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Organoleptic Quality of Herbal Coagulated Chhana Spread

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The current study was conducted in the Animal Husbandry & Dairying (Dairy Technology) department of the C.S.A. University of Agriculture & Technology Kanpur. By using herbal coagulants to coagulate cow's milk fat, chhana spread was created with specific textural and organoleptic characteristics. In the experiment, two distinct water-herbal coagulant ratios (90:10 and 80:20), two different storage times (fresh day and 10 days) at 5°C refrigeration temperature, and three different coagulant agents (aonla extract, lemon extract, and ginger extract) were used to make chhana spread from cow milk. The five organoleptic qualities include flavor, body and texture, color and appearance, spreadability, and overall acceptance. The study found that after a new day of storage, the physical/organoleptic quality of chhana spread which is prepared from cow milk employing herbal coagulants was superior to other spreads.

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Keywords: Cow milk; herbal coagulants (aonla, lemon and ginger extract); flavour; body; texture; colour; appearance; spreadability; over-all acceptability.

1. INTRODUCTION

Chhana spread is a versatile and delectable dairy product that has its origins in South Asian cuisine, particularly in regions like Bangladesh and West Bengal, India. It is made from fresh cow's milk, which is curdled and then strained to separate the whey from the solids. The resulting soft cheese, known as chhana or paneer, forms the base for this creamy and flavorful spread. Spread is a type of food arrangement that is used as a breakfast item on bread, toast, buns, chapatti, etc. In India, people prefer dairy spreads like butter and processed cheese to non-dairy spreads because of their delicious flavor and nutritional value. Chhana is a well-known naturally caustic coagulated milk product with a respectable nutritional value. It is incredibly suitable for spread fabrication because to its smooth surface, delicate body, and mildly acidic enhancement [1]. Significant interest has been generated in the development of low-fat and low-calorie spreads in recent years.

In the show, there are essentially two types of spreads available in the market: cheese and butter spreads, which are typically served with toast for breakfast. Due to its high animal fat content, butter spread is not recommended for people with heart disease or abbess individuals [2,3]. On the other hand, cheese spread is suitable for all age groups, but its use is essentially limited to a small portion of the western-influenced population due to its unusually sharp flavor that doesn't go well with Indian cuisine and its extravagant price. Recently, chhana has been used to create a spread that tastes good, has less animal fat than other spreads, and is preferred much because of its nutty flavor [4,5]. The chhana is usually crushed or mixed to get a smooth consistency before being used to make chhana spread. Then, based on regional differences and personal choice, it can be improved with a variety of ingredients like sugar, condensed milk, cardamom, saffron, almonds, and occasionally even fruits like pineapple or mango. There are many different ways to eat chhana spread because of its extreme versatility [6-9]. It's a great side dish for breakfast or as a snack with bread, crackers, or toast. Additionally, it can be utilized as a filling for pastries, sweets, or desserts. This gives meals like sandesh, rasgulla, or rasmalai a rich, creamy texture [10-12].

The product known as chhana or paneer is made from the milk of cows or buffaloes, or from a combination of these, by precipitating the mixture with acrid milk, lactic corrosive, or citric corrosive (both the herbal and artificial coagulants). It may not have more than 70% moisture content, and at least 50% of the dry matter foundation should be made up of milk fat. Additionally, milk solids may be used in the preparation of this item (PFA, 1976).

The average amounts of calcium, phosphorus, and vitamins A, B, B2, and C per 100 grams of chhana tested were found to be 208 mg, 138 mg, 3.66 IU, 73 µg, 15 µg, and 2.8 mg, respectively. According to the details, Chhana essentially has no nicotinic corrosive. When chhana was being made, the ascorbic corrosive's unfortunate rate was reported to be roughly 57% higher than that of boiled milk. (Mani and others, 1955)

2. MATERIALS AND METHODS

The current study was carried out in the Animal Husbandry and Dairy Department of the Chandra Shekhar Azad University of Agriculture and Technology in Kanpur. The cow milk came from the university's dairy farm. The Chhana spread manufacturing procedure was standardised based on the many criteria under investigation, and the finished product's organoleptic characteristics were assessed. Herbal coagulants were used, such as aonla extract, lemon extract, and ginger extract, respectively. The chhana spread was prepared using refined commercial grade brand salt.

