



P-ISSN: 2349-8528

E-ISSN: 2321-4902

[www.chemijournal.com](http://www.chemijournal.com)

IJCS 2020; 8(5): 750-752

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Received: 01-07-2020

Accepted: 03-08-2020

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## Development and standardization of stevia (*Stevia rebaudiana*) incorporated multigrain cookies

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**DOI:** <https://doi.org/10.22271/chemi.2020.v8.i5k.10387>

**Abstract**

The present investigation was undertaken on the utilization of finger millet, pearl millet, sorghum and flax seed for preparation of multigrain cookies when compared to conventional wheat flour cookies. The gluten content and calorific value are less when compared to control cookies made by wheat flour. The glycemic index of stevia is zero, which is useful for diabetic people when compared to sugar (high glycemic index). On the basis of the scores in organoleptic evaluation conducted using 9-point hedonic scale, T2 cookies prepared using wheat (12.5%), finger millet (24%), pearl millet (25%), sorghum (26%), flax seed (12.5%) to which 6g of stevia added was standardized. The proximate composition of standardized cookies showed a mean percentage of moisture as  $3.20 \pm 0.85$ , ash  $2.24 \pm 0.12$ , fat  $19.5 \pm 1.7$ , protein  $12.5 \pm 0.85$ , crude-fiber  $3.3 \pm 0.84$  and carbohydrates  $59.17 \pm 3.66$  g/100g.

**Keywords:** Cookies, stevia, gluten, multigrain, flax seed

**Introduction**

In India, one of the most consumable processed foods is cookies. When compared to Indian snack items such as salted snacks, sweets etc., cookies are low cost processed food. Among all the snack foods, cookies have certain advantages such as they offer good nutrition, taste, and longer shelf life and used for fortification purpose and they can also be packed in a variety of sizes.

In the Indian diets, major portion of energy and protein comes from Wheat (*Triticum aestivum*)<sup>[4]</sup>. Wheat is deficient in lysine, but it contains 12% protein, 71.2% carbohydrates, 1.5% mineral and 1.2% fiber. The states in the India where finger millet (*Eleusine coracana*) is mostly grown and consumed in states Karnataka, Andhra Pradesh, Tamilnadu, Maharashtra and Goa. Finger millet is a non-gluten food, which is easily assimilated and digested in the body and it contains high amount of minerals such as calcium (440 mg/100 g) and magnesium (435.1 mg /100 g). Traditionally, in India finger millet is used in preparation of cookies, porridge, malted beverages etc. Sorghum (*Sorghum bicolor* L. Moench) is the fifth leading cereal crop in the world<sup>[9]</sup>. Sorghum contains about 349 K cal energy, 9.6% protein, 3.8% fat, 73.2% carbohydrates, 2.4% ash and 11% moisture<sup>[2]</sup>. In Western India, the major important coarse cereal is Pearl millet (*Pennisetum typhoideum*). By using pure Pearl millet in the production of cookies, texture is tough, taste is gritty and mealy.

Stevia (*Stevia rebaudiana*) grows up to 65-80 cm tall, where the leaves are oppositely arranged. *S. rebaudiana* contains several sweetening compounds and the sweetest of all when compared to the remaining species of stevia. For diabetic patients, it is safe to use stevia and the leaves of stevia are 30 times sweeter than the normal sugar. It has an advantage like being stable at high temperatures and has a pH range of 3-9, over artificial sweeteners.

Flaxseed (*Linum usitatissimum*) is rich in contents of  $\alpha$ -linolenic acid (ALA), lignans and fiber. It contains omega-3s and lignan phytoestrogens which may possess chemoprotective properties in animals and humans. Flaxseed incorporation into bread and cookies improves in texture and crumb structure.

## Materials and Methods

### Source of raw materials and pre preparation

The required raw materials were procured from local supermarket, Bodhan. The millets were cleaned, washed and dried. The dried ingredients were milled into flour and sieved. Flax seed was procured from the local supermarket, Bodhan, was cleaned and powdered. Stevia leaves collected from the garden were cleaned, dried and powdered. Other ingredients required for preparation of cookies such as refined wheat

flour, vanilla essence, shortening, baking powder were also procured from the local supermarket.

### Development and standardization of multigrain cookies by incorporating stevia powder

Multigrain cookies were developed using different proportions of ingredients to standardize the final proportion. The proportion of ingredients used in test samples is detailed in table 1.

