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Shreeya Baghel

Department of Soil and Water
Engineering, SVCAET & RS,
IGKV, Raipur, Chhattisgarh,
India

Shristi Shefali Saraugi

Department Agricultural
Processing and Food
Engineering, SVCAET & RS,
IGKV, Raipur, Chhattisgarh,
India

Aekesh Kumar

Department of Soil and Water
Engineering, SVCAET & RS,
IGKV, Raipur, Chhattisgarh,
India

Aarti Rathore

Bhartiya College of Agricultural
Engineering, Durg Affiliated to
IGKV Raipur, Chhattisgarh,
India

Deepak Kumar Soni

Bhartiya College of Agricultural
Engineering, Durg Affiliated to
IGKV Raipur, Chhattisgarh,
India

Corresponding Author:**Shreeya Baghel**

Department of Soil and Water
Engineering, SVCAET & RS,
IGKV, Raipur, Chhattisgarh,
India

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Sensory and physical evaluation of herbal biscuit incorporated with Ashwagandha (*Withania somnifera*) and Ragi (*Eleusine coracana*)

Shreeya Baghel, Shristi Shefali Saraugi, Aekesh Kumar, Aarti Rathore, and Deepak Kumar Soni

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Abstract

Preparation of herbal biscuit is innovative, futuristic research in the field of functional food preparation. During this research wheat flour-based herbal biscuits were prepared using wheat flour, ragi flour, milk, white butter/ghee, salt, baking soda, baking powder, sugar, vanilla essence, and Ashwagandha root powder. Six samples of biscuit of white butter were prepared with variation in the quantity of Ashwagandha root powder and Ragi flour. The sensory analysis of all the six samples was done based on a 9-point hedonic scale. At 2% incorporation of Ashwagandha and 28% incorporation of ragi, the biscuit is accepted due to its taste. Further, for flavour enhancement ghee was chosen in place of white butter for the biscuit preparation. The same procedure was repeated for biscuit preparation and the same percentage composition is taken with ghee biscuit also. The sensory and physical analysis for both white butter and ghee sample was done. The analysis shows that the biscuits prepared from ghee had more diameter and thickness and significantly got the highest score in all the aspects of sensory analysis. Ghee biscuits are better in context with their nutritional benefits than white butter. Therefore, ghee biscuits are superior to white butter biscuits. The health benefits in the form of herbal biscuits can tickle the taste buds of the consumers and influence them for consuming it for a healthy wellbeing. Hence, the development and utilization of such functional foods will not only improve the nutritional status of the population but also helps those suffering from many diseases.

Keywords: Herbal biscuit, Ragi flour, Ashwagandha root powder, sensory and physical evaluation

Introduction

Biscuits are a well-liked foodstuff consumed by a good range of population due to low moisture content and free from microbial spoilage, their varied taste, long period, and comparatively low cost. The white flour used for the assembly of biscuits is deficient in several nutrients including some vitamins, mineral elements also dietary fiber. due to competition within the market and increased demand for healthy, natural, and functional products, attempts are being made to enhance the nutritive value of biscuits and functionality by modifying their nutritive composition.

Ashwagandha (*Withania somnifera*) or Indian winter cherry is a critical historical medicinal plant of the Solanaceae family, the roots and leaves of which have been used in an Indian traditional system of drugs for over 3000 years, Ayurveda and Unani. It is usually used in Indian conventional fitness care systems. The leaves and roots are generally converted to powder and small amounts are used in churna ball, biscuit, cookies, murku, namakpara, missi roti for fitness benefits. It carries constituents like cuseohygrine, anahygrine, tropine, and anaferrine, glycosides, withanolide with starches and amino acid (Singh *et al.* 2011) [14]. Withanolide consists of steroidal molecules which are said to combat infection. Ashwagandha has anti-stress, adaptogenic, aphrodisiac, antibacterial, antioxidant, sedative, diuretic, antispasmodic, germicidal, and anti-inflammatory action. It serves as a nervine tonic and appropriates hypnotic in alcoholism. It stimulates the thyroid and acts as a herbal nutrient for insomnia. It also compliments anti-peroxidation of liver and immunity in opposition to diseases (Singh *et al.* 2014) [15]. It has a bitter taste. *Withania Somnifera* is considered to be one in all the excellent rejuvenating agents in Ayurveda.

