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EVALUATION OF BOTTLE GOURD (*LAGENARIA SICERARIA* (MOL.) STANDL. GERMPLASMS FOR BIOCHEMICAL CHARACTERS IN GARO HILLS, MEGHALAYA, INDIA

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ABSTRACT

An experiment was carried out at Research laboratory, Department of Horticulture, North Eastern Hill University Meghalaya, India to study Bio-chemical characters of Bottle gourd germplasms for 30 bottle gourd genotypes. The experiment was conducted using a completely randomized design with three replications. The collected accessions exhibited a wide range of variability in their chemical composition. The characters studied were TSS (◦Brix), Total Sugar(%), Reducing Sugar (%), Ascorbic acid (mg/100g), Total soluble Protein (%), Total Carbohydrate (%), Moisture (%), Dry matter (%), Total ash (%), Total phenols (%), Calcium (mg/100g) and Crude Fibre (%). A wide range of variation was recorded for all the characters under study which indicates that there is better possibility for selection for the improvement of these characters.
Keywords **:** *Lagenaria siceraria*, Biochemical, Germplasm, Growth, Yield.

Introduction

Bottle gourd (*Lagenaria siceraria* (Mol.) Standl.) belongs to the family Cucurbitaceae, having diploid chromosome number 2n=22, is an important vegetable crop originated in Africa. It is a climbing perennial plant widely cultivated as a vegetable crop in tropical countries, such as India, Japan and Thailand. The area under bottle gourd cultivation in India is 193 thousand hectare and production is 3171 thousand metric tonnes (NHB, 2020-21). Meghalaya is one of the seven sister's states in North-Eastern India which covers an area of approximately 22,430 square kilometers situated at 25.57°N and 91.88°S. The altitude of Meghalaya ranges from 150 meters to 1961 meters. The area under vegetable cultivation in Meghalaya is 49.28 thousand hectares and production is 517.76 thousand metric tonnes. Whereas, area under bottle gourd cultivation in Meghalaya is 0.76 thousand hectare and production is 9.43 thousand metric tonnes (NHB, 2020-21). In Meghalaya mostly local cultivars of bottle gourds are grown by farmers and specially grown in homestead garden. Bottle gourd is a nutritive and popular cucurbitaceous vegetable crop grown in Garo Hills of Meghalaya. There are number of local cultivars with wide range of variability available in Garo Hills of Meghalaya.

Bottle gourd is one of the cheapest source of vitamin B complex and choline and vitamin c. The fruits of bottle gourd have long been an important component of indigenous herbal medicine, particularly in Asia. The fruits are used as a nutritive entity having cardio protective, cardio tonic, general tonic, diuretic, aphrodisiac, antidote to certain poisons, alternative purgative and having cooling effect on our body. It is also considered to be beneficial in insanity, epilepsy and other nervous diseases (Gajera *et al*. 2017). It is a rich source of potassium, vitamin-C, protein, sulphur and phosphorus (Singh, 1990). The main objective of this experiment is to study the nutritional composition of bottle gourd fruits grown under Garo Hills District conditions of Meghalaya.

Materials and Methods

The study was carried out during 2018 at Horticulture Research laboratory, Department of Horticulture, North Eastern Hill University, Tura Campus, Chasingre, Meghalaya, India. The experiment comprised of thirty genotypes of bottle gourd collected from different Districts of Garo Hills Region of Meghalaya. The experiment was laid out in a completely randomized design with three replications at 2m×2m row to row and plant to plant spacing. The crop was grown under rain fed condition. All the recommended cultural practices by ICAR were adapted to for proper growth and stand of the crop during the cropping period. The observations were recorded according to NBPGR descriptor for bottle gourd. Data were recorded on nine randomly selected plants with respect to characters viz., TSS (ºBrix), Total Sugar (%), Reducing Sugar (%), Ascorbic acid (mg/100g), Total soluble protein (%), Total carbohydrate (%), Dry matter (%), Total Ash, Total Phenols (mg/100g), Calcium (mg/100g) and Crude Fibre(%). Biochemical traits were evaluated at Horticultural maturity stage.

