

## Development of Cookies using Garden Cress Seed *Lepidium Sativum L* and Evaluation of its Antioxidant Activities

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### Abstract

Bakery products are widely popular among population now days because of their taste and ease in availability. Among bakery products, cookies are commonly used in each house hold. Frequency of consuming bakery products especially cookies is huge compared with any other processed or packed food. Besides, the usefulness of readily available foods, health of people also compromised day by day. Consumption of functional food can help in preventing harmful effect of processed food. That is why, the demand of processed food added with functional ingredient are increasing. Looking to this, an attempt was made to develop cookies using Garden Cress Seed. After developing cookies, sensory, nutritional and antioxidant activities were evaluated.

**Keywords:** Garden Cress Seed; Antioxidants; Degenerative diseases.

## INTRODUCTION

Lifestyle changes have increased the demand of ready to serve food products. It has become a first choice of working women and people living in urban areas. Among ready to serve food, bakery products are very popular among all age groups. Cookies are one the widely consumed bakery products which is available in many flavors and

shapes. It is a good source of carbohydrate, fat and protein, few vitamins and minerals. Primarily they are made up of refined wheat flour, sugar and fat. But one can easily replace the ingredients with highly nutritional food such as millet flour, seed powder, fruit pulp etc. This way the nutritional value of cookies can be enhanced. Garden cress seed belongs to Brassicaceae family and its scientific name is *Lepidium sativum*. Common names of Garden cress seed includes Common Cress (English), Halim (Bengali), Aseliyo (Gujrati), Chansur (Hindi), Allibija, Kapila (Kannada), Alian (Kashmiri) Asali (Malayalam), Ahaliva, Haliv (Marathi), Allivirai (Tamil) and Adityalu, Aadalu (Telugu).<sup>1</sup> As per scientific investigations, seed comprising of 80–85% endosperm, 12–17% seed coat and 2–3% embryo. Seed contain 25% protein, 14–24% lipids, 33–54% carbohydrates and 8% crude fiber.<sup>3,7</sup> Garden cress seed possess various pharmacological properties.<sup>9</sup> In traditional medicinal system, Garden cress seed have been widely used in treating number of disorders in India such as hypertension, diabetes

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and kidney diseases and in prevention of cancer, cardiovascular diseases and mild glycemia in diabetic patients.<sup>2,6</sup>

Diabetes and cancers are the major degenerative diseases which are life threatening. Dietary management is one of the best ways to treat such diseases. Foods rich in fiber and antioxidants can help to great extents once these diseases occur.

Keeping all these researches and reports in view, an attempt was made to develop Garden cress seed cookies.

### Objectives

- To develop cookies by incorporating Garden Cress Seed.
- To standardize the process parameters of cookies based on sensory properties.
- To evaluate sensory score, nutritional and antioxidant activities of developed product.
- To estimate the physicochemical properties of flour and blends used for cookie preparation.
- To determine Physical, Textural properties and shelf life of developed product.

## **METHODOLOGY**

### Development of Cookies

In the process of developing cookies, first standard formula of cookies was gathered from the bakery expert. Initial trials were conducted with incorporation deferent levels of garden cress seed powder and other ingredients. Each ingredient was standardizing to optimize the formula of garden cress seed cookies (Table 1). After optimizing the formula, cookies incorporated with garden cress seed was evaluated for sensory quality by using composite scoring test (Table 2).

### Nutritional Composition and Antioxidant capacity of Cookies

Nutritional composition of cookies was carried out using AOAC standard methods. For evaluation antioxidant activity of cookies, sample extraction was carried out. Methanol: Distilled water (80:20) was used as a solvent for the extraction of cookies. Cookies were ground with mortal pastel and 300 mg of ground powder was taken in 50 ml conical flask. Then 5 ml of solvent was added. The mixture then was shaken for 30 minutes using a mechanical shaker (NOVA) at 30 rpm. After shaking, the content

of flask was centrifuged (REMI) at 3000 rpm for 10 minutes and supernants were collected in sugar tubes. Again 5 ml of the same solvent was added to flask and process was repeated. Both supernants were combined, filtered and volume was adjusted to 16.3 ml. The obtained extract was stored at -20°C and used to anylised for their total antioxidant capacity two methods i.e. ABTS and DPPH.

