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Formulation and Nutritional Analysis of Herbal Shrikhand

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Abstract

Shrikhand is a traditional fermented product with a classic, pleasant sweet-sour taste. The present study was aimed at incorporating hibiscus flower extract and honey without losing its nutritive value. AB 437 DVS culture was selected over *Lactobacillus fermentum* and *Lactobacillus paracasei* for the preparation of curd. Incorporation of hibiscus flower extract acts as a natural colouring agent and also a rich source of antioxidants. Honey is considered as a natural therapeutic agent by its anti-inflammatory, antimicrobial and antioxidant properties. Shrikhand with 3.5% hibiscus extract and 46% honey was considered optimal with a high overall acceptability score of 8.2. The sensory attributes like colour and appearance, sweetness, body and texture, and overall acceptability were judged using a 9-point hedonic scale. The antioxidant activity of herbal Shrikhand, honey, and hibiscus flower extract was studied. The total solids, fat, sucrose, protein, and ash content of herbal Shrikhand were 58%, 10%, 74.63%, 9%, and 0.33%, respectively. The pigment from flowers of *Hibiscus rosa-sinensis* Linn had a strong antioxidant ability, and its antioxidant activity was improved with the higher concentration, so it will be a promising natural antioxidant and functional food.

Keywords: Shrikhand, Hibiscus, Honey, Anti-oxidant

Introduction

Fermented milk products are highly popular with remarkable therapeutic and anti-carcinogenic properties (Boghra and Mathur, 2000). Since it is a probiotic product, fermenting milk with lactic acid bacteria is one of the oldest and most effective ways to preserve milk and its important ingredients.

(Kongo and Malcata, 2016). Through the inhibition of opportunistic bacterial development, probiotic microorganisms can modify the human gut microbiota. Probiotics strengthen immunity, promote intestinal health, and lessen the severity of some allergic reactions. (Khaneghaha *et al.* 2020). Shrikhand is a highly nutritive fermented dairy product with characteristics flavour, sweetish sour taste, palatable nature with remarkable therapeutic value. It's made by blending chakka with sugar. However, over consumption of sugar can lead to hypertension, type 2 diabetes, cardiovascular disease, and dental cavities (WHO, 2003; Grembecka, 2015). This research focuses on substitute sugar in Shrikhand with a better alternative like honey. Honey was an important source of carbohydrates and a small number of other compounds such as phenolics, proteins, amino acids, minerals, vitamins, pigments and organic acids. Honey sugars contain 70% monosaccharide, 10-15% disaccharides and oligosaccharides composed of glucose and fructose (Laid Boukraa *et al.*, 2012). Honey contains a wide variety of substances that can function as prebiotics, which are substances that increase the growth and activity of good bacteria to help with the GI tract (Kolayli Sevgi, 2012). Bioactive compounds (phytochemicals) found in plants have many uses in the therapeutic, pharmaceutical, and food industries (Beltran Guerrero *et al.*, 2015). The pigment from flowers of *Hibiscus rosa-sinensis* Linn had a strong antioxidant ability and contains 3.9% protein, 3.9% fat, 86.3% carbohydrate and 15.7% Fiber (KrishtiVincenta, *et al.*, 2016). *Hibiscus rosa-sinensis* is a genus of family Malvaceae. The plant has been used as powerful antioxidant, anti-inflammatory, cardioprotective, antidiabetic, hepatoprotective and anticancer agent. *H. rosa-sinensis* contain numerous phytochemicals such as quercetin glycoside, riboflavin, niacin, anthocyanin, anthocyanidine, malvalic acid, gentisic acid and lauric acid (Khan *et al.*, 2017).

Apart from all these health benefits, the anthocyanin pigment of *Hibiscus rosa-sinensis* exert a pleasant colour to the product. The present study aims to formulate herbal shrikhand with suitable combination of sugar and honey.

Materials and Methods

Materials

This study was conducted at College of Dairy Science and technology, Pookode. Amul toned milk (3 % fat & 8.5 % SNF) was used for the preparation of chakka. AB 437 DVS culture was selected for the study. Dabur honey obtained from local market and hibiscus was obtained from Dairy hostel surroundings. The Chemicals were procured from Sigma-Aldrich (Bengaluru, India).

Preparation of hibiscus flower extract

Hibiscus flowers were collected and the petals were separated from stamens and calices and left to shade dry until they became brittle. The dried petals were ground in a blender to a fine powder which was collected in an air tight container and stored at 4 °C. A quantity of 2 g of hibiscus petal powder was added to 100 mL of distilled water in a 250 mL Erlenmeyer flask and heated for 1 h at 60 °C. The mixture was filtered to remove debris using Whatmann No.1 filter paper. The filtrate was centrifuged at 7000 rpm for 15 min to remove fine debris (Razack *et al.*, 2020).

Preparation of Herbal Shrikhand

Chakka was prepared as per the method mentioned by Dinker Singh and Jai Singh, 2014. Herbal shrikhand was formulated using different combinations of hibiscus flower extract and honey (Fig.1).