2.1 Materials

1. Cow milk: Milk from cows that was standardized to have 4.0 percent fat and 8.7 percent SNF was obtained from the university dairy farm.
2. Coagulants: Aonla extract, lemon extract, ginger extract, and other herbal coagulants were employed.

3. Salt: The chhana spread was made with refined commercial grade salt.

4. Chemicals: Chemicals of analytical grade were employed to evaluate the chemical properties.

5. Equipments:

The following tools were utilized to spread and prepare the chhana.

(a) Gas Stove
(b) Stainless Steel Pan
(c) Stainless Steel Ladle
(d) Muslin Cloth
(e) Stainless Steel Plate
(f) Domestic Blender
(g) Celsius thermometer
(h) Weight machine

2.2 The Procedure of Making Chhana Spread

In a karahi, the cow milk was heated to 80^0 degrees Celsius over an open flame. A scoop was used to stir the milk while it warmed up so as to prevent scorching. When the milk reached 80^0 degrees Celsius, it was stopped being heated and allowed to cool to 70^0 degrees Celsius for a while. At that point, coagulation was added to the milk gradually by blending in a 10 per cent or 20 per cent solution of herbal coagulants until the entire amount of coagulation was achieved. Following coagulation, the mixture was stopped, the material was poured over some clean muslin cloth to strain the whey, and the whey was allowed to milk for about an hour without the use of external weight. Following the process of milking whey, chhana was gathered and weighed. Following weight, the chhana is broken into small pieces and transferred to a home blender, where it is expanded with regular salt (1.5%) and water (10–20 ml/100g chhana) to create a glue. Finally, the chhana spread was gathered and firmly packed into plastic glasses. The tests were stored at 5^0 degrees Celsius for refrigeration.

2.3 Instructions

Prepare the chhana (paneer): In a large pot, bring the cow's milk to a gentle boil over medium heat, stirring occasionally to prevent scorching. Once the milk comes to a boil, reduce the heat to low and add the lemon juice or vinegar gradually while stirring continuously. The milk will start to curdle, and the curds will separate from the whey. Once the whey becomes clear and the curds have completely separated, turn off the heat.

Strain the curds: Line a colander or sieve with cheesecloth or a clean cotton cloth. Place it over a bowl or in the sink to catch the whey. Carefully pour the curdled milk mixture into the lined colander, allowing the whey to drain away. Rinse the curds with cold water to remove any residual lemon juice or vinegar taste.

Press the curds: Gather the corners of the cheesecloth and twist them together to form a pouch containing the curds. Place a heavy object, such as a plate or a pot filled with water, on top of the cheesecloth pouch to press out excess moisture. Let the curds press for about 30 minutes to 1 hour, or until they become firm and compact.

Prepare the chhana spread: Transfer the pressed chhana (paneer) to a mixing bowl and mash it using a fork or blend it in a food processor until smooth and creamy. Add sugar to taste and any additional flavorings such as cardamom powder, chopped nuts, saffron strands, condensed milk, or fruit puree if desired. Mix well to combine.

Store or serve: Transfer the chhana spread to a clean, airtight container for storage in the refrigerator. Alternatively, serve the chhana spread immediately as a spread on bread, crackers, or toast, or use it as a filling for pastries, desserts, or sweets.

3. RESULTS AND DISCUSSION

A panel of five judges from the Animal Husbandry and Dairy department at Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, used organoleptic tests to assess the spread's sensory quality. When assessing the sample, the judges took into account the chhana spread's flavor, body and texture, color and appearance, spreadability, and general acceptability. Using a point hedonic scale, the product's sensory attributes were evaluated. The following headings contain the presentation of this investigation's findings and debate.