### Evaluation of antioxidant activity

#### DPPH Radical Scavenging Activity

For analyzing DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging capacity of cookies, 0.2 ml of extracted sample was taken and volume was made up to 1 ml with methanol. Then 3 ml of DPPH reagent (1 mM in methanol) were added. The content was mixed properly. It was incubated at 37°C for 20 minutes. After incubation the absorbance was measured 517 nm in a UV visible double beam spectrophotometer (Hitachi 220S, Japan). For control, 3 ml of DPPH was added to 1.0 ml of methanol. For standard, known concentration of trolox (10-40 µg) was taken and volume was made up to 1 ml with methanol. Pure methanol was used as a blank and percent inhibition was calculated using the following formula: % inhibition = (Abs of control - Abs of sample)/ Abs of control x 100<sup>4</sup>.

#### Total Phenolic Compounds Estimation

For estimating total phenolic compounds, 0.05 ml sample extract was taken in a test tube and volume was made up to 1 ml with distilled water. To this, 1 ml each of folin-ciocalteau reagent diluted with water (1:2) and 35% Na<sub>2</sub>CO<sub>3</sub> were added. The contents were incubated for 30 min at room temperature. 2 ml of distilled water was added and intensity of blue colour was recorded at 620 nm in UV visible double beam spectrophotometer (Hitachi 220S, Japan). Gallic acid of known concentration (5-20 mg) was used as standard.

#### TEAC Measurement by ABTS Method

The TEAC (Trolox equivalent antioxidant capacity) of sample extract was measured using the modified 2,2'-azinobis (3-ethylbenzothiazoline-6-sulfonic acid diammonium salt (ABTS) radical decolonization assay. This method was given by Re et al (1999). 7mmol/L ABTS stock solution was reacted with 2.45mmol/L potassium persulphate to prepare ABTS radical cation (ABTS+) and

incubated in the dark at room temperature for 12–16 h. The ABTS+ solution was diluted with 5mM PBS (Potassium phosphate buffered saline, pH 7.4) to an absorbance of 0.7 at 734 nm before use. For assay, 20 µl of extract was taken, volume was made up to 1 ml with ethanol and 3 ml of ABTS was added to it. The contents were vortexed for 10 seconds. The discoloration caused by reduction of the cation by antioxidant from the sample measured at 734 nm in a UV visible spectrophotometer (Hitachi 200S, Japan). 1.0 ml of ethanol was added to 3 ml of ABTS and used as a control. For Standard, known concentration of trolox (5-20 µg) was taken and the volume was made up to 3 ml with ethanol and thereafter all test tubes were treated in the same way as sample. Percent inhibition was calculated using the following formula: % inhibition = (Abs of control - Abs of sample)/ Abs of control x 100<sup>8</sup>.

## RESULT

### Nutritional Composition

High ash content is associated with high minerals content. Results of nutritional composition reflected the same, cookies without seed contained 1.82 mg% ash whereas cookies incorporated with garden cress seed found high ash content i.e. 2.83 mg% (Table 3). Among minerals, garden cress seed is rich source of calcium and iron. Incorporation of seed enhances calcium and iron level significantly. Cookies without garden cress seed possessed 68.47 mg% calcium whereas cookies incorporated with garden cress seed possessed 90.04 mg% of calcium. Same pattern was seen in case of iron, iron level of control cookies was 3.61 mg% and cookies incorporated with seed were 9.02mg%. Similarly, protein and fiber content of developed cookies were higher i.e. 8.04g% and 3.14g% respectively. Results of nutritional composition shows that developed cookies have high minerals and protein content and low in carbohydrate

content. Inclusion of such product in diet can surely help in maintaining overall health.

### In vitro Antioxidant activity

#### ABTS & DPPH radical scavenging activity

Either DPPH• or ABTS• radical scavenging activity can be used to evaluated the antioxidant capacity of food products. Generally, the ABTS•+ free radical is commonly used when issues of solubility or interference arise and the use of DPPH• based assays becomes inappropriate. In the present study both radical scavenging activities was evaluated. The percent inhibition of developed cookies extracts was 69.19 and 81.23 for ABTS• and DPPH• radical respectively. FRAP assay was also used to evaluate the overall antioxidant capacity. Cookies incorporated with seed shown 157.54% inhibition and control shown 74.35% inhibition. Similar pattern was followed in case of total phenolic compounds. The total phenolic compound of developed cookies was 251.75 mg% whereas 139.37 mg% was observed in control (Table 4). Results of antioxidant activities, suggested that cookies incorporated with garden cress seed possessed good antioxidant activity and can be used in prevention of degenerative diseases.

