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DEVELOPMENT OF MULTI-GRAIN ATTA COOKIES INCORPORATED WITH WITHANIA SOMNIFERA

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Abstract
Cookies rank among the most popular baked snacks, cherished for their crunchy texture and delightful flavor. Nonetheless, standard cookies made with refined flour and sugar can lead to various health issues when eaten in large quantities. This study centers on creating multigrain atta cookies infused with Withania somnifera (Ashwagandha) to improve the nutritional and functional attributes of a frequently enjoyed snack. Multigrain flour is a valuable source of essential nutrients, such as dietary fiber, proteins, and complex carbohydrates, which promote digestive health and provide long-lasting energy. Withania somnifera is a recognized medicinal herb known for its adaptogenic, anti-inflammatory, and immune-enhancing properties. It also helps alleviate stress and supports overall wellness. The formulation of the cookies includes multigrain flour, jaggery as a natural sweetener, milk powder, baking powder, salt, and Withania somnifera powder. Several trials were performed by adjusting the amount of Withania somnifera to assess sensory characteristics, nutritional value, and functional advantages. The goal of this research is to create a nutritious, functional, and sustainable baked item that meets contemporary dietary needs while incorporating natural, health enhancing ingredients.

Keywords: Multigrain atta, Withania somnifera, functional cookies, fiber-rich.

Introduction

Cookies are a popular bakery product consumed by people of all age groups due to their palatable taste, appealing texture, long shelf life, portability, and affordability. However, conventional cookies are generally made from refined wheat flour (maida), which lacks important nutrients such as dietary fiber, essential vitamins, and minerals. With the growing awareness among consumers about health, nutrition, and wellness, there is increasing demand for cookies that are not only tasty but also functional and nutritious. As a result, efforts are being made to improve the nutritional profile of cookies by incorporating natural, health-promoting ingredients and whole grains.Ashwagandha (Withania somnifera), also known as Indian winter cherry, is a highly valued medicinal plant of the Solanaceae family, widely used in Ayurveda and Unani systems of medicine for over 3000 years. The roots and leaves are commonly dried, powdered, and incorporated into food products such as churna, biscuits, cookies, and traditional snacks for their therapeutic benefits. Ashwagandha contains active constituents like cuseohygrine, anahygrine, tropine, anaferine, glycosides, and withanolides, along with starches and amino acids (Singh et al. 2011) [14]. These bioactive compounds exhibit multiple pharmacological properties including anti-stress, antioxidant, anti-inflammatory, adaptogenic, antibacterial, sedative, and immune-boosting effects. It is traditionally used as a nervine tonic, thyroid stimulant, and natural remedy for insomnia, stress, and fatigue (Singh et al. 2014) [15].To further enhance the health potential of cookies, a composite blend of multigrain flours such as corn flour, oats flour, wheat flour, and gram flour can be used in place of refined flour. These flours are rich in complex carbohydrates, dietary fiber, protein, and various micronutrients, contributing to improved digestibility and satiety. Jaggery, a natural sweetener, is used instead of refined sugar, providing iron and other minerals while imparting a unique flavor. Additional ingredients like milk powder, white butter, baking powder, and a small amount of salt help improve texture and palatability.The development of cookies enriched with Ashwagandha and multigrain flour aims to create a functional food product that not only satisfies taste preferences but also supports general health and well-being. The combination of medicinal herbs and nutrient-rich grains offers the potential to deliver multiple health benefits, thereby meeting the demands of modern health-conscious consumers.Therefore, a research study titled " Development of Multi-grain atta flour incorporates with withania somnifera" is carried out with the following objectives:
1.To prepare herbal cookies with multi-grain atta flour incorporated with withania somnifera.
2.To evaluate sensory and Physico-chemical analysis of herbal cookies.

