

Development and Evaluation of a Natural Sleep-Support Functional Drink Mix

Mallinedi Venkata Naga Lakshmi

Department of Food Technology, Vignan's Foundation for Science, Technology and Research (Deemed to be University), Vadlamudi, Guntur-522213, Andhra Pradesh, INDIA

Abstract — The increasing prevalence of stress, irregular sleep patterns, and lifestyle-related sleep disturbances has created a growing demand for natural and functional food-based sleep support products. This study focuses on the formulation and development of a natural sleep-support functional drink mix designed to promote relaxation and improve sleep quality through nutritional intervention. The formulation consists of oats powder (40%), almond powder (25%), ashwagandha root powder (10%), turmeric powder (5%), nutmeg powder (0.5%), and jaggery powder (19.5%). Each ingredient was selected based on its functional role in supporting sleep physiology, stress reduction, and nighttime recovery. Oats contribute calming carbohydrates and serotonin support, almonds provide magnesium for muscle relaxation, ashwagandha root powder helps reduce cortisol levels, turmeric offers anti-inflammatory benefits, and nutmeg provides mild sedative effects. Jaggery improves palatability and contributes mild calming effects. The product was developed using simple dry blending technology with emphasis on ingredient safety, particularly maintaining nutmeg within the safe consumption limit. The final product was designed as a convenient bedtime nutritional supplement to be mixed with warm milk and consumed 30–45 minutes before sleep. The study highlights the potential of developing affordable, natural, and functional sleep-support beverages with consumer-friendly processing and storage characteristics.

Index Terms — Functional food, Sleep support drink, Ashwagandha root powder, Oats powder, Nutmeg, Bedtime nutrition, Natural sleep aid.

I. INTRODUCTION

Sleep is an essential physiological process required for physical recovery, cognitive function, hormonal regulation, and overall well-being. Modern lifestyle patterns, increased work stress, excessive screen exposure, and poor dietary habits have significantly contributed to sleep disturbances among individuals of different age groups. Insufficient sleep is associated

with fatigue, anxiety, reduced productivity, impaired immunity, and several chronic health disorders [1].

The growing awareness regarding the adverse effects of synthetic sleep medications has increased consumer interest in natural and food-based alternatives for sleep improvement. Functional foods designed for nighttime nutrition have emerged as a promising approach to address mild sleep disturbances without causing dependency or major side effects [2].

Several natural ingredients possess scientifically recognized sleep-support properties. Oats contain complex carbohydrates that help support serotonin production and relaxation. Almonds are rich in magnesium, which contributes to muscle relaxation and nervous system regulation. Ashwagandha root powder is a well-known adaptogenic herb that helps reduce stress and cortisol levels. Turmeric possesses anti-inflammatory and recovery-supporting properties, while nutmeg in controlled quantities provides mild sedative effects. Jaggery enhances taste and contributes to a soothing effect [3,4].

The present study aims to formulate and develop a natural sleep-support functional drink mix using these ingredients and evaluate its suitability as a bedtime nutritional beverage. The product is intended to serve as a convenient, affordable, and health-oriented alternative for promoting natural sleep support.

II. MATERIALS AND METHODS

2.1 Materials

The raw materials used for the formulation included oats powder, almond powder, ashwagandha root powder, turmeric powder, nutmeg powder, and jaggery powder. All ingredients were selected based

on their nutritional functionality, safety, availability, and compatibility for dry mix formulation.

2.2 Formulation Design

The optimized formulation of the natural sleep-support drink mix is presented below:

Ingredient	Quantity (g)	Percentage (%)	Functional Role
Oats powder	40	40.0	Base ingredient, calming carbohydrates, serotonin support
Almond powder	25	25.0	Healthy fats, magnesium, muscle relaxation
Ashwagandha root powder	10	10.0	Stress reduction, cortisol control, sleep support
Turmeric powder	5	5.0	Anti-inflammatory and recovery support
Nutmeg powder	0.5	0.5	Mild sedative effect
Jaggery powder	19.5	19.5	Taste enhancement and mild calming effect

Special attention was given to the nutmeg concentration, which was maintained at a maximum of 0.5% to avoid dizziness and toxicity. Ashwagandha root powder was limited to 10% to prevent strong taste and potential side effects.