**Table 1:** Final formula optimized for GCSP cookies

Ingredients	Quantity
Flour	90%
GCSP	10%
Sugar	10%
Salt	2%
Ammonium bi-carbonate	2%
Cumin seed	2%
Carom seed	2%
Oregano	2%
Red Chili flakes	2%
water	17.50%
Shortening	40%

**Table 2:** Average Sensory (Composite) Scores of cookies prepared by replacing Maida with different levels of Garden Cress Seed powder

Characteristics/ Product	Volume	Crust Character	Crumb Color	Crumb Texture	Taste and Aroma	Mouth Feel	Overall quality
0% GCSP	7.76 <sup>a</sup> ±0.15	8.23 <sup>a</sup> ±0.14	16.76 <sup>a</sup> ±0.28	24.21 <sup>a</sup> ±0.33	8.42 <sup>a</sup> ±0.13	8.38 <sup>a</sup> ±0.14	8.42 <sup>a</sup> ±0.13

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5% GCSP	7.76 <sup>a</sup> ±0.15	7.59 <sup>b</sup> ±0.15	15.14 <sup>b</sup> ±0.30	23.64 <sup>a</sup> ±0.38	8.07 <sup>a</sup> ±0.15	8.02 <sup>a</sup> ±0.15	7.97 <sup>a</sup> ±0.16
10% GCSP	<b>7.78<sup>a</sup></b> <b>+0.14</b>	<b>7.64<sup>b</sup></b> <b>+0.17</b>	<b>15.09<sup>b</sup></b> <b>+0.33</b>	<b>23.92<sup>a</sup></b> <b>+0.38</b>	<b>8.00<sup>a</sup></b> <b>+0.19</b>	<b>7.88<sup>a</sup></b> <b>+0.19</b>	<b>7.92<sup>a</sup></b> <b>+0.20</b>
15% GCSP	7.26 <sup>b</sup> ±0.15	5.21 <sup>c</sup> ±0.19	12.57 <sup>c</sup> ±0.31	16.00 <sup>b</sup> ±0.75	5.33 <sup>b</sup> ±0.24	5.28 <sup>b</sup> ±0.23	4.92 <sup>b</sup> ±0.32
F Value	2.80	61.40	31.58	64.69	58.19	58.01	54.81
CV%	9.10	10.91	9.47	10.31	11.52	11.56	13.61

GCSP = Garden Cress Seed Powder

All the replacements are based on bakers' percentage.

Values are Mean ± SEM scores of a composite scoring test by a panel of 7 judges × 3 replication.

Means bearing the same superscript within the column do not differ significantly ( $p \leq 0.05$ ) \*\* $p \leq 0.01$

Values in the parentheses indicate number of maximum score.

**Table 3:** Nutritional Composition of Control and Developed Cookies

Cookies	Moisture (g%)	Ash (g%)	Protein (g%)	Fat (g%)	Fiber (g%)	CHO (g%)	Calcium (mg%)	Iron (mg%)
Control	9.73	1.97	7.29	24.85	2.67	64.06	68.47	3.61
10%GCSP	9.49	3.13	8.99	28.38	3.45	54.88	90.04	9.02
t-value	0.72	9.04**	12.05**	11.85**	7.22**	38.63**	41.95**	23.87**
p-value	0.48	3.19×10 <sup>-07</sup>	8.84×10 <sup>-09</sup>	1.09×10 <sup>-08</sup>	2.14×10 <sup>-06</sup>	1.26×10 <sup>-15</sup>	4.01×10 <sup>-16</sup>	9.64×10 <sup>-13</sup>

Values are mean of 8 replication

All the data except moisture is reported on dry weight bases

**Table 4:** Antioxidant capacity of Developed Cookies

Cookies	ABTS (% inh)	DPPH (% inh)	FRAP (% inh)	Total Phenol (mg%)
Control	35.84	50.16	74.35	139.37
10%GCSP	69.19	81.23	157.54	251.75
t-value	29.56**	18.60**	37.40**	16.25**
p-value	5.09×10 <sup>-14</sup>	2.86×10 <sup>-11</sup>	1.96×10 <sup>-15</sup>	1.74×10 <sup>-10</sup>

Values are mean of 8 replication

## DISCUSSION

Numerous researches have been carried out to document the nutritional and functional properties of garden cress seed is rich source of minerals and possess functional properties. In present study, an attempt was made to incorporate garden cress seed in cookies which is widely used in each home. Cookies incorporated with garden cress seed shown a good nutritional and antioxidant profile. This study was conducted *in vitro* and further need to conduct *in vivo* study for more detail.

## CONCLUSION

On the bases of present study, it can be concluded that, cookies incorporated with 10% garden cress seed powder had good sensory acceptance. Addition of garden cress seed powder has enhanced protein, calcium and iron level besides increasing antioxidant activity. Such cookies can be preferred as a snack for kids and elder people also without much altering sensory attributes.

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