Result and Discussion

TSS (ºBrix): Maximum TSS of 3.97º Brix was recorded in genotype GHA-7 and minimum TSS of 2.70 ºBrix was recorded in genotypes GHA-4. General mean recorded was 3.30. Harika *et al.* (2012) reported similar findings of

Maximum TSS of 6.13 ºBrix in NBOH-1 and minimum of 2.35 ºBrix in Champion variety in their evaluation of 25 bottle gourd genotypes. Gajera, 2017 also reported TSS of 5.17 ºBrix in blend juice of bottle gourd, aonla and lemon.

Total Sugar (%): Highest Total Sugar of 3.09% was recorded in genotype GHA-7 whereas, minimum Total sugar 1.12% was recorded in genotype GHA-19. The general mean observed was 2.16. Gajera, 2017 studied and reported total sugar of 3.18% in blend juice of bottle gourd, aonla and lemon. Gajera *et al*. 2017 studied processing potential of bottle gourd fruits and reported 5.87% of total sugar in bottle gourd fruits with peel and 8.29% of total sugar in bottle gourd fruits without peel.

Reducing Sugar (%): Maximum Reducing sugar of 2.77% was observed in genotype GHA-7 and minimum Reducing sugar was observed 0.69% in genotype GHA-19. The general mean recorded was 1.74. Gajera, 2017 studied and reported reducing sugar content of 2.59% in blend juice of bottle gourd, aonla and lemon. Gajera *et al*. 2017 studied processing potential of bottle gourd fruits and reported 5.22% of reducing sugar in bottle gourd fruits with peel and 7.92% in bottle gourd fruits without peel.

Ascorbic acid (mg/100g): Ascorbic Acid was found highest in genotype GHA-8 of 10.03 mg/100g whereas, minimum amount of Ascorbic Acid of 7.38 mg/100g was recorded in genotype GHA-18. General mean recorded was 8.87. Similar findings ascorbic acid content (7.5 mg/100g) was also reported by Lata and Ray (2014). Gajera, 2017 also reported ascorbic acid content of 38.51 mg/100g in blend juice of bottle gourd, aonla and lemon in their studies. Gajera *et al*. 2017 studied processing potential of bottle gourd fruits and reported 12 mg/100g of ascorbic acid in bottle gourd fruits.

Total soluble protein (%): Amount of total soluble protein was recorded maximum of 1.04% in genotype GHA-15 and lowest amount of total soluble protein was recorded 0.68% in genotype GHA-5. The observed general mean was 0.86. In an experiment Lata and Ray (2014) also found similar results in total soluble protein content of 0.18% in their studies of Physico-chemical changes in bottle gourd juice during storage. Sithole *et al.* 2015 also reported maximum Protein content in Landrace M03 of 0.96% and minimum of 0.73% in Landrace Mean Hybrid GRH. Gajera *et al*. 2017 also found 1.20% of protein in their study on processing potential of bottle gourd fruits.

Total carbohydrate (%): Total carbohydrate was recorded highest in genotype GHA-8 (3.39%) and lowest total carbohydrate was recorded in genotype GHA-9 (1.43%) having a general mean of 2.28. Gajera *et al*. 2017 studied processing potential of bottle gourd fruits and reported 3.75% of carbohydrate in bottle gourd fruits.

Moisture (%): Maximum moisture content of 93.10% was reported in genotype GHA-16 whereas, minimum moisture content of 89.30% was reported in genotype GHA-23. The general mean recorded was 91.24. Lata and Ray (2014) reported similar finding of Moisture (94.65%) in their study of Physico-chemical changes in bottle gourd juice during storage. Gajera *et al*. 2017 studied processing potential of bottle gourd fruits and reported 94.5% moisture content in bottle gourd fruits.

Dry matter (%): The dry matter percentage was found highest in genotype GHA-23(10.70) and lowest dry matter percentage was found in genotype GHA-16(6.90). General mean was recorded 8.76 for thirty genotypes.

Total Ash: Maximum total ash content was recorded as 1.89% in genotype GHA-30 whereas, minimum was recorded as 0.33% in genotype GHA-3 with a general mean of 1.01. Lata and Ray (2014) also reported 0.49% of total ash in their study of Physico-chemical changes in bottle gourd juice during storage. Gajera *et al*. 2017 studied processing potential of bottle gourd fruits and reported 0.50% of total ash in bottle gourd fruits.