3.1 Flavour

The highest chhana spread flavour score (7.400) was discovered in ($A_3B_2C_1$), while the lowest

score (5.400) was discovered as the flavour score increased ($A_3B_1C_2$). As the ideal coagulant level grew, the flavour score of chhana spread increased. The maximum taste score (7.200) of chhana spread was found in B2C1 sample, while the least flavour score (7.156) was observed in B_1C_1 sample. At a 5% level of significance, the results were non-significant.

In terms of (Table 1B) varied amounts of coagulant, the B_2C_1 sample had the highest flavour score (7.200), whereas the B_1C_1 sample had the lowest flavour score (7.156). At a 5% level of significance, the results were non-significant. As storage periods have been extended, the product's flavour quality has decreased, implying that quality has deteriorated as storage periods have been extended.

Table 1(A). A×B×C combination score for flavour

Treatment	A_1		A_2		A_3	
	B_1	B_2	B_1	B_2	B_1	B_2
C_1	7.000	7.267	7.333	6.933	7.133	7.400
C_2	6.000	6.200	6.333	6.000	5.400	6.400
C.D.		N/A				

Table 1(B). The average flavor score of chhana spread is influenced by the types of coagulants (A), their concentrations (B), and the length of storage (C)

Treatment	B_1	B_2	C_1	C_2	Mean
A_1	6.500	6.733	7.133	6.100	6.615
A_2	6.833	6.467	7.133	6.167	6.650
A_3	6.267	6.900	7.267	5.900	6.583
B_1			7.156	5.911	6.533
B_2			7.200	6.200	6.700
Mean	6.533	6.700	7.177	6.055	
C.D.	(A×B) N/A		(A×C) N/A		(B×C) N/A