Dried roots are used as a tonic for hiccup, cold, diabetes, leprosy, senile dementia, Parkinson's disease, cough, ulcers, rheumatism, arthritis, intestinal infections, bronchitis, as a sedative, in care of senile debility, etc. Leaves are applied for carbuncles, irritations, and swellings.

Ragi (*Eleusine coracana*) is a minor millet utilized by the economically weaker section of the population specifically with the aid of south India rural folk. It is a hardy crop that gives high rated nutrition at a low price. Ragi also referred to as Madua or finger millet or nachni or rollu or sattemaw, grows properly without irrigation, pesticides, or fertilizer so small millet is very vital vegetation for the Himalaya regions. The majority of humans in India are economically weak and their choice for a balanced diet is therefore restricted by poverty and by the supply of insufficient nutritional foods. With the converse in the situation of utilization pattern of processed products and seeking the attention of the purchasers about the health benefits, finger millet has achieved importance due to its functional components inclusive of slowly digestible starch and resistant starch (Manvi & Mamta, 2015) [5]. Apart from eatable products the straw from finger millet is used as animal fodder. Ragi helps to cure malnutrition, degenerative diseases, and premature aging (Shobana *et al* 2013) [10]. Ragi is suggested to treat blood pressure, liver disorders, asthma, and coronary heart weakness. Ragi is also useful for lactating mothers in the condition of less milk production (Muktar *et al.* 2018) [17]. Ragi is nutritious cereal and is very beneficial for maintaining amazing health.

The incorporation of medicinal herbs and nutritive grains in the biscuits can aid in numerous health benefits, therefore a research article entitled "Sensory and Physical evaluation of Herbal biscuit incorporated with Ashwagandha (*Withania somnifera*) and Ragi (*Eleusine coracana*)" is written with following objectives:

1. To prepare Herbal Biscuits incorporated with Ashwagandha and ragi.
2. To evaluate Sensory and Physical characteristics of Herbal Biscuit.

Materials and Methods

Ingredients required

Wheat flour, Ragi flour, Ashwagandha root powder, Milk, Sugar, White butter, Ghee, Salt, Vanilla essence, Baking powder, Baking soda.

Machines and apparatus required

Microwave oven, Weighing machine, Blenders, Digital vernier caliper, Sieve, Rolling pin, Rolling board, Cutter.

Methodology

The flow chart for the preparation of Herbal Biscuit is shown Fig i.

Sensory evaluation

The judgment was made by rating product on a 9 point hedonic scale with corresponding descriptive terms ranging from "like extremely" to "dislike extremely" as shown below. The panelists were instructed to rinse their mouths with water after every sample and not to make comments during evaluation to prevent influencing other panelists.

Score card

9- Like extremely	6- Like slightly	3- Dislike moderately
8- Like very much	5- Neither like nor dislike	2- Dislike very much
7- Like moderately	4- Dislike slightly	1-Dislike extremely

Physical analysis

Physical parameters are computed from the following formulas:

Spread ratio: The spread ratio was determined by using this formula.

$$\text{Spread ratio} = \frac{\text{diameter (mm)}}{\text{thickness (mm)}}$$

Thickness: The thickness was measured in mm by digital vernier caliper.

Volume: The volume of biscuits is defined as the area of the biscuit multiplied by thickness.

$$\text{Volume (cm}^3\text{)} = \frac{d^2 \pi T}{4}$$

t = Average thickness of biscuit (mm)

d = Diameter of biscuit (mm)

Diameter: The diameter was measured in mm by digital vernier caliper.

Density: After calculating volume, density was obtained by the ratio of the weight of volume.

$$\text{Density} \left(\frac{\text{g}}{\text{cm}^3} \right) = \frac{\text{mass of sample (g)}}{\text{volume of sample (cm}^3\text{)}}$$

Results and Discussion

Preparation of Herbal Biscuit

During the biscuit preparation, the sugar and fat (white butter/ghee) were blended in a blender to give a creamy combination earlier than the flour and other dry ingredients were added. Further, the mixture was properly mixed to form a consistent dough. The dough was thoroughly kneaded manually for 5 min. The dough was rolled on a rolling board with a rolling pin to a uniform thickness of about 6 mm and cut them into round shapes for equal sizes of diameter 70 mm. The cut-out biscuit dough pieces were kept in a greased baking tray and baked in a hot oven (180°C) for 25 min. The biscuit was cooled without delay after baking and kept in an airtight container and stored at room temperature until used for physical analysis and sensory evaluation.