**Table 1:** Preparation of control cookies

Ingredients	Quantity
Wheat flour	100 g
Sugar	40g
Shortening	70 g
Baking powder	1-3 g

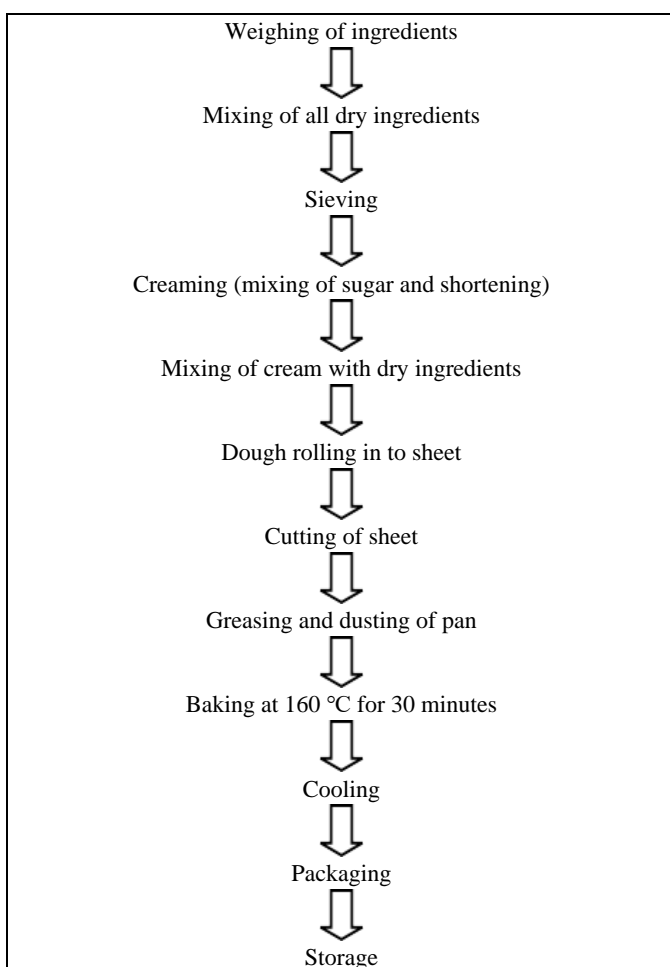
### Preparation of stevia incorporated multigrain cookies

**Table 2:** Different combinations of stevia incorporated multigrain cookies

Sample	Wheat flour	Multigrain flour	Stevia powder(g)	Shortening(g)	Baking powder(g)
T <sub>0</sub>	100%	0% FMF + 0% PMF + 0% SF + 0% FSP	0	70	1-3
T <sub>1</sub>	16%	23% FMF + 24% PMF + 25% SF + 12% FSP	7	70	1-3
T <sub>2</sub>	12.5%	24% FMF + 25% PMF + 26% SF + 12.5% FSP	6	70	1-3
T <sub>3</sub>	9%	25% FMF + 26% PMF + 27% SF + 13% FSP	5	70	1-3

WF = Wheat flour, FMF=Finger millet flour, PMF = Pearl millet flour, SF=Sorgum flour, FSP = Flax seed powder

### Experimental procedure



**Flow chart 1:** Process flow chart for Preparation of stevia (*Stevia rebaudiana*) incorporated multigrain cookies

### Organoleptic evaluation of stevia incorporated multigrain cookies

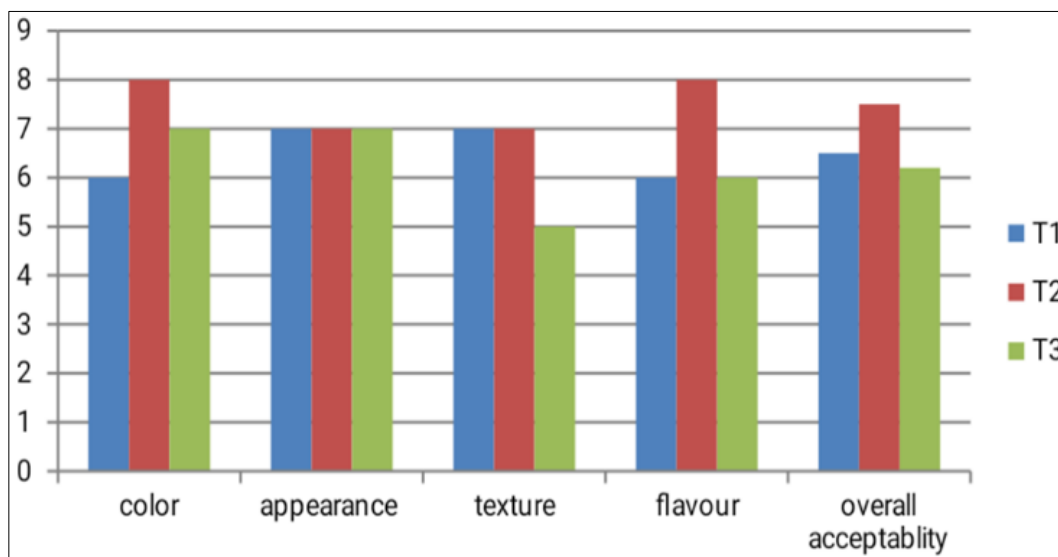
The sensory evaluation was carried out by semi trained panelists for the stevia incorporated multigrain cookies. The samples were presented and coded in identical plates. The panelists were provided with portable water for mouth-rinsing between each tasting. The sensory characteristics of the samples were evaluated by use of 9-point hedonic scale<sup>[1]</sup>.