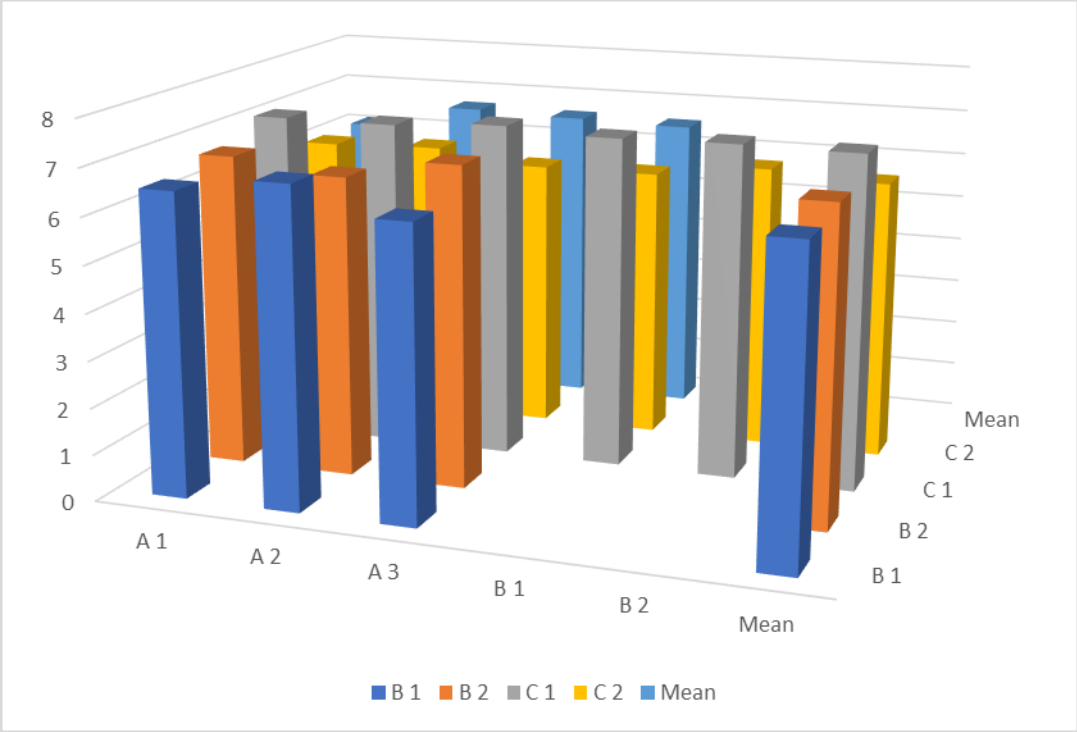

Fig. 1. Average flavour score of chhana spread using herbal coagulants (A) as affected by different levels of coagulant(B) and storage periods (C)

3.2 Body and Texture

As the body and texture score grew, the lowest score (4.300) was found in ($A_2B_1C_2$). The greatest body and texture score (8.100) was found in ($A_1B_2C_1$). The major difference (P0.05, CD=0.337) in body and texture score was determined to be significant at the 5% level of significance due to different coagulant amounts and storage times. The results differed considerably at a significance threshold of 0.1 percent. The body and texture scores were raised when the right amount of coagulants were used. The ideal amount of coagulants was commended by the panel of experts that judged the case.

In terms of (Table 2B) varied degrees of coagulant and storage duration, B_1C_1 samples had the highest body and texture scores (7.767), while B_2C_2 samples had the lowest flavour score (5.167). At a 0.1 per cent threshold of significance, the results differed significantly. At the 5% level of significance, the key difference in body and texture score (P0.05, CD=0.195) was judged to be significant. As storage periods have become longer, the product's body and texture quality has degraded, implying that quality has deteriorated as storage periods have grown longer.

3.3 Colour and Appearance

The sample's rising color and appearance score ($A_2B_1C_2$) had the lowest score (4.300) and the greatest color and appearance score (8.100) of the chhana spread. Growth tendencies were observed in the color and appearance score of chhana spread as the use of ideal coagulant levels increased. The main difference in color and appearance score was demonstrated to be significant at the 5% level of significance due to different coagulant amounts. The results differed considerably at a significance threshold of 0.1 per cent. The color and appearance score increased when the proper amount of coagulants were used. A group of knowledgeable judges bestowed great acclaim on the ideal coagulant dosages.

In terms of the (Table 3B) varied levels of coagulant, the A_1B_1 sample had the highest colour and appearance scores (6.950), while the A_2B_2 sample had the lowest flavour score (6.300). At a 0.1 percent threshold of significance, the results differed significantly. At the 5% level of significance, the key difference in colour and appearance score (P0.05, CD=0.238) was judged to be significant. When the CD values were examined further, it was discovered that factor C was much greater than the other groups, and that all of the groups differed from one another. As storage times have become longer, the colour and appearance quality of the product has degraded, implying that quality has worsened as storage times have grown longer.

It was discovered that the B_2C_1 combination had the highest color and appearance score (7.667), while the B_2C_2 combination had the lowest score (5.500), based on the impact of different BXC combinations on the chhana spread. The data was considered significant at a significance threshold of 0.1 percent. The primary difference in appearance and color score (P0.05, CD=0.195) was determined to be significant at the 5% level of significance.

3.4 Spreadabilty

Sample ($A_2B_1C_1$) had the highest spreadabilty score (8.100) of chhana spread, whereas sample ($A_1B_2C_2$) had the lowest score (5.100). The spreadability score of chhana spread rose as the optimal coagulant level rose. The main difference in spreadabilty score (P0.05, CD=0.337) was determined to be significant at the 5% level of significance due to varying coagulant levels. A group of knowledgeable judges bestowed great acclaim on the ideal coagulant dosages.