Materials and Methods

Ingredients required

Ashwagandha root powder, multi-grain atta flour(wheat flour, oats flour, corn flour, gram flour), milk powder, jaggery, white butter, baking powder, salt

Methodology

Preparation of ashwagandha root powder

The roots of Withania somnifera, commonly known as Ashwagandha, were initially cleaned thoroughly to remove any dirt, dust, or unwanted particles. The cleaned roots were then allowed to dry completely under shade for several days to preserve their active constituents and medicinal properties. Shade drying also helps in retaining the original color and aroma of the roots, as direct sunlight can degrade certain bioactive compounds.Once the roots were completely dried, they were broken into smaller pieces manually using a mortar and pestle. These smaller pieces were then transferred into a high-speed electric grinder or blender. The grinding process was carried out until a fine, smooth powder consistency was achieved. The powder was then sieved through a fine mesh sieve to eliminate any coarse particles and obtain a uniform texture.
The resulting Withania somnifera powder was collected and stored in an airtight container under cool, dry conditions to prevent moisture absorption and preserve its phytochemical properties. This powdered form of Ashwagandha was later used as a functional ingredient in the preparation of multigrain atta cookies. The quantity of Ashwagandha powder used was carefully optimized to ensure its health benefits were retained without overpowering the taste or altering the texture of the cookies.

Fig: 1 Ashwagandha root powder

Preparation flow chart of herbal cookies

Procurement of ingredients

↓

Separation of ingredients

↓

Dry ingredients (multi-grain atta, ashwagandha powder,

baking powder, milk powder, salt)

↓

Wet ingredients (cream butter and jaggery)

↓

Whisk butter and jaggery

↓

Mix all dry ingredients and add into it to make dough

↓

Refrigerate dough for 30 mins

↓

Shape the dough

↓

Shaping and cutting

↓

Preheat the oven

↓

Baking(180c for 30 mins)

↓

Cooling aat room temperature

↓

Storage

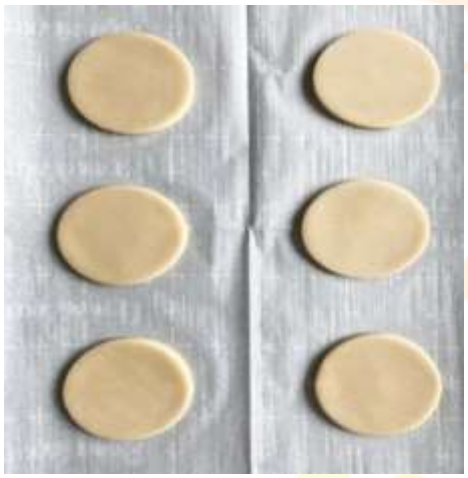

Fig 2: Before baking

Fig 3: After baking

TABLE 1: SAMPLE FORMULATIONS:

INGREDIENTS	VARIATION-1	VARIATION-2	VARIATION-3
Multi-grain atta flour	**150g**	100g	150g
Butter	**100g**	100g	100g
Jaggery	**80g**	100g	50g
Milk powder	**20g**	20g	20g
Baking powder	**2g**	2g	2 g
Salt	**1g**	1g	1g
Ashwagandha powder	**3g**	4g	3g

PHYSICO-CHEMICAL ANALYSIS

MOISTURE

Digital moisture analyser (infrared drying method) is used to test moisture in cookies.

A digital moisture analyzer measures moisture content in samples by heating them to evaporate moisture, calculating the weight loss. The process involves placing a sample in the analyzer, setting the temperature and time, and initiating the test. The analyzer then provides a precise moisture content reading, making it a rapid and reliable tool for quality control in food, pharmaceuticals, and research applications.

FAT

Soxlet extraction method is used to test fat content in cookies.

The Soxhlet extraction method involves continuous extraction of lipids or other soluble compounds from a sample using a solvent. The procedure entails placing the sample in a thimble, which is then placed in the Soxhlet apparatus. A solvent, such as hexane or petroleum ether, is heated, vaporized, and condensed, allowing it to flow through the sample, extracting the desired compounds. The extracted solution is collected in a flask, and the solvent is evaporated, leaving behind the extracted lipids or compounds. This method is widely used for efficient and thorough extraction of soluble components from solid samples.

CARBOHYDRATES

Lane-Eynon Method is used to test carbohydrates content in herbal cookies.(FSSAI manual method).

The Lane-Eynon method, as per FSSAI, is a titration-based technique for estimating reducing sugars in carbohydrates. The procedure involves reacting the sample with Fehling's solution (copper sulfate, sodium hydroxide, and Rochelle salt) and titrating against a standard sugar solution. The endpoint is determined using methylene blue as an indicator. By calculating the volume of sample required to reduce the Fehling's solution, the reducing sugar content is determined. This method provides a quantitative estimate of reducing sugars in food samples.