The ragi flour and Ashwagandha root powder were mixed in various proportions as shown in Table i. Ashwagandha dosage recommendations vary depending on the condition being treated. But generally, for a healthy person the recommended dosage should be from 1% to 10%. Other ingredients such as ghee, sugar, milk, salt, vanilla essence, baking powder, and baking soda were kept constant for all six combinations.

Biscuits with different composition of ingredients were made for getting the right composition. Due to the bitter taste of Ashwagandha the amount of Ashwagandha root powder was decreased to acquire better taste by making six samples of biscuits keeping all the ingredients constant and varying the amount of Ashwagandha and ragi in every sample.

Sensory Analysis of six samples

The samples were evaluated by 8 panelists selected from the faculties of Bhartiya college of agricultural engineering Durg. The sensory analysis of all the six samples of white butter shown in Table ii was done based on a 9-point hedonic scale. After preparation of various samples, it was found that composition of 30% wheat flour, 28% Ragi flour, 20% sugar, 15% White Butter, 5% others and 2% Ashwagandha (highlighted in Table i and shown in Graph i) had favourable taste and baking properties and it is highly acceptable composition. For flavour enhancement Ghee was chosen in place of white butter for the second flavour of biscuit. The same procedure and same composition of ingredients shown in Table i (highlighted) were taken with ghee biscuit also. Thereafter, sensory and physical analysis of both white butter and ghee biscuits are done with 2% Ashwagandha root powder and 28% ragi. Fig ii shows samples of the different compositions shown in Table i. Fig iii shows pictures of white

butter (final composition) and ghee biscuits and Graph ii denotes composition chart for the same.

Sensory Analysis of ghee and white butter samples

Sensory evaluation of 6-biscuits (3 of each Ghee and White Butter) is done by the semi-skilled panel. Three-three samples of the acceptable composition of each white butter and ghee are selected for analysis. The sensory score given by the panel has been evaluated for the sensory result. Graph iii and Table ii is drawn (highlighted columns) based on an average of three samples of each Ghee and White Butter biscuits.

Physical analysis

Three-three samples of the acceptable composition of each white butter and ghee are selected for analysis. Physical characteristics of all the three samples of Ghee and White Butter biscuits are done. Further average of three samples of each Ghee and White Butter biscuits are done and shown in Table iii.

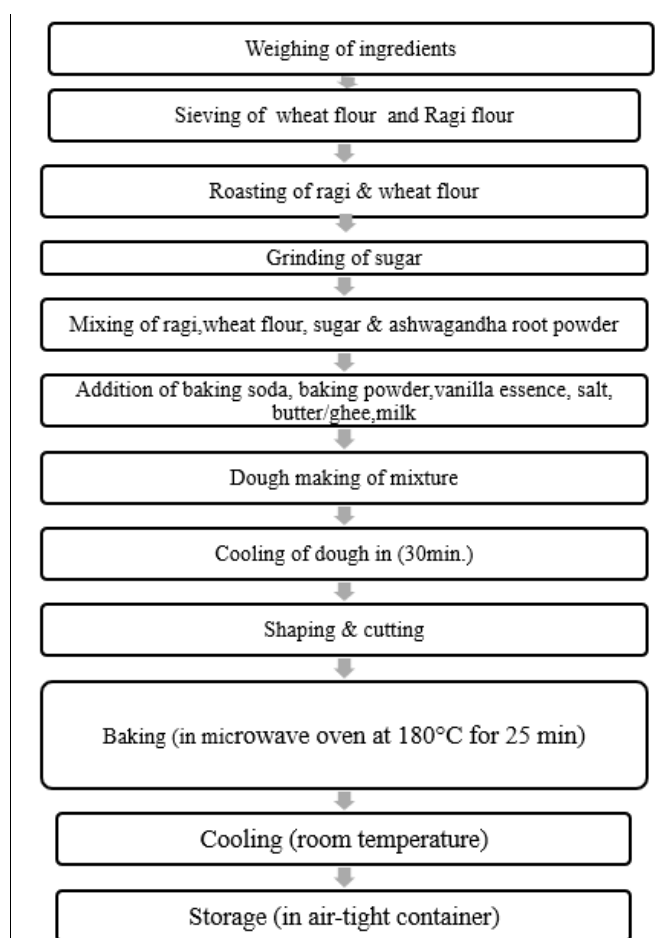
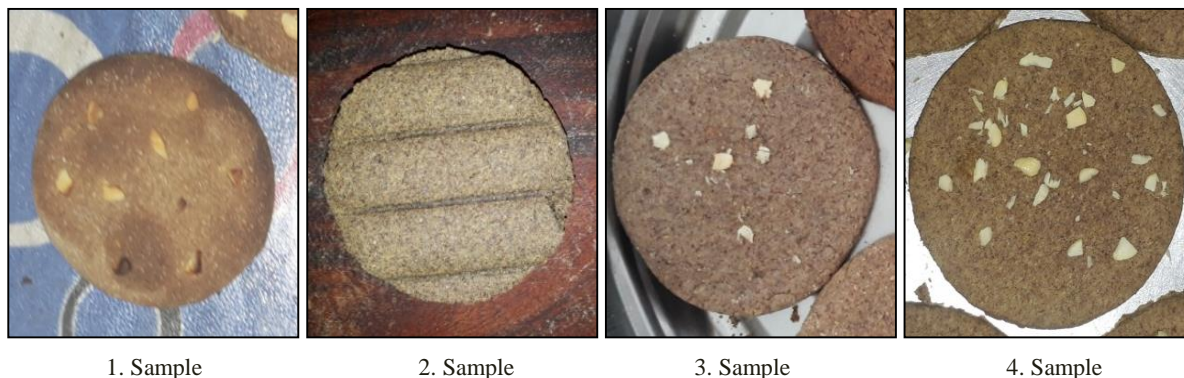


