



Value Addition to the Green Tea with Bio-Supplement Stevia (*Stevia rebaudiana Bertoni*)

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ABSTRACT

Green tea is widely considered as a health promoting beverage. Based on a survey conducted on a group of people, it was found that bitter and astringent tastes are the main reasons of unacceptability by consumer to drink green tea. In order to increase the consumer acceptability without affecting the nutritional benefits of green tea, it is assorted with *Stevia rebaudiana Bertoni* which is a natural sweetener with zero calories. A sample of dried green tea and stevia leaves were selected from the available brands in the market. Based on the provided instructions on the pack for usage, a sample of 4 grams was brewed in 250ml of portable water. The extraction process was carried out in two ways and each in 4 different proportions of green tea: stevia. The moisture content determined by hot air oven method for green tea was found to be 5.76% on dry basis and for stevia leaves 10.52% on dry basis. The ash content of green tea was found to be 4.95% on dry basis and for stevia leaves 7.35% on dry basis. Based on the hedonic scale rating, ranking was done for all the 8 samples and for control. The results obtained are: green tea(control c)-3.825,code A-6.75,code B-6.6,code D-3.9,code E-6,code F-4.6,code G-4.225,code H-3.825,code I-5.025. Hence it can be concluded that all the samples are ranked better than the control sample, thus increasing the acceptability to devour green tea.

Key words: Green tea, stevia, sensory evaluation, hedonic scale rating

INTRODUCTION

Green tea is widely considered as a health promoting beverage and the beneficial effects generally associated with green tea have been attributed to its polyphenol content, particularly to catechins and their antioxidant activity. Catechins are a group of very active flavonoids that include epicatechin (EC), epicatechin gallate (ECG), epigallocatechin (EGC) and epigallocatechin gallate (EGCG), the latter being the most abundant. Catechins are colourless, water-soluble compounds that contribute to the bitterness and astringency of green tea. A typical green tea serving (250ml) contains approximately 90mg catechins [3]. The foremost objective for undertaking this project is based on the survey which was conducted on a group of different aged people of both who do consume the green tea and who do not consume the green tea. This survey included attributes like preference and reasons for devouring green tea. The results obtained were that 15% people devour green tea without any sweetener, 42% people do not prefer because of its astringent taste, 38% people add different forms of sweeteners, and 5% people are unconcerned about the product.

Bitter and astringent tastes are the main reasons of unacceptability by consumer to drink green tea. In order to increase the consumer acceptability without affecting the nutritional benefits of green tea, it is assorted with *Stevia rebaudiana Bertoni* which is a natural sweetener with zero calories. Adding sugar to sweeten green tea will increase the calorie content, making it ineffective as a weight-loss agent. Artificial sweeteners produce metallic after taste frequently and are harmful to health on long run. Stevia, a natural sweetener, contains no calories per serving and is much sweeter in taste than refined sugar. Because it contains no calories, adding it with green tea can help you keep the low-calorie benefits of green tea with more consumer acceptability.

Stevia is a small perennial herb belonging to the Asteraceae family, in the genus *Stevia*. Its scientific name is *Stevia rebaudiana Bertoni*. Some commonly referred names are honey leaf plant, sweet chrysanthemum, sweet leaf stevia, sugar leaf etc. Stevia plant grows 2-4 feet in height with slender, branched stems and flourishes well all

over temperate and some parts of tropical regions [6]. Stevia herb parts are very low in calories. Parts by parts, its dry leave possess roughly 40 times more sweetness than sugar. This sweetness quality in stevia is due to several glycoside compounds including stevioside, steviolbioside, rebaudiosides A-E, and dulcoside. Stevioside is a non-carbohydrate glycoside compound. Hence, it lacks the properties that sucrose and other carbohydrates possess [1].