PROTEIN

Kjeldhal method is used to test protein content in herbal cookies.

The Kjeldahl method is a widely used technique for protein analysis, determining nitrogen content in a sample. The process involves digestion with sulfuric acid, conversion of nitrogen to ammonia, distillation, and titration to quantify nitrogen content. The nitrogen content is then converted to protein content using a conversion factor. This method provides accurate and reliable results, making it a standard approach for protein analysis in food, dairy, and pharmaceutical industries.

pH

Digital pH meter is used to test herbal cookies.(Benchtop pH meter).

A benchtop pH meter measures the pH of liquids by immersing an electrode in the sample. The process involves calibration with standard buffer solutions, followed by placing the electrode in the sample and recording the stabilized pH reading. This provides an accurate measurement of the sample's acidity or alkalinity, essential for various laboratory applications.

FIBER

Crude Fiber Test Procedure (AOAC Method) to test fiber content in herbal cookies.

The AOAC method for crude fiber testing involves treating the sample with acid and alkali to remove digestible components. The process includes: treating the sample with sulfuric acid, followed by sodium hydroxide, and then filtering and weighing the residue. The residue is then ashed, and the weight loss is calculated to determine the crude fiber content. This method provides an estimate of the indigestible fiber content in food samples.

ASH

(FSSAI manual method) is used to find ash content in herbal cookies.

The ash test procedure as per FSSAI manual involves weighing a sample in a crucible and igniting it in a muffle furnace at 550-600°C to burn off organic matter. The residue (ash) is then cooled and weighed. The ash content is calculated as a percentage of the original sample weight, providing a measure of the inorganic residue, which indicates mineral content and potential contamination in food samples.

RESULTS AND DISCUSSION:

Table 2: Sensory analysis of different formulations

Sensory attributes	Control	Variation-1	Variation-2	Variation-3
Colour	9	**9**	8.5	9
Taste	9	**9**	8	7
Appearance	9	**9**	7.5	8
Flavor	9	**8**	8	8
Texture	9	**9**	7	8

Overall acceptability	9	**9**	8	8

The sensory analysis revealed that the control and varation-1 formulations exhibited superior sensory attributies and overall acceptability , while variatons-2 and 3 showed potential but required improvements in specific characteristics to match the control's quality standards.

Table 3: Physcio-chemical analysis

S.NO	PARAMETERS	CONTROL	OPTIMIZED VARIATION
1	Moisture%	**3%**	**2.86%**
2	Fat%	**18%**	**16%**
3	pH	**6.2**	**6.3**
4	Fiber%	**7%**	**15%**
5	Protein%	**7.6%**	**9%**
6	Carbohydrate%	**68%**	**65%**
7	Ashcontent	**1.2%**	**2.28%**

The comparative analysis between the control and optimized formulations revealed notable differences in nutritional parameters. The optimized formulation exhibited a slightly lower moisture content of 2.86% compared to 3% in the control, and a reduced fat content of 16% compared to 18% in the control. The pH levels remained similar, with the optimized formulation having a pH of 6.3 compared to 6.2 in the control. Notably, the optimized formulation had a significantly higher fiber content of 15% compared to 7% in the control, and a higher protein content of 9% compared to 7.6% in the control. Additionally, the optimized formulation had a slightly lower carbohydrate content of 65% compared to 68% in the control, and a higher ash content of 2.28% compared to 1.2% in the control. Overall, the optimized formulation appears to have a more favorable nutritional profile, making it a potentially healthier option.

CONCLUSION

Adding Withania somnifera to multigrain flour cookies has turned out to be a fresh and valuable idea. The adaptogenic qualities and earthy flavor of Withania somnifera mix well with the healthy base of multigrain flour, creating a product that is both nutritious and tasty. Using Withania somnifera not only boosts the health benefits of the cookies but also provides possible therapeutic advantages like reducing stress, enhancing cognitive function, and improving immunity.

This new formula offers a health-friendly choice in the baked goods section, appealing to today's shoppers who care about both flavor and health. More studies on different amounts and ways to use Withania somnifera could lead to new possibilities for creating functional snacks and dietary supplements. Overall, multi-grain flour cookies with Withania somnifera offer a great chance for cooking creativity, attracting many people looking for healthy foods that fit with overall wellness practices.

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