Fig i: Flow chart for the development of herbal biscuit





5. Sample

6. Sample

Fig ii: Samples of the different compositions shown in Table i.

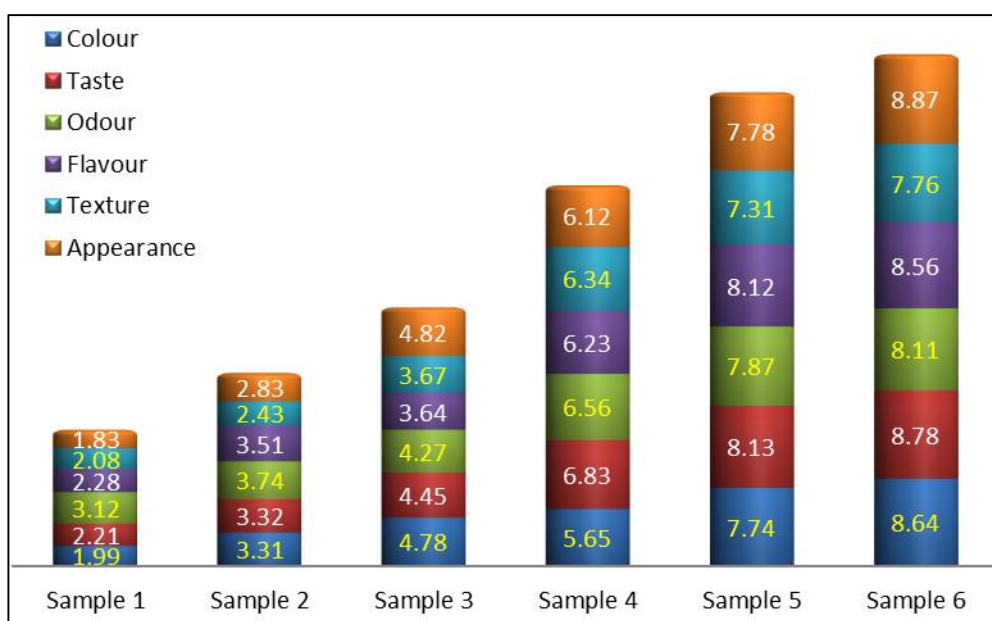
Biscuits before baking

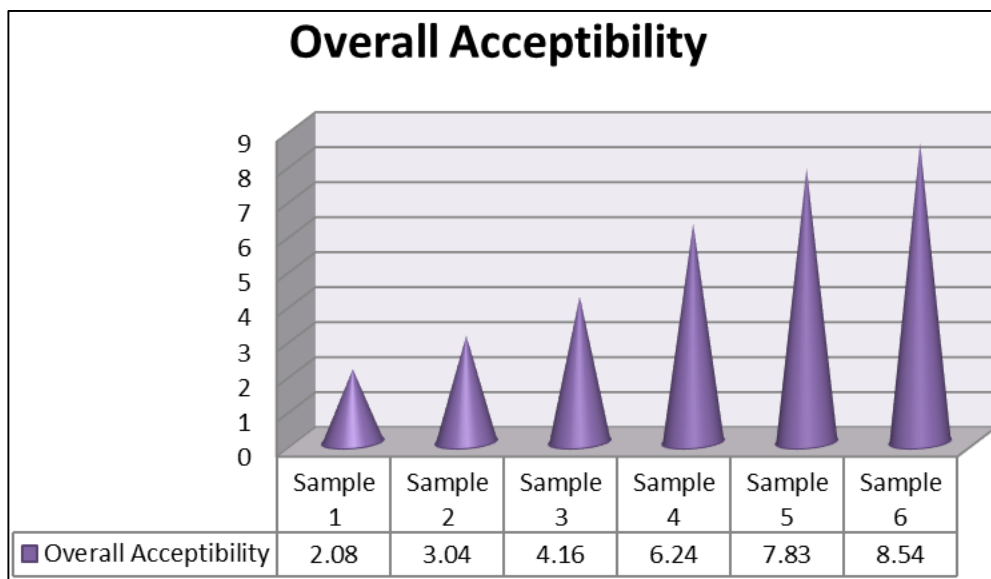
Biscuits after baking

White butter Biscuits

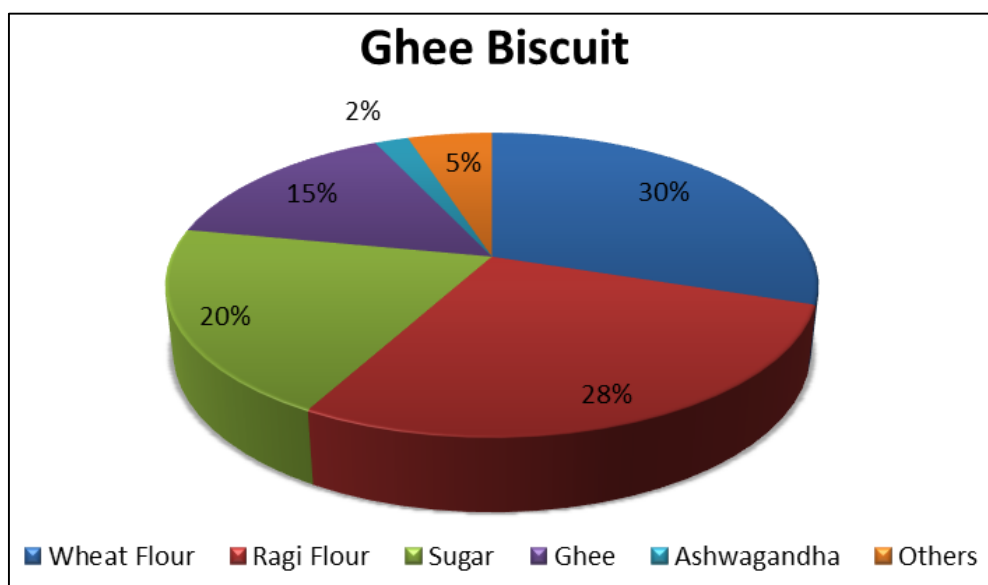
Biscuits before baking

Biscuits after baking

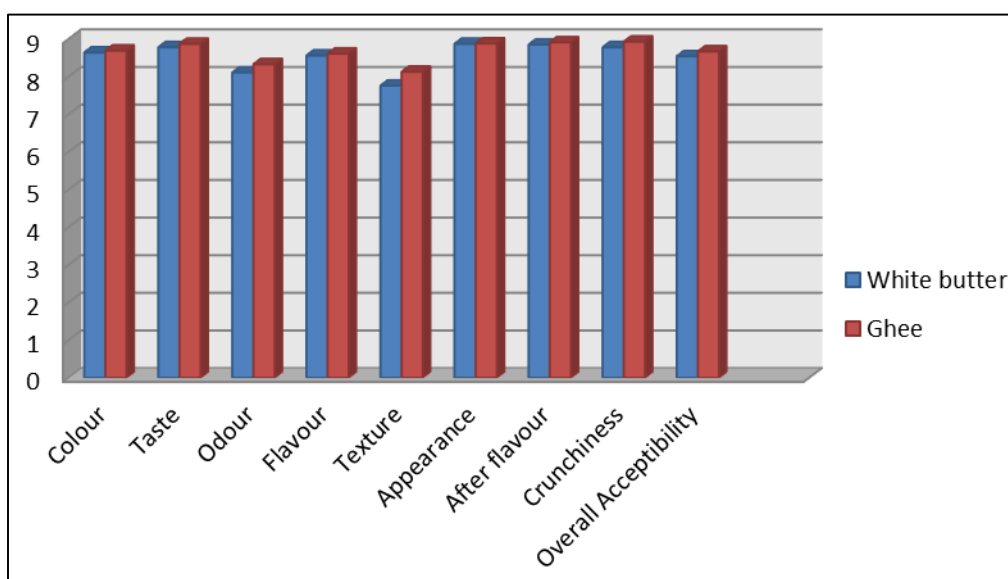
Fig iii: White butter and Ghee Biscuits



Graphs i: Sensory evaluation of six samples of herbal biscuit and overall acceptability among six samples of herbal biscuit



Graphs ii: Composition chart of biscuit sample (Ghee and White Butter)



Graphs iii: Sensory evaluation of samples of White Butter and Ghee

Table i: Percent composition table of biscuit

Samples	Fat Used	Wheat flour	Ragi flour	Sugar	White butter/ Ghee	Ashwagandha	Others	Time
1. 100%	White butter	30%	23%	20%	15%	7%	5%	25 min.
2. 100%	White butter	30%	24%	20%	15%	6%	5%	25 min
3. 100%	White butter	30%	25%	20%	15%	5%	5%	25 min
4. 100%	White butter	30%	26%	20%	15%	4%	5%	25 min
5. 100%	White butter	30%	27%	20%	15%	3%	5%	25 min
6. 100%	White butter	30%	28%	20%	15%	2%	5%	25 min
7. 100%	Ghee	30%	28%	20%	15%	2%	5%	25 min