Total Phenols (mg/100g): Total phenol was recorded maximum of 54.92 mg/100g in genotype GHA-6 and minimum of 28.15 mg/100g was recorded in genotype GHA-1. The general mean observed was 40.68.

Calcium (mg/100g): The calcium content was found highest in genotype GHA-8 (13.88 mg/100g) and lowest was recorded in genotype GHA-7 (8.18 mg/100g). General mean recorded was 11. These results are in accordance with the findings of Sithole *et al.,* 2015 in their assessment of minerals and protein contents in selected South African Bottle gourd landraces and they reported lowest of 2051 mg/100g of calcium content in Landrace M03 and highest of 6619 mg/100g in Landrace Mean Hybrid GRH. Gajera *et al*., 2017 studied processing potential of bottle gourd fruits and reported 80.20 mg/100 of calcium in bottle gourd fruits with peel and 52.78 mg/100g of calcium in bottle gourd fruits without peel.

Crude Fibre (%): Maximum percentage of crude fibre was recorded as 0.73 in genotypes GHA-10 and GHA-24 whereas; minimum percentage of crude fibre was recorded as 0.56 in genotypes GHA-3 and GHA-20. The general mean recorded was 0.66. Gajera *et al*. 2017 studied processing potential of bottle gourd fruits and reported 4.45% of crude fibre in bottle gourd fruits with peel and 3.40% in bottle gourd fruits without peel.

Conclusion

Bottle gourd is still underutilized fruit in spite of being one of the cheapest source of nutrients and potential source of natural antioxidants. Different plant parts of bottle gourd have several putative medicinal properties (Chopra, 1986; Moreman, 1998; Chaudhary, 2001; Manandhar, 2002). It has a good amount of vitamins and minerals. Its fruit contains 95.54% moisture, vitamin C (10.1 g), vitamin A (16 IU), thiamine (0.029 g), riboflavin (0.022 g), niacin (0.320 g), carbohydrates (3.39 g), fats (0.02 g) and potassium (150 mg)/100g (USDA, 2018). Bottle gourd have a rich source of nutrients viz; potassium, vitamin-C, protein, sulphur and phosphorus. Keeping the above considerations in view the research proposal entitled "Evaluation of Bottle gourd (*Lagenaria siceraria* (Mol.) Standl. Germplasms for Biochemical Characters in Garo Hills, Meghalaya" with an objective to nutritional quality of bottle gourd which may help in supplementing the nutritional requirement of people of the society.

Table 1.1: Mean values of 12 different characters of 30 bottle gourd genotypes

Treatment	TSS (ºBrix)	Total sugar (%)	Reducing sugar (%)	Ascorbic acid (mg/100g)	Total soluble protein (%)	Total carbohydrate (%)
GHA-1	3.47	1.55	1.35	6.76	0.80	1.95
GHA-2	3.27	2.28	1.63	8.67	0.99	2.12
GHA-3	3.00	2.34	2.13	8.80	1.00	2.74
GHA-4	2.73	1.65	1.12	9.87	0.82	2.37
GHA-5	3.07	2.15	1.72	6.56	0.65	2.58
GHA-6	3.07	0.84	2.04	7.43	0.94	1.89
GHA-7	3.93	3.14	2.73	8.69	0.64	1.86
GHA-8	4.20	3.34	2.80	10.60	0.86	3.66
GHA-9	3.07	2.05	1.83	8.43	1.00	1.63
GHA-10	3.00	2.24	1.54	9.40	0.96	2.88
GHA-11	3.73	2.67	2.40	7.69	0.94	1.24
GHA-12	2.87	1.85	1.50	8.68	0.72	1.36
GHA-13	3.27	2.28	1.65	8.62	0.65	2.76
GHA-14	3.53	1.53	0.50	7.70	0.76	1.28
GHA-15	3.73	2.83	1.55	7.64	1.15	2.87
GHA-16	3.07	2.34	1.75	9.81	0.57	2.74
GHA-17	3.53	2.05	1.25	8.63	0.70	1.81
GHA-18	3.67	2.47	1.96	7.08	0.90	2.42
GHA-19	2.80	1.18	0.84	8.19	0.53	1.37
GHA-20	3.07	2.36	1.95	7.54	0.56	2.40
GHA-21	3.27	2.41	1.86	9.23	0.69	2.21
GHA-22	3.33	2.23	1.95	9.61	0.99	2.62
GHA-23	3.07	2.35	2.12	8.67	0.66	1.06
GHA-24	2.73	2.05	1.44	9.50	0.78	1.37
GHA-25	2.73	2.02	1.65	8.67	0.81	2.33
GHA-26	3.27	2.56	2.45	9.73	0.62	2.46
GHA-27	3.73	2.25	1.88	8.85	0.81	2.17
GHA-28	3.33	2.61	2.29	9.73	0.70	1.84
GHA-29	3.07	2.29	1.92	8.11	0.93	2.91
GHA-30	3.93	3.16	2.69	10.13	0.86	3.16
GM	3.28	2.24	1.82	8.63	0.80	2.20
CV (%)	6.06	2.74	3.54	5.02	5.99	5.03
SEm	0.11	0.04	0.04	0.25	0.03	0.06
CD (5%)	0.32	0.10	0.11	0.71	0.08	0.18
Range(min)	2.73	0.84	0.50	6.56	0.53	1.06
Range(max)	4.20	3.34	2.80	10.60	1.15	3.66