Proximate Analysis

Proximate analysis of the sample was carried out as per the procedures followed by standard AOAC methods. Moisture content (AOAC,2005), Fat % (AOAC,1997), Titratable acidity of shrikhand (AOAC,2000) and the reducing sugars (AOAC 2000) were determined.

Antioxidant activity

The free radical scavenging ability of the extract was determined using DPPH according to the method of Burtis and Bucar, 2000. Freshly prepared 1 ml DPPH solution (0.004% w/v in 99 % ethanol) was added to a 3 ml of sample (100 ug/ml ethanol). The mixture was incubated at room temperature in the dark for 20 minutes. After incubation, the mixture was vortexed and the absorbance was read at 517 nm using a spectrophotometer. Ascorbic acid was used as reference and 99 % ethanol was used as blank. The DPPH free radical scavenging activity was measured using the following formula:

DPPH radical scavenging activity (%) = $B - SB \times 100$

B= Optical density of control

S= Optical density of sample

Sensory Evaluation

Sensory evaluation for Herbal Shrikhand was carried out by using 9 -point hedonic scale for Colour and appearance, Sweetness, Body and Texture and overall acceptability.

Microbial Analysis

Standard plate count of Shrikhand was determined by using Tryptone dextrose extract agar (TDA), coliform count by Violet Red Bile Agar (VRBA) and yeast and mould count by Potato Dextrose Agar (PDA).

Result and Discussion

Colour and appearance

The maximum score of 8.4 was obtained for sample D having 46% honey and 3 % Hibiscus flower extract. The minimum score of 7.4 was obtained for sample A and C having 46 % honey and 1.5 % and 2.5 % hibiscus flower extract. While increasing the concentration of hibiscus flower extract, the product developed dark violet colour. A light-yellow colour was imparted to Herbal shrikhand during the addition of honey. Together with honey, the product attained a peach shade during the addition of 3.5 % of hibiscus flower extract.

Sweetness

The maximum score of 8.6 was obtained for sample E having 46 % honey and 3.5 % hibiscus flower extract. The minimum score of 8 was obtained for sample A during the addition of 46 % honey and 1.5 % hibiscus flower extract. Since the sweetness factor of honey is higher than sugar, less quantity was enough to get the required sweetness. At higher concentration of honey, the product exhibited slight sour taste and was not acceptable. The pleasant and optimum sweetness was obtained at 46 % of honey.

Body and texture

The maximum score of 7.7 was obtained for sample C having 46 % honey and 2.5 % hibiscus flower extract. The minimum score was obtained for sample A and B having 46 % honey and 1.5 % and 2 % hibiscus flower extract. The consistency of the product increased with increasing concentration of honey and suitable consistency was obtained at 46 % of honey. While increasing the concentration of hibiscus flower extract, the body became thinner. Values of sensory evaluation for concentration of honey and combination of honey and hibiscus flower extract were given in Table 1 and Table 2.

Table 1: Optimizing concentration of honey by sensory evaluation

Trial no	Concentration of honey	Response 1: Colour & appearance	Response 2: Sweetness	Response 3: Body and texture	Response 4: Overall acceptability
1	43	6.1	6.2	6	6.3
2	46	6.9	7	7.5	6.8
3	48	6.2	7.2	6.4	6.5
4	50	6	7.1	6	6.7
5	52	6.1	7.2	5.9	6.5

Table 2: Sensory evaluations of herbal shrikhand

Trial no	Concentration of honey (%)*	Concentration of hibiscus flower extract (%)	Response 1: Colour & appearance	Response 2: Sweetness	Response 3: Body and texture	Response 4: Overall acceptability
A	46	1.5	7.4	8	7.3	7.6
B	46	2	7.5	8.2	7.3	7.7
C	46	2.5	7.4	8.1	7.7	7.6
D	46	3	8.4	8.1	7.5	7.9
E	46	3.5	8.2	8.6	7.5	8.2

Table 3: Chemical composition of optimized product

Parameter	Value
Sucrose (%)	74.63
Total solids (%)	55
Titrateable acidity (% LA)	1.26
pH (%)	4.6
Fat (%)	32
Moisture content (%)	45
Ash content (%)	0.33

Antioxidant activity

The antioxidant activity of hibiscus flower extract was 84 % and honey was 15 % at 517 nm. Due to the granular texture of product, it was not possible to find out the antioxidant content in Herbal Shrikhand.

Microbial analysis

Table 4: Changes in Microbial growth

	Total plate count (10^{-6})	Coliform count (10^{-1})	Yeast and mould count
Count (cfu/ml)	8×10^6	0	5/g

The results of microbial analysis are presented in the Table.4. per FSSAI standards, maximum coliform count is 50/g and yeast and mould count is 100/g. There is no observable growth of coliform in the given sample but it shows the presence of yeast and mould. It may get in to the product from utensils and atmosphere.

Conclusion

From the research it can be summarized that incorporation of honey and hibiscus flower extract in Shrikhand leads to improved colour and flavour, overall acceptability and nutritive value of Shrikhand. This study also indicates the potential application of hibiscus flower extract as a natural source of colouring agent and antioxidant and honey as a natural sugar substitute.

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