Table. 2(A). A×B×C combination score for body and texture

Treatment	**A_1**		**A_2**		**A_3**	
	B_1	**B_2**	**B_1**	**B_2**	**B_1**	**B_2**
C_1	7.900	8.100	7.400	7.700	8.00	7.500
C_2	5.300	6.000	4.300	6.200	5.900	4.800
C.D.		0.337				

Table 2(B). The average body and texture score of the chhana spread was influenced by the levels of coagulant (A), storage times (B), and coagulant levels (C)

Treatment	B_1	B_2	C_1	C_2	Mean
A_1	6.600	7.050	8.000	5.650	6.825
A_2	5.850	6.950	7.550	5.250	6.400
A_3	6.950	6.150	7.750	5.350	6.550
B_1			7.767	5.167	6.467
B_2			7.767	5.667	6.717
Mean	6.466	6.716	7.766	5.416	
C.D.	(A×B) 0.238		(A×C) N/A		(B×C) 0.195

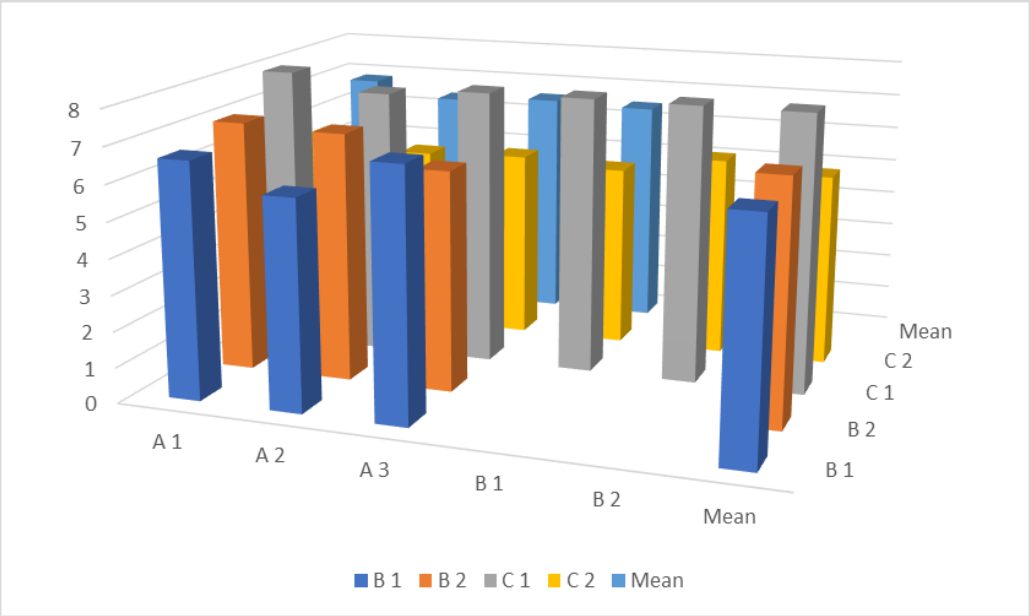

Fig. 2. The average body and texture score of chhana spread prepared with herbal coagulants (A) was determined by varying the coagulant's concentration (B) and the length of storage (C)

Table 3(A). A×B×C combination score for colour and appearance

Treatment	A_1		A_2		A_3	
	B_1	B_2	B_1	B_2	B_1	B_2
C_1	7.800	8.100	7.300	7.700	7.100	7.200
C_2	6.100	5.700	6.100	4.900	5.800	5.900
C.D.		0.337				

Table 3(B). Average Colour & appearance score of chhana spread as affected by different coagulants (A), there levels of coagulant (B) & storage periods (C)

Treatment	B_1	B_2	C_1	C_2	Mean
A_1	6.950	6.900	7.950	5.900	6.925
A_2	6.700	6.300	7.500	5.500	6.500
A_3	6.450	6.550	7.150	5.850	6.500
B_1			7.400	6.000	6.700
B_2			7.667	5.500	6.583
Mean	6.683	6.583	7.533	5.750	
C.D.	(A×B) 0.238		(A×C) 0.238		(B×C) 0.195