Table-1 Chemical Composition of Green Tea Leaves [5]

Constituent	Percentage (% of dried leaf)
Polyphenols	37
Carbohydrates	25
Caffeine	3.5
Protein	15
Amino acids	4.0
Lignin	6.5
Organic acids	1.5
Lipids	2.0
Ash	5.0
Chlorophyll	0.5

Table-2 Chemical Composition of Stevia Leaves [6]

Components	(% on dry weight basis)
Moisture	5.37 ± 1.12
Protein	11.41 ± 0.19
Fat	3.73 ± 0.29
Crude fibre	15.52 ± 0.19
Ash	7.41 ± 0.14
Carbohydrates	61.93 ± 6.6
Reducing sugar	5.88 ± 0.21
Non-reducing sugars	9.77 ± 0.13
Total soluble carbohydrates	15.65 ± 2.97

METHODS

Determination of Moisture Content

The moisture content was determined by measuring the mass of both green tea and stevia leaves sample, before and after the water is removed by evaporation in a hot air oven maintained at 102± 4^oc for regular intervals of 3 and 4 hours.

$$\% \text{Moisture} = \frac{M(\text{INITIAL}) - M(\text{DRIED})}{M(\text{INITIAL})} \times 100 \quad (1)$$

Here, M(INITIAL) and M(DRIED) are the mass of the samples before and after drying respectively. The basic principle of this technique is that water has a lower boiling point than the other major components within foods e.g. Lipids, proteins, carbohydrates and minerals.

Determination of Ash Content

Ash is the inorganic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within a food. It is crucial to carefully select a sample whose composition represents that of the food being analyzed and to ensure that its composition does not change significantly prior to analysis. Before carrying out an ash analysis; samples are dried to prevent spattering during ashing. The food sample is weighed before and after ashing to determine the concentration of ash present. Ashing is done in muffle furnace for 4hrs maintained at 600^o C. The ash content can be expressed on a dry basis as:

$$\% \text{Ash(dry basis)} = \frac{M(\text{ASH})}{M(\text{DRY})} \times 100 \quad (2)$$

Method of Extraction

The effects of product and preparation variables on the in-cup chemical composition of tea extracts is of interest because the appearance and taste characteristics and the possible health effects of a tea liquor arise from the chemical components extracted from the leaf during tea preparation. Based on the available literature work on effect of brewing temperature and duration on green tea catechin solubilisation, a brewing temperature of 50±5^oC is chosen for duration of 30 minutes [2].

A sample of dried green tea and stevia leaves were selected from the available brands in the market. Based on the provided instructions on the pack for usage, a sample of 4 grams was brewed in 250ml of portable water. The extraction process was carried out in two ways:

- 4g of dried green tea leaves and 4g of dried stevia leaves were brewed separately in 250 ml of water. Then they were mixed in 4 different proportions of varying ratio of extracted green tea: extracted stevia (50:50, 60:40, 70:30, and 80:20) maintaining the parameters mentioned above.
- 4g mixture containing varying ratios of dried green tea leaves: dried stevia leaves (50:50, 60:40, 70:30, and 80:20) were brewed in 250 ml of water.

When the process of extraction is completed, then sensory evaluation of different samples for taste is done based on the hedonic scale rating.

Sensory Evaluation

A scientific discipline used to evoke measure, analyse and interpret reactions to those characteristics of foods and materials as they are perceived by the sense of sight, smell, taste, touch and hearing. Sensory evaluation was one of the earliest methods of quality control and is still widely used in industry. However the level of application depends on the situation. Sensory evaluation offers the opportunity to obtain a complete analysis of the various properties of foods [5].

Hedonic Rating Test

Hedonic rating test relates to pleasurable or un-pleasurable experiences. The hedonic rating test is used to measure the consumer acceptability of food products. Samples are served to panellists and asked to rate the acceptability of the produce on a scale, usually of 9 points, ranging from 'like extremely' to 'dislike extremely'. The results were analysed for preference with data from large untrained panels. The test is more useful in determining preferences than in determining differences.

