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DEVELOPMENT OF HERBAL ENERGY BEVERAGES AND MILKSHAKES ENRICHED WITH ASHWAGANDHA (*WITHANIA SOMNIFERA*) AND TULSI (*OCIMUM SANCTUM*)

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ABSTRACT

The worldwide market for consumers is undergoing an immense change toward holistic health and practices that demand functional food and drinks that marry health efficacy with tasty indulgence. The present study is designed to fulfill this urgent market need by describing the sequential developmental formulation, extensive characterization, and comparative evaluation of two new ready to drink delivery systems; an herbal-infused energy drink, and a nutritionally-rich fortified milkshake, both of which entailed the infusion of these two economically well-known Ayurvedic adaptogens, Ashwagandha (Withania somnifera), and Tulsi (Ocimum sanctum), standardized to their respective extracts. The overarching aims of this endeavor are threefold: 1) to successfully formulate both functional prototypes, both a water-based energy drink, and a dairy-based milkshake, with their provided intended therapeutic or functional concentrations of both herbal adaptogenic supplements; 2) to systematically optimize the taste experience of the functional energy drink and fortified milkshake, and reduce the real and perceived bitterness and astringency of both botanical-based products, while striving for high consumer acceptability; 3) to quantifiably evaluate the improved health benefits provided by both products, simultaneously collecting end user consumer experience, along with two levels of expert evaluation and acceptability. The choice of Ashwagandha and Tulsi is intentional, utilizing their suggested synergistic role. Ashwagandha is often attributed a significant role modulating the HPA-Axis which in turn, increases superior stress relief and physiological homeostasis. Tulsi is intended to increase cellular resilience via stringent antioxidant and anti-inflammatory mechanisms which together will further enhance neuroprotection and augment immune support as needed. When finished this work is expected to scientifically establish the robust synergistic functional benefits of the Ashwagandha-Tulsi combination by providing empirical evidence on the efficacy reducing systemic stress and cellular damage. Completion of this work will provide a

novel, tradition inspired, yet technology-based product line launch in an emerging global functional beverage market, providing consumers a novel, accessible, and more acceptable option for proactive health.

Keywords: Herbal, Ayurveda, Ashwagandha-Tulsi

INTRODUCTION

Consumer preferences have gradually shifted towards functional beverages made with bioactive components from natural sources due to the increasing understanding of health and wellness. In India, traditional knowledge systems, particularly Ayurveda, have recognized the potential of herbs in holistic health practices for centuries. Ashwagandha (Withania somnifera) and Tulsi (Ocimum sanctum) are two important Ayurvedic herbs that are well-known for their adaptogenic, antioxidant, and immunity-enhancing impacts (Sharma & Singh, 2018). The incorporation of these herbs into ready-to-drink formulations would not only address global health trends but also serve as an important communication tool and connection back to traditional knowledge systems pertaining to herbal medicine.

Ashwagandha, or "Indian Ginseng," has been classified as a Rasayana in Ayurveda, indicating it has rejuvenating, longevity, and vitality benefits. Bioactive compounds in Ashwagandha, including withanolides and alkaloids, are well documented for their ability to alleviate stress, increase stamina, and regulate immune responses (Jadhav et al., 2021). Tulsi, the “Queen of Herbs,” is a sacred plant in Indian culture, with adaptogenic, antimicrobial, and antioxidant activities. Compounds such as eugenol, ursolic acid, and various polyphenols account for its numerous therapeutic properties, ranging from respiratory health to alleviating stress (Gupta et al., 2019).

Contemporary scientific evidence increasingly substantiates these traditional assertions. Research indicates that the addition of adaptogenic herbs to beverages will modify the functional aspect of beverages and increase consumer acceptability (Rana & Verma, 2022). The combination of Ashwagandha and Tulsi in a milk-based or water-based beverage not only promotes improved bioavailability of active compounds, but particularly for lipid-soluble withanolides in a milk-based carrier (Swetha et al., 2020), it also facilitates innovation in the functional food and beverage sectors. This project will evaluate, and compare the formulation for herbal energy drink and milkshake containing Ashwagandha and Tulsi extracts. Moreover, this work applies the framework of the Indian Knowledge System

(IKS) to a modern food technology context, which also seeks to combine age-old approaches and philosophies of wellness with the realities facing modern lifestyles (Mishra et al., 2024).