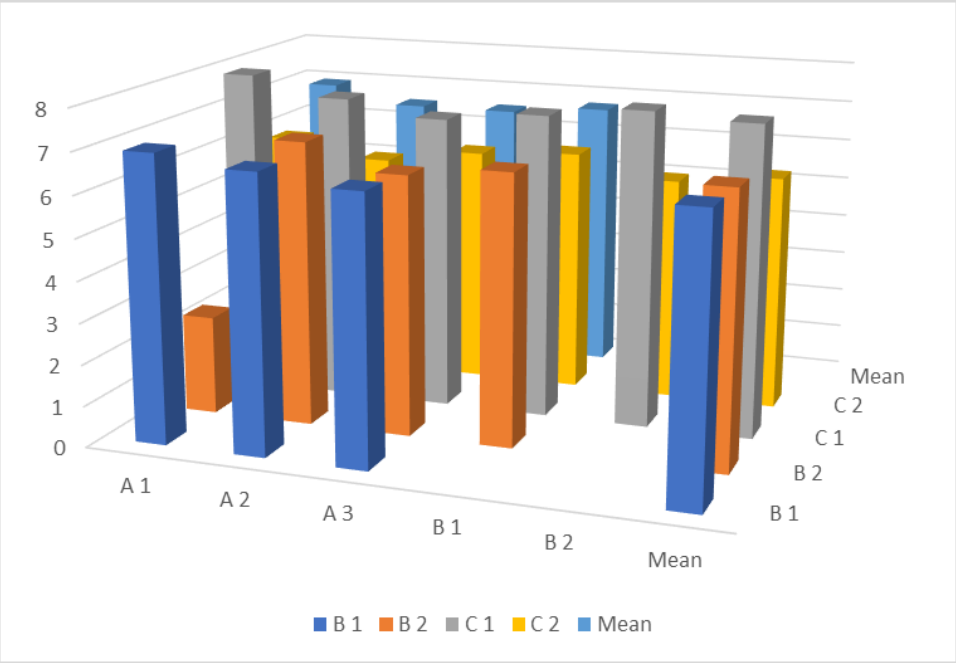

Fig. 3. The average color and appearance score of chhana spread made with herbal coagulants (A) was determined by varying the coagulant's concentration (B) and the length of storage (C)

Table 4(A). A×B×C combination score for spreadabilty

Treatment	A_1		A_2		A_3	
	B_1	B_2	B_1	B_2	B_1	B_2
C_1	7.700	7.300	8.100	7.000	7.200	7.800
C_2	5.700	5.100	5.600	5.300	5.700	5.200
C.D.		0.337				

Table 4 (B). The average spreadability score of chhana spread is influenced by the types of coagulants (A), their concentrations (B), and the length of storage (C)

Treatment	B_1	B_2	C_1	C_2	Mean
A_1	6.700	6.200	7.500	5.400	6.450
A_2	6.850	6.150	7.550	5.400	6.487
A_3	6.450	6.500	7.500	5.450	6.475
B_1			7.667	5.667	6.667
B_2			7.367	5.200	6.283
Mean	6.666	6.283	7.516	5.423	
C.D.	(A×B) 0.238		(A×C) N/A		(B×C) N/A

The largest spreadabiltys cores (7.667) of chhana spread were discovered in the (Table 4B) varied amounts of coagulant and storage time, but the least flavour score (5.200) was obtained in the B_2C_2 sample. At a 5% threshold of significance, the outcomes differed significantly. As storage periods have increased, the spreadability quality of the product has decreased, implying that quality has worsened as storage periods have increased.

It was observed that different AXC combinations had an impact on the spreadabilty score. The A_2C_1 combination had the highest spreadabilty score of chhana spread (7.550), whereas the A_1C_2 combination had the lowest score (5.400). The data was considered non-significant at the 5% level of significance.