Table 1.2: Mean values of 12 different characters of 30 bottle gourd genotypes

Treatment	Moisture (%)	Dry matter (%)	Total Ash (%)	Total Phenols (%)	Calcium (mg/100g)	Crude fibre (%)
GHA-1	90.07	9.93	0.42	31.26	10.53	0.67
GHA-2	89.87	10.13	1.51	36.69	9.20	0.64
GHA-3	90.13	9.87	0.20	28.78	12.47	0.51
GHA-4	91.20	8.80	0.31	35.40	8.30	0.67
GHA-5	90.33	9.67	0.50	23.23	9.70	0.64
GHA-6	91.13	8.87	0.44	55.47	10.07	0.61
GHA-7	91.20	8.80	1.23	37.89	8.63	0.71
GHA-8	90.60	9.40	1.23	33.25	16.40	0.62
GHA-9	92.07	7.93	0.83	32.66	11.23	0.60
GHA-10	91.93	8.07	1.13	42.23	11.60	0.71
GHA-11	92.00	8.00	0.62	32.30	12.30	0.66
GHA-12	91.73	8.27	0.52	45.87	11.43	0.53
GHA-13	92.73	7.27	0.80	40.59	8.20	0.71
GHA-14	91.20	8.80	1.85	38.27	9.20	0.70
GHA-15	92.13	7.87	0.65	37.31	9.37	0.62
GHA-16	92.73	7.27	1.32	41.96	8.37	0.64
GHA-17	92.53	7.47	1.09	37.45	10.53	0.60
GHA-18	93.07	6.93	0.44	47.55	12.23	0.61

GHA-19	90.47	9.53	0.90	42.52	9.83	0.65
GHA-20	91.33	8.67	1.71	36.20	11.90	0.53
GHA-21	91.27	8.73	1.79	39.24	10.63	0.60
GHA-22	92.73	7.27	0.70	46.66	10.77	0.65
GHA-23	90.20	9.80	1.51	38.25	10.33	0.68
GHA-24	89.60	10.40	0.63	46.52	8.67	0.71
GHA-25	91.80	8.20	0.40	42.50	8.87	0.60
GHA-26	91.40	8.60	0.51	45.23	9.57	0.59
GHA-27	90.40	9.60	1.32	46.75	9.73	0.65
GHA-28	91.60	8.40	0.93	39.79	12.40	0.53
GHA-29	91.33	8.67	0.40	48.08	10.17	0.65
GHA-30	89.80	10.20	1.83	49.29	14.77	0.68
GM	91.29	8.71	0.92	39.97	10.58	0.63
CV (%)	2.01	21.07	3.89	3.18	3.48	3.11
SEm	1.06	1.06	0.02	0.73	0.21	0.01
CD (5%)	3.00	3.00	0.06	2.08	0.60	0.03
Range(min)	89.60	6.93	0.20	28.78	8.20	0.51
Range(max)	93.07	10.40	1.85	55.47	16.40	0.71

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