2.3 Processing Method

The preparation of the functional drink mix involved the following steps:

Step 1: Oats Preparation

Dry oats were cleaned and ground into a fine powder to improve uniformity and mixing efficiency.

Step 2: Almond Preparation

Almonds were lightly roasted to improve flavor and reduce moisture content, followed by grinding into fine powder.

Step 3: Sieving

All powdered ingredients were sieved separately to obtain uniform particle size and improve blend consistency.

Step 4: Mixing

The sieved powders were mixed thoroughly using dry blending techniques to ensure uniform distribution, especially for nutmeg due to its low concentration and potency.

Step 5: Packaging

The final blended powder was packed immediately in moisture-proof packaging materials to prevent moisture absorption and preserve shelf stability.

2.4 Serving Recommendation

The recommended serving size was fixed at 20 g of powder per serving. The product is intended to be mixed with 150–200 mL of warm milk and consumed 30–45 minutes before bedtime for optimal sleep-support benefits [5-9].

III. RESULTS AND DISCUSSION

3.1 Functional Significance of Formulation

The selected formulation provides a synergistic effect by combining ingredients that support multiple pathways involved in sleep regulation.

Oats act as the primary base and provide slow-releasing carbohydrates that support serotonin production, which contributes to calmness and improved mood. Almonds contribute magnesium, which plays an important role in muscle relaxation and nervous system balance.

Ashwagandha root powder serves as the major herbal active component by helping reduce cortisol, the primary stress hormone associated with sleep disturbances. Its adaptogenic nature improves stress resilience and relaxation [10].

Turmeric supports recovery by reducing inflammation and oxidative stress, which may indirectly improve sleep quality. Nutmeg contributes mild sedative action, but due to safety concerns, its inclusion was strictly controlled within safe limits.

Jaggery improves taste acceptability and enhances the soothing sensory profile of the product, making it more suitable for bedtime consumption [11].

The combination of these ingredients creates a balanced formulation that supports relaxation, recovery, and natural sleep cycles without the use of synthetic sedatives.

3.2 Product Positioning

The product was designed not as a general health mix, but specifically as a targeted functional food for nighttime wellness. Suggested market positioning includes:

- Sleep Support Night Drink
- Stress Relief Bedtime Nutrition
- Relax and Sleep Naturally

This focused positioning improves consumer understanding and product acceptance compared to conventional health drink mixes [12,13].

3.3 Packaging and Shelf Life

Packaging plays a major role in maintaining product quality. Small 20 g sachets were identified as the best market option for convenience and portion control, while 200 g jars can serve as family-use packaging [8].

The expected shelf life of the product is approximately 3 months without preservatives under normal dry storage conditions. With low moisture content and proper moisture-proof packaging, shelf life may be extended up to 6 months.

IV. CONCLUSION

The present study successfully developed a natural sleep-support functional drink mix using oats, almonds, ashwagandha root powder, turmeric, nutmeg, and jaggery as key ingredients. The formulation was designed based on nutritional

functionality, safety considerations, consumer convenience, and product stability.

The developed product offers a natural, affordable, and easy-to-consume bedtime nutritional solution for supporting relaxation and healthy sleep patterns. The formulation avoids dependency risks associated with synthetic sleep aids while promoting overall nighttime wellness.

This study demonstrates the potential of functional food innovation in addressing modern lifestyle-related sleep challenges through simple and sustainable food-based interventions.

Future studies may include proximate nutritional analysis, sensory evaluation, microbial safety assessment, clinical validation through sleep quality studies, and large-scale shelf-life testing. Consumer acceptance studies and market feasibility analysis can further support commercialization of the product

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