Table ii: Sensory evaluation of Six samples of white butter of different composition and ghee biscuit

Characteristics	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Ghee Sample
Fat Used	White Butter	White Butter	White Butter	White Butter	White Butter	White Butter	Ghee
Colour	1.99	3.31	4.78	5.65	7.74	8.64	8.69
Taste	2.21	3.32	4.45	6.83	8.13	8.78	8.87
Odour	3.12	3.74	4.27	6.56	7.87	8.11	8.33
Flavour	2.28	3.51	3.64	6.23	8.12	8.56	8.61
Texture	2.08	2.43	3.67	6.34	7.31	7.76	8.13
Appearance	1.83	2.83	4.82	6.12	7.78	8.87	8.88
After Flavour	2.32	3.56	4.21	6.26	7.72	8.85	8.91
Crunchiness	0.78	1.62	3.43	5.92	7.97	8.78	8.93
Overall Acceptability	2.08	3.04	4.16	6.24	7.83	8.54	8.67

Table iii: Physical characteristics of Ghee and white butter samples

	Samples	Dia. (mm)	Thickness (mm)	Volume (mm ³)	Spread ratio	Density (gm/mm ³)
Ghee	Sample 1	84.3	9.56	53358.415	8.818	0.000563
	Sample 2	84.8	9.45	53358.417	8.817	0.000562
	Sample 3	84.2	9.19	51171.668	9.162	0.000586
	Average values	84.43	9.4	52629.504	8.9323	0.000570
White Butter	Sample 1	71.9	7.32	29720.68	9.82	0.000605
	Sample 2	71.7	7.34	29636.32	9.76	0.000607
	Sample 3	72.0	7.45	30332.70	9.66	0.000593
	Average Values	71.866	7.37	29897.566	9.746	0.000601

Conclusions

Six samples of biscuit of white butter were prepared with variation in the quantity of Ashwagandha root powder and Ragi flour. After the preparation of six samples it was found that composition of 30% wheat flour, 28% ragi flour, 20% sugar, 15% white butter, and 2% ashwagandha was found highly acceptable. For flavour enhancement Ghee was chosen in-place of white butter for the second flavour of biscuit. The same procedure and the same composition of ingredients were taken with ghee also. Thereafter, sensory and physical analysis of both white butter and ghee sample (2% Ashwagandha root powder and 28% ragi) is done. With the analysis it is found that the biscuits prepared from ghee had more diameter and thickness and significantly got the highest score in all the aspects of sensory analysis. Ghee biscuits are better in context with their nutritional benefits than white butter. Therefore, ghee biscuits are superior to white butter biscuits. Therefore, the ghee biscuit incorporated with ragi flour and ashwagandha root powder will enhance the nutritive qualities of biscuit. The development of such biscuits will not only improve their nutritional status but also helps to cure many diseases.

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