu, Potassium and Phosphorus. Yet, this crop remain undervalued due to a lack of comprehensive knowledge about its potential, absence of appropriate sowing equipment, and limited awareness regarding its integration into production systems. The yield of this vegetable could help meet demand, address shortages, and alleviate nutritional deficiencies. Thus, this nutrient rich under exploited vegetable can be cultivated to reduce the load on commercial vegetables for nutritional security.

Future research needs

Collection and identification of the various cultivars in the Indian subcontinent is very essential. More information is needed on the uses of the crop in the Indian societies. Focus should be given on nutritive value of leaves, seeds and tubers of *Solena amplexicaullis*. Further research into the health benefits of the various parts of the *Solena amplexicaullis* is urgently needed. In particular, comprehensive studies on its phytochemical composition spanning from the seedling stage through harvesting, storage, processing, and eventual consumption are essential for a clearer understanding of its mechanisms and potential impacts on human health. Breeding efforts for this crop remain at a rudimentary stage and require significant advancement. The development of improved planting materials is also critical to enhance productivity.

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