RESULTS AND DISCUSSION

The moisture content determined by hot air oven method for green tea was found to be 5.76% on dry basis and for stevia leaves 10.52% on dry basis. The ash content of green tea was found to be 4.95% on dry basis and for stevia leaves 7.35% on dry basis. After the process of extraction, sensory evaluation for taste is done by Hedonic rating test for 9 different samples which were given different codes for analysis i.e.,

1) green tea-control(C)	Green tea leaves: stevia leaves
Extract of green tea: Extract of stevia	6)50: 50 (F)
2)50: 50 (B)	7)60: 40 (I)
3)60: 40 (E)	8)70: 30 (G)
4)70: 30 (A)	9)80: 20 (H)
5)80: 20 (D)	

Specimen evaluation cards were given for a group of different people and results were analysed. The scores received by each sample were then averaged and compared with the average score received by other samples in the series. Hedonic rating can also be evaluated by ranking method. For this purpose, the ratings given by a panellist to each sample are arranged in increasing or decreasing numerical order and ranking assigned.

A more accurate evaluation of Hedonic ratings is the determination of fiducial limits for the reference sample. The fiducial limits represent a range of average scores within which an average score for a particular sample is not significantly different from the control. Average scores above or below the fiducial limits are significantly different from the control. Fiducial limits of green tea were calculated and compared with other samples for determining the consumer acceptance of the product. The standard deviation value is 1.4177. The fiducial limits obtained for green tea at 5% significance is 3.3 ± 0.68 and at 1% significance is 3.3 ± 0.93 . Based on the hedonic scale rating, ranking is done for all the 9 samples and results obtained are: green tea (control c)-3.825, code A-6.75, code B-6.6, code D-3.9, code E-6, code F-4.6, code G-4.225, code H-3.825, code I-5.025 [Fig.1].

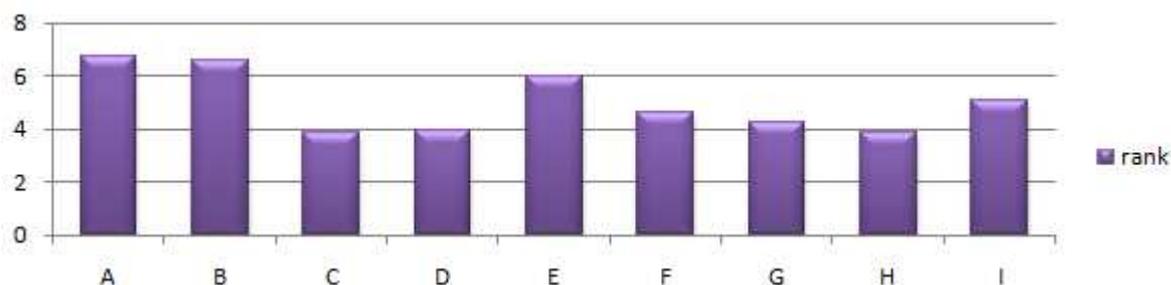


Fig.1 ranking for 9 different samples

Thus arranging in the ascending order of ranks obtained, acceptability of code A sample is highest while that of green tea (control C) and code H is lowest. Hence it can be concluded that all the samples are ranked better than the control sample. Based on the obtained fiducial limits for green tea, samples are compared with green tea:

At 5% significance, samples that are

Table-3 Comparison at 5% Significance

Superior to control	Code A, B, E, F, G, H, I
Inferior to control	None
Not significant from control	code D

At 1% significance, samples that are

Table-4 Comparison at 1% Significance

Superior to control	Code A, B, E, F, H, I
Inferior to control	None
Not significant from control	code D,G

CONCLUSION

Hence it can be concluded that the objective of the project is achieved as the acceptability of all the samples assorted with stevia leaves was found to be more than green tea. The highly accepted sample is code A (70% extracted green tea: 30% extracted stevia). Spoilage of the sample was observed after storage for one day without adopting any preservation technique. Microbial studies can be continued further for the determination of spoilage organism.

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