To Study the utilization of Arrowroot Powder (Maranta arundinacea L.) in the Preparation of Probiotic Shrikhand and their physico-chemical quality

Abstract:

Present investigation was carried out at Dairy Science Laboratory of Department of Animal Husbandry and Dairy Science, College of Agriculture, Dr. BSKKV., Dapoli (M.S.) to study the Utilization of Arrowroot Powder (*Maranta arundinacea* L.) in the Preparation of Probiotic Shrikhand. In present study, shrikhand prepared from buffalo milk and Arrowroot powder was used in preparation of Probiotic shrikhand. Shrikhand made with different proportions of Arrowroot powder (5 per cent, 7.5 per cent and 10 per cent) and a fixed sugar level (70 per cent) and using *Lactobacillus casei* as the probiotic culture. It was found that Probiotic shrikhand made from utilization of Arrowroot Powder at 5% was best in present investigation and it may conclude that Arrowroot Powder can be successfully utilized for preparation of Probiotic shrikhand.

Key words: Probiotic shrikhand, Arrowroot Powder.

Introduction:

Milk is a complex diet that provides essential nutrients for young mammals. From a nutritional standpoint, milk is regarded as nature's practically perfect diet. Other foods may include more of a specific vitamin, but milk is thought to be the best-balanced food. Milk output in India has increased steadily during the previous two decades. India is now the world's leading producer of liquid milk. India is the world largest milk producer, with an average annual production of 230.58 MT in 2022-23 (FAO). India is the world largest producer of milk and value-added dairy products, accounting for more than 16 per cent of total milk consumption. In recent years, there has been a

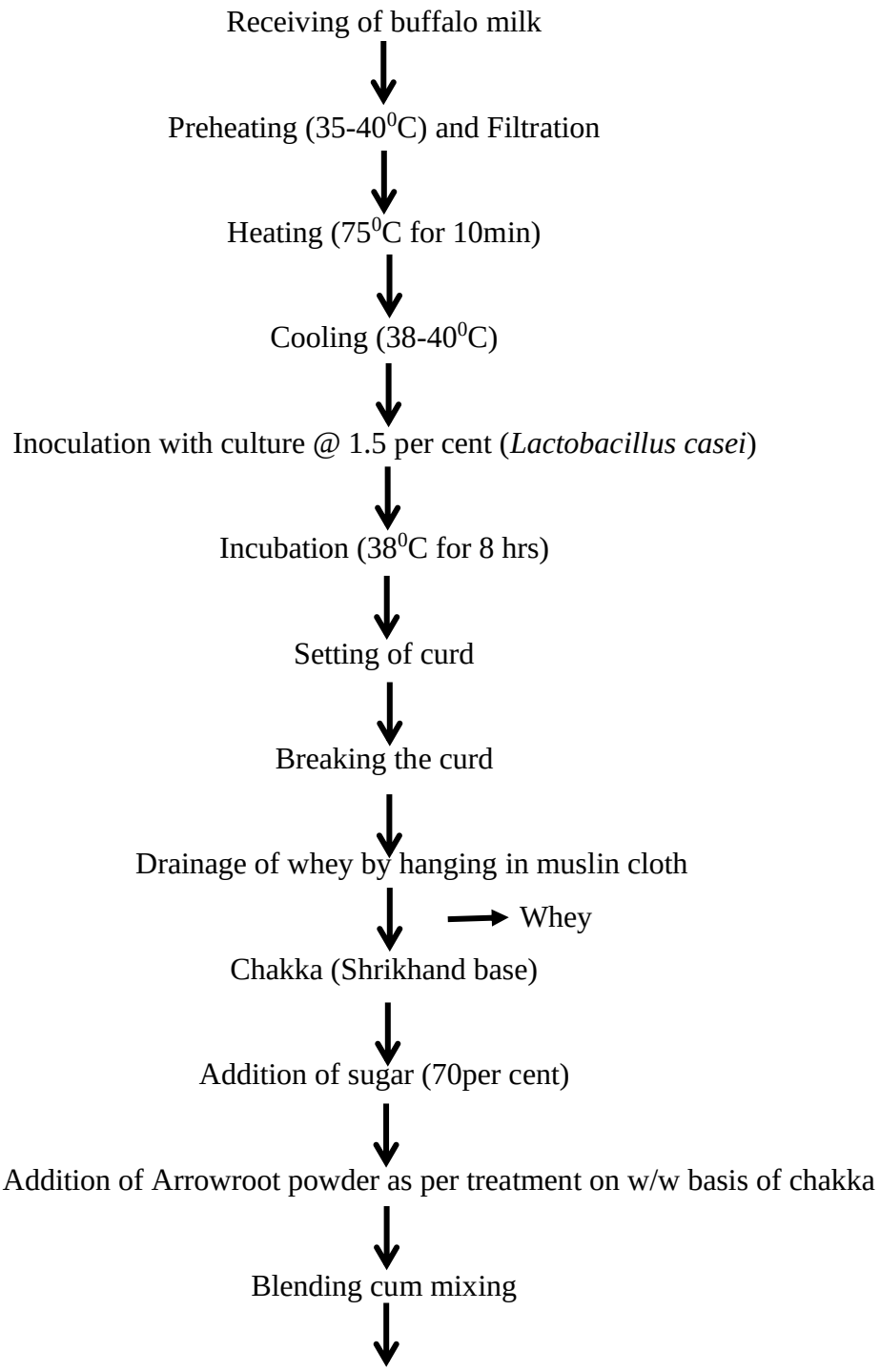
growing interest in probiotic foods due to their health benefits beyond basic nutrition, including improved gut health, immune system support, cholesterol reduction and antibacterial properties. For these benefits to be effective, probiotics must be consumed in sufficient quantities (10^6 cfu/g). Incorporating prebiotics into probiotic Shrikhand, a traditional Indian dairy dessert, enhances its nutritional profile. Prebiotics are non-digestible food ingredients that affect the host by selectively targeting the growth and activity of one or a limited number of bacteria in the colon and thus have the potential to improve health (Bosscher, 2006). Gibson (2004) reported that prebiotics able to withstand acid hydrolysis in the stomach, able to move to large intestine without changes or being absorbed in small intestine so that they can be utilized by the indigenous microflora in the large intestine to enhance their growth. Prebiotics, natural or synthetic, can enhance the growth and activities of probiotics and gut microflora, which are beneficial to the health and wellbeing of humans and animals. They are polysaccharides that are capable of surviving acidic and enzymatic digestion in the small intestine and can be fermented by probiotics in the large intestine to produce short-chain fatty acids, vitamins and other compounds, which can normalize bowel movement, increase immunity against diseases, prevent cancer, improve mineral absorption and lower cholesterol. Chen and Walkar (2005) observed that probiotics are live flora that allow for bacterial colonization of the colon and their function is to activate the mucosal immune system and prevent pathogen colonization and translocation by strengthening the mucosal barrier interfering with pathogen colonization and in some instances, producing secretary antibacterial substances. The incorporation of Arrowroot powder (*Maranta arundinacea* L.) in the formulation of probiotic Shrikhand presents an intriguing avenue for enhancing both the nutritional profile and the sensory attributes of this traditional Indian dairy product. The rhizomes of the Arrowroot plant are used to make Arrowroot powder, which is well known for its superior thickening qualities and bland flavour. It is possible that the addition of Arrowroot powder to the Shrikhand recipe might act as a natural thickening agent, increasing the finished product's viscosity and creaminess. Furthermore, because of its neutral flavour, it might be possible to integrate it seamlessly without sacrificing the true flavour of Shrikhand, which could provide a potential fix for texture-related issues that are frequently present in conventional formulations.