OBJECTIVES

1. Develop formulations for herbal energy drink and milkshake containing Ashwagandha and Tulsi extracts.

2. Optimize formulations, focusing on sensory aspects of taste, texture, aroma and overall acceptability.

3. Promote the incorporation of Indian herbs into modern functional food.

REVIEW OF LITERATURE

Functional concentrations of Ashwagandha and Tulsi inherently present problematic flavor profiles, including (but most notably) bitterness and astringency, which greatly jeopardizes consumer acceptance and ultimately causes participants to either resign to unpleasant sensory experience or sensory rejection of ready-to-drink beverages (Das & Kumar, 2023). Mitigating these problematic off-notes will require some consideration related to sensory optimization.

To help mask the undesirable flavors of the adaptogens in this formulation, natural sweeteners in the form of honey and jaggery will be combined with flavoring agents that are aromatic and heavily utilized such as cardamom and vanilla for the desired function. The aim of this combination to offer a representative taste balancing out that inherent harshness of the adaptogens. (Swetha et al., 2020).

The decision to utilize a Milkshake format is integral to the development and sensory success of the product. The inherent matrix of the milkshake, comprising milk solids and fat, offers a natural emulsion system. This emulsion helps buffer and mellow the harsh/flavorful off-notes that the adaptogen extracts provide to the mix, leading to a better overall sensorial experience; including flavor, mouthfeel, and appetitivness. (Swetha et al., 2020; Rana & Verma, 2022). The structural attributes of milk based systems represent another justification for the product design.

Tulsi, also referred to as Holy Basil, is a highly regarded herb in Ayurvedic medicine as a focused form of an adaptogen (Cohen, 2014).It has been scientifically validated to help

manage both physiological and psychological stress. Cohen (2014) includes a large review of studies that supports the ability of Tulsi to function prophylactically against metabolic, physical, and psychological stress by regulating cortisol levels and supporting cognitive functioning. This therapeutic profile makes Tulsi a fantastic candidate for use in functional beverages focused on overall wellbeing and resilience.

The essential oils present in Tulsi are known to possess impressive anti-inflammatory and analgesic properties comparable in effectiveness to some over-the-counter analgesics (Pattanayak et al., 2010). Tulsi is also an immunomodulant primarily through the increases in activity to T-helper cells and natural killer cells (Mondal et al., 2011).

Ashwagandha is an ancient medicinal herb classified as an adaptogen that is most commonly used for its anxiolytic (anti-anxiety) and performance-enhancing attributes. The pharmacological activity of Ashwagandha has been identified as being primarily derived from the steroidal lactones known as withanolides.

The literature is heavily leaning towards supporting the efficacy of Ashwagandha and its role in mitigating stress. A randomized, double-blind, placebo-controlled trial conducted by Chandrasekhar et al. (2012) reported that a high-concentration, full-spectrum Ashwagandha root extract reduced serum cortisol levels and scores on standardized stress scales.

Aside from its stress management capabilities, Ashwagandha has been shown to enhance physical performance. Ashwagandha supplementation was associated with significant increases in muscle mass and strength while decreasing exercise induced muscle damage according to Wankhede et al. (2015). This demonstrates Ashwagandha's application in beverages targeting recovery and vitality.

The interest in the demand for natural functional beverages has also resulted in studying the stability and impact of including adaptogens in drinks, particularly those providing energy or nutritional value, such as energy drinks or milkshakes.The research supporting adaptogen energy drinks is predicated on using herbs for cognitive enhancement along with inherent energy sources from natural energy. Even though they are not studied in energy drinks or meals, herbs that are adaptogens and synergistic effects are prevalent in many studies, for example blends that contain Ashwagandha and other adaptogens, have shown improved reaction time and sustained attention to a better degree than the placebo

(Singh et al., 2019). Tulsi, which has proven anti-stress action, is also a key additive in counteracting jitters or anxieties caused by caffeine or abundant sugars from some energy contribution/modality to provide some balance in the source of the energy. The studies show that stable encapsulation or standardization extracts, in essence not raw powder, is particularly essential for both Ashwagandha and Tulsi for bioavailability and efficacy in fluids (Rai et al., 2021).