3.5 Over-all Acceptability

Sample ($A_2B_1C_1$) had the greatest overall acceptability score (8.100) of the chhana spread,

whereas sample ($A_1B_1C_2$) had the lowest score (6.100). The chhana spread's overall acceptability score rose as the optimal coagulant level rose. The critical difference (P0.05, CD=0.337) in the overall acceptability score was determined to be significant at the 5% level of significance due to varying levels of coagulant; the overall acceptability score improved with optimal amounts of coagulant. An expert panel has highly complimented the correct levels of coagulant.

In terms of (Table 5B) varied amounts of coagulant, A_2B_1 had the highest overall acceptability score (6.900) of chhana spread, whereas A_2B_2 had the lowest flavour score (5.950). At a 0.1 percent threshold of significance, the results differed significantly. At the 5% level of significance, the key difference in overall acceptability score (P0.05, CD=0.238) was judged to be significant. As storage times have increased, the overall acceptance quality of the product has decreased, implying that quality has degraded as storage periods have increased.

It was observed that different B×C combinations had an impact on the overall acceptance score. The B_1C_1 combination yielded the highest overall acceptability score of 5.633 for the chhana spread, whereas the B_2C_2 combination produced the lowest score of 5.300. The data was considered non-significant at the 5% level of significance. The primary difference in the overall acceptability score (P0.05, CD=N/A) was determined to be non-significant at a 5% level of significance.

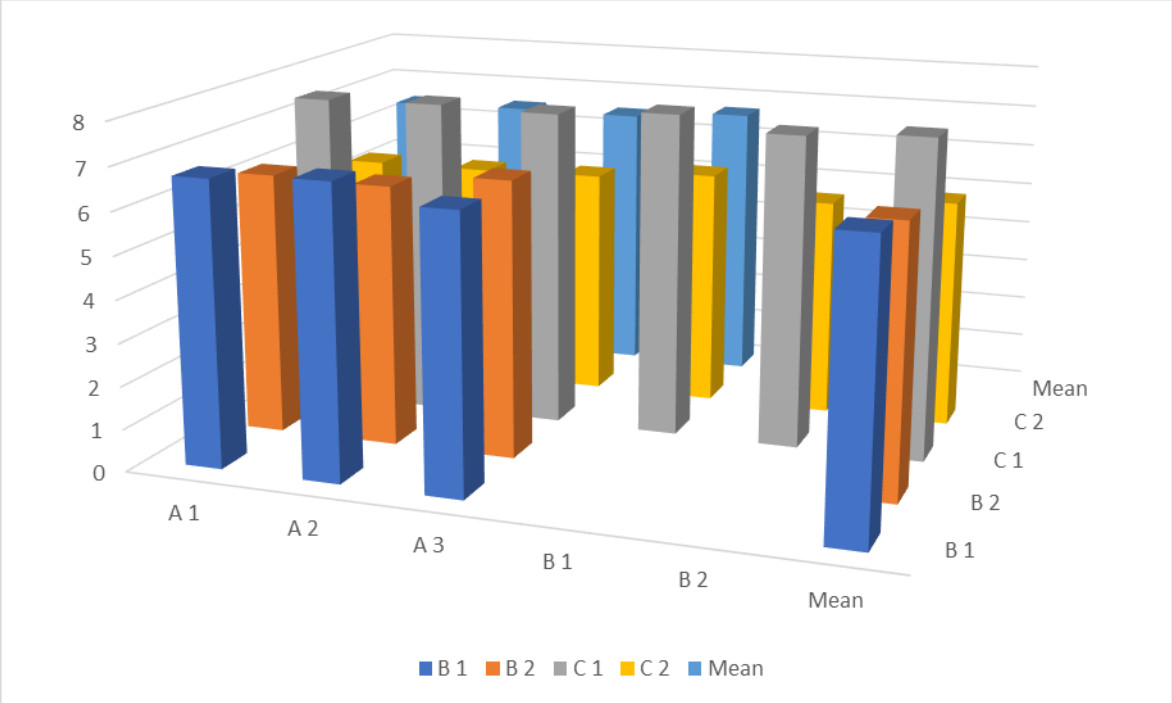

Fig. 4. Chhana spread's average spreadability score while employing herbal coagulants (A) as influenced by varying coagulant concentrations (B) and storage times (C)