### Sensory analysis of stevia (*Stevia rebaudiana*) incorporated multigrain cookies

Sensory analysis of stevia (*Stevia rebaudiana*) incorporated multigrain cookies sample T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, was carried out on the basis of color, appearance, texture, flavour and overall acceptability with the help of semi trained panelists on 9-point hedonic scale<sup>[1]</sup>. Based on sensory evaluation T<sub>2</sub> sample was standardized. The results are depicted in Table-3.

**Table 3:** Organoleptic evaluation of stevia (*Stevia rebaudiana*) incorporated multigrain Cookies

Sample	Color	Appearance	Texture	Flavor	Overall acceptability	Mean value
T <sub>0</sub>	7	8	8	8	8.0	7.8+ <sub>-</sub> 0.4
T <sub>1</sub>	6	7	7	6	6.5	6.5+ <sub>-</sub> 0.5
T <sub>2</sub>	8	7	7	8	7.5	7.5+ <sub>-</sub> 0.5
T <sub>3</sub>	7	7	5	6	6.2	6.2+ <sub>-</sub> 0.8



**Fig 1:** Organoleptic evaluation of stevia (*Stevia rebaudiana*) incorporated multigrain cookies

### Results and Discussion

The experiment was conducted for Development and Standardization of Stevia (*Stevia rebaudiana*) incorporated multigrain cookies. The present investigation was under taken to evaluate the development and standardization as well as acceptability of utilization of stevia incorporated multigrain for the preparation of cookies. Based on sensory evaluation of cookies, there is high overall acceptability to T2 sample. In T2 sample, the ingredients used were 12.5% of wheat flour and 87.5% of multigrain flour (24%FMF, 25%PMF, 26%SF and 12.5% FSP). The cookies contain low gluten as the major proportion is millet flour, due to which the texture was undesirable. By addition of flax seed powder, texture of cookies was improved. In place of sugar, stevia powder was used, which is a natural sweetener and contains many health benefits.

### Proximate composition of cookies

Proximate composition was analysed for the standardized multigrain cookies and the results are depicted in table 4. It is evident from the table that the percentage moisture is  $3.20 \pm 0.85$ , ash  $2.24 \pm 0.12$ , fat  $19.5 \pm 1.7$ , protein  $12.5 \pm 0.85$ , crude-fiber  $3.3 \pm 0.84$  and carbohydrates  $59.17 \pm 3.66$  g/100g.

**Table 4:** Proximate composition standardized stevia incorporated multigrain cookies

S. No.	Parameters	Mean value (T <sub>2</sub> ) /100 g
1	Moisture	$3.20 \pm 0.85$
2	Ash	$2.24 \pm 0.12$
3	Protein	$12.5 \pm 0.85$
4	Fat	$19.5 \pm 1.72$
5	Crude fiber	$3.36 \pm 0.84$
6	Carbohydrates	$59.1 \pm 3.66$

### Conclusion

On the basis of overall acceptability in sensory evaluation of cookies T2 sample cookies were having the high overall acceptability when compared to other. It could be concluded that the cookies prepared with 12.5% wheat, 24% finger millet, 25% pearl millet and 26% sorghum, 12.5% flax seed and 6g stevia incorporation in cookies could be considered optimum with respect to sensorial quality characteristics, these cookies were also observed to be superior. Addition of multigrain flour to cookies, increases the nutrients such as fibre and minerals like calcium, iron and magnesium. The

gluten content, glycemic index and calorie content is also low in the cookies prepared with flour containing high proportion of millets and low proportion of wheat flour and replacing sugar with stevia powder, a natural sweetener, compared to the cookies prepared with wheat flour.

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