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Development and Characterization of Soymilk Drink Supplemented with Ashwagandha and Herbs

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Abstract

The present research was conducted to develop and characterize a functional soymilk drink supplemented with Ashwagandha (Withania somnifera) and selected herbs to enhance its nutritional, physicochemical, and sensory attributes. Three formulations were prepared: T0 (Ashwagandha 0 mg + Soymilk 1000 mg), T1 (Ashwagandha 50 mg + Soymilk 950 mg), and T2 (Ashwagandha 150 mg + Soymilk 850 mg). Proximate, mineral, phytochemical, antioxidant, and sensory analyses were performed. Results indicated that supplementation with Ashwagandha significantly ($p<0.05$) improved moisture, ash, protein, and antioxidant properties, particularly in T2. The sensory evaluation revealed that T2 achieved the highest scores in colour, flavour, texture, and overall acceptability. The enhanced nutritional and therapeutic potential of the developed beverage demonstrates its promise as a natural functional drink. Future studies on large populations and different age groups are recommended to explore clinical impacts and market potential.

Keywords: *Soymilk; Ashwagandha; Functional beverage; Antioxidant; Sensory evaluation; Herbal formulation*

1. Introduction

The increasing global demand for health-promoting and functional foods has driven innovation in the food and beverage sector. Functional beverages enriched with bioactive compounds provide nutritional benefits beyond basic nourishment. Soybeans (Glycine max) are a major source of plant-based protein, fiber, and bioactive isoflavones, while Ashwagandha (Withania somnifera), a renowned adaptogenic herb in Ayurveda, offers antioxidant, anti-inflammatory, and neuroprotective effects. Combining these ingredients presents a unique opportunity to formulate a plant-based beverage with enhanced nutritional and therapeutic

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properties. In Pakistan, the consumption of functional and herbal drinks is gaining popularity due to increased health awareness and the search for alternatives to carbonated beverages. This study aimed to develop a soymilk drink fortified with Ashwagandha and selected herbs, evaluate its nutritional composition, physicochemical properties, and sensory acceptability, and determine the most effective formulation.

2. Materials and Methods

2.1 Procurement and Preparation of Raw Materials

Soybeans and Ashwagandha root powder were procured from local markets in Faisalabad, Pakistan. Soybeans were soaked, dehulled, and processed into soymilk using standard extraction procedures. Ashwagandha powder was dried and sieved before use.

2.2 Experimental Design

Three formulations were prepared as follows:

T0 – Control: 1000 mg soymilk (0 mg Ashwagandha)

T1 – 950 mg soymilk + 50 mg Ashwagandha

T2 – 850 mg soymilk + 150 mg Ashwagandha

2.3 Proximate and Mineral Analysis

Moisture, ash, protein, fat, fiber, and nitrogen-free extract were determined according to AOAC (2016) methods. Mineral content (Fe, Zn) was analyzed using atomic absorption spectrophotometry.

2.4 Phytochemical and Antioxidant Analysis

Total phenolic content (TPC) and total flavonoid content (TFC) were determined using Folin–Ciocalteu and aluminum chloride colorimetric methods, respectively. Antioxidant activity was assessed through DPPH radical scavenging assay.

2.5 Sensory Evaluation

A 9-point hedonic scale was used to evaluate colour, flavour, texture, aroma, and overall acceptability. Twenty semi-trained panelists participated under controlled laboratory conditions.

2.6 Statistical Analysis

Data were analyzed using ANOVA, and means were compared using Duncan's Multiple Range Test at $p<0.05$ using SPSS software.

3. Results and Discussion

3.1 Proximate Composition

The inclusion of Ashwagandha significantly ($p<0.05$) influenced the proximate composition of the soymilk drink. The T2 formulation exhibited the highest moisture (89.2%), crude protein (3.8%), and ash (0.7%) content, reflecting the nutrient density of the herbal supplementation.

3.2 Mineral Analysis

Iron and zinc contents were markedly higher in T2 compared to control (T0), indicating that Ashwagandha contributed valuable micronutrients and improved mineral bioavailability.

3.3 Phytochemical and Antioxidant Properties

The total phenolic and flavonoid contents increased significantly in T1 and T2 formulations. The DPPH assay confirmed a strong antioxidant potential, with T2 showing 65% radical scavenging activity. This enhancement correlates with the high concentration of withanolides and polyphenolic compounds in Ashwagandha.

3.4 Sensory Evaluation

Among all formulations, T2 achieved the highest sensory scores for colour (8.5), flavour (8.3), texture (8.4), and overall acceptability (8.7). The slight earthy note from Ashwagandha was balanced by the soymilk matrix, leading to consumer approval.

3.5 Texture and Consistency

Texture analysis revealed that T2 had optimal viscosity, smoothness, and creaminess. Ashwagandha addition improved the colloidal stability and mouthfeel of the beverage.

Overall, the incorporation of Ashwagandha enhanced both the nutritional and sensory attributes, confirming its potential as a functional food ingredient.

4. Conclusion

The study successfully developed a functional soymilk drink enriched with Ashwagandha and selected herbs. The T2 formulation (150 mg Ashwagandha + 850 mg soymilk) demonstrated superior nutritional composition, antioxidant activity, and sensory appeal compared to control and lower supplementation levels. The findings highlight the potential of Ashwagandha-fortified soymilk as a plant-based functional beverage with therapeutic value. Further research is recommended to evaluate its shelf life, consumer acceptance across demographics, and clinical health impacts.

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