Table 5(A). A×B×C combination score for overall acceptability

Treatment	A_1		A_2		A_3	
	B_1	B_2	B_1	B_2	B_1	B_2
C_1	7.300	7.500	7.900	7.100	7.700	7.800
C_2	4.800	6.100	5.900	4.800	5.600	5.000
C.D.		0.337				

Table 5 (B). On average the overall acceptability score of chhana spread as influenced by the types of coagulants (A), their concentrations (B), and the length of storage (C)

Treatment	B_1	B_2	C_1	C_2	Mean
A_1	6.050	6.800	7.400	5.450	6.425
A_2	6.900	5.950	7.500	5.350	6.425
A_3	6.650	6.400	7.750	5.300	6.525
B_1			7.633	5.330	6.481
B_2			7.467	5.300	6.383
Mean	6.533	6.383	7.550	5.346	
C.D.	(A×B) 0.238		(A×C) 0.238		(B×C) N/A

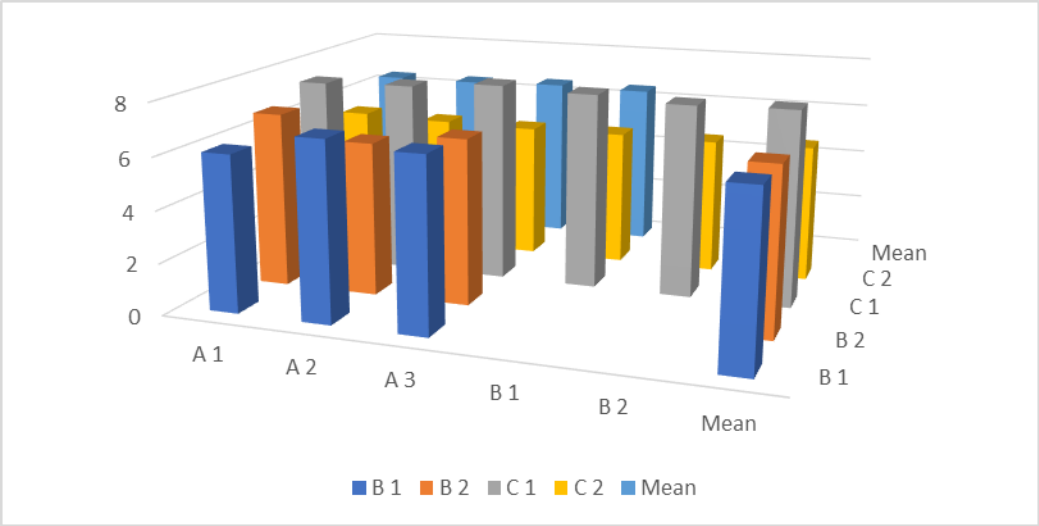

Fig. 5. The average acceptability score of chhana spread made with herbal coagulants (A) was found to be influenced by varying coagulant levels (B) and storage times (C)

4. CONCLUSION

After analyzing the organoleptic quality of chhana spread created with different concentrations of coagulant, it was found that the most popular chhana spread on the fresh day was made with an 80:20 ratio of water to herbal coagulant. The best flavor, body and texture, color and appearance, spreadability, and overall acceptability were all found in this composition. The physical quality of chhana spread made from cow milk utilizing herbal coagulants was found to be superior to other chhana spreads made from cow milk when stored on fresh days. The results of this experiment also indicate that this chhana spread may be successfully kept at 5 degrees Celsius for 10 days without experiencing any significant deterioration. In order to get exceptional quality and enhanced nutrition, it is feasible to suggest using 80:20 ratios of water and herbal coagulants in chhana spread after the trial.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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