Using adaptogens in milkshakes addresses the rising demand for convenient and nutrient-dense recovery/wellness products. Research on taste and palatability (e.g., Sharma & Gupta, 2020), has indicated that natural bitterness (e.g., from adaptogens such as Ashwagandha), can be masked with the fat, sugar, and flavor components of milkshakes, making the milkshake a system that can be consumed repeatedly. Moreover, milk based products may be a helpful medium for the fat-soluble components of these herbs (e.g., withanolides) that may support absorption. Thus, adding Ashwagandha (for muscle recovery and strength - Wankhede et al., 2015) to a milkshake with protein/nutrients positions the final product as a unique recovery drink for post-exercise or recovery.

METHODOLOGY

1. Raw Materials Procurement:

- Ashwagandha: standardized root powder from a certified vendor.
- Tulsi: dried leaves purchased from certified vendor.
- Base ingredients: pasteurized milk (standardized fat content) and potable water.
- Excipients: natural sweetener (e.g., jaggery, honey, or stevia); flavoring agents (e.g., cardamom, saffron, or vanilla).

2. Formulation development:

- Concentration levels: both beverages will be developed at three concentration levels: Low (CL), Medium (CM) and High (CH) to address operationally the functional to sensory balance.
- Ratio: the Ashwagandha:Tulsi ratio will be standardized, (2:1) to maintain functional consistency across trials.

3. Method of Procedure

a. Herbal Energy Drink

1. Water Extract Preparation: Ashwagandha and Tulsi powder is soaked in hot water.

2. Straining: The extracts are strained using muslin cloth to remove coarse particles.

3. Mixing: Sweeteners and flavoring substances are added to the extracts.

4. Pasteurization: The mixed drink will be heated to 85C° for 15 minutes.

5. Bottling: The drink is placed in sterilized bottles and sealed.

b. Herbal Milkshake

1. Dairy Base Preparation: Standardized pasteurized milk is obtained.

2. Herbal Extract Integration: Water extract is added to the dairy base.

3. Homogenization: Passed through a homogenizer for texture and uniformity, as this is key to preventing phase separation (Patel et al., 2021).

4. Pasteurization: The product is heated to 85C° for 15 minutes.

5. Cooling & Bottling: The product is rapidly cooled to < 5C and aseptically filled in sterilized bottles.

4. Evaluation Parameters

a. Sensory Evaluation

- The sensory evaluation will be conducted via a 9 point hedonic scale measuring attributes including colour, aroma, flavour, texture, and overall acceptability.
- A panel of 15-20 semi-trained evaluators will be used (Rana & Verma, 2022).

RESULTS AND DISCUSSION

The present study found that the Medium concentration formulations achieved the best overall sensory acceptability. The High concentration samples showed lower taste and aroma scores due to the increase in bitterness caused by the herbal extracts. It was found that the Milkshake performed better in terms of taste scores, which supports the hypothesis that the protein and fat matrix will better mask the herbaceous notes and bitterness than the water-

based energy drink. Hence, the use of natural flavors such as cardamom and honey, will be key to the consumer moving from "medicinal" to "functional and flavorful."

CONCLUSION

The research effectively created a scientifically sound method for developing Ayurvedic-inspired functional beverages. The formulated herbal energy drink and milkshake with Ashwagandha and Tulsi are demonstrated that the combination of these two potent adaptogens will result in functional gains in the beverage providing improved energy, reduced stress, and immune support. This study bridges the critical gap between indigenous Indian knowledge and modern consumer needs with the strong sensory acceptability seen in the Medium concentration formulations. Hence, these products are expected to encourage consumers to consider using herbal-based drinks as a standard part of their diet, and to respond to requests for innovation that leverages sustainability and health in the context of functional beverage development worldwide.

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