Methodology:

Arrowroot powder was procured from AICRP on Tuber Crops, CES, Wakawli, DBSKKV, Dapoli. Fresh Buffalo milk required for research was obtained from the Instructional Dairy farm of College

of Agriculture, Dapoli.

Preparation of Probiotic Shrikhand



Probiotic Shrikhand

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Storage in Refrigerator at 5°C

Treatment details:

In the present investigation probiotic culture Lactobacillus casei was used @ 1.5 per cent for all treatments, whereas Arrowroot Powder was used in different proportion of 5 ,7.5 and 10 per cent and Sugar level used 70 per cent for all treatment. The designed shrikhand was prepared in following different combinations,

T0A0 = Chakka + without Arrowroot Powder + 70 per cent sugar

T1A1 = Chakka 95 per cent + 5 per cent Arrowroot Powder + 70 per cent sugar

T2A2 = Chakka 92.5 per cent + 7.5 per cent Arrowroot Powder + 70 per cent sugar

T3A3 = Chakka 90 per cent + 10 per cent Arrowroot Powder + 70 per cent sugar

Chemical Analysis

The total solid content was determined by gravimetric method as per IS:1479 (Part II), 1961. The fat content was determined by using standard Gerber method as described in IS:1224 (part I), 1977. The protein content was estimated by determining the per cent nitrogen by microkjeldhal method as recommended in IS:1479(Part II), 1961. Per cent Ash content was determined by the method described in A.O.A.C.,1975. Acidity of Shrikhand was estimated as per method given in IS 1479, Part II (1960).

Statistical Analysis

For present investigation, CRD i.e., Completely Randomized Design was employed using six replications.

Results and discussion:

Table 1. Total Solid Content of Probiotic shrikhand (%).

	R-I	**R-II**	**R-III**	**R-IV**	**R-V**	**R-VI**	**Mean**
T_0A_0	61.47	61.20	61.85	60.8	61.22	60.72	**61.21^{cd}**
T_1A_1	62.12	61.70	62.25	61.15	61.62	61.11	**61.65^{c}**
T_2A_2	62.96	62.29	62.79	61.95	62.32	62.70	**62.50^{ab}**

T_3A_3	63.65	63.11	63.55	62.36	62.96	63.45	**63.18[a]**
Mean	**62.55**	**62.07**	**62.61**	**61.56**	**62.03**	**61.99**	**62.13**

The total solids increased significantly with the increase in level of Arrowroot powder. The significantly highest per cent of total solids due to Arrowroot was recorded in level T_3A_3 (63.18%) and lowest in case of level T_0A_0 (61.21%). This was due to high solids content of Arrowroot powder. The treatment T_0A_0, T_1A_1, T_2A_2 and T_3A_3 contain 61.21, 61.65, 62.50 and 63.18 per cent total solid respectively. The statistical interpretation of data reveals that the results are statistically significant at 1 per cent level of probability.

Table 2. Fat Content of Probiotic shrikhand (%).

	R-I	**R-II**	**R-III**	**R-IV**	**R-V**	**R-VI**	**Mean**
T_0A_0	7.50	7.00	6.95	7.45	7.60	7.50	**7.33[a]**
T_1A_1	7.28	6.68	6.62	7.15	7.25	6.85	**6.97[ab]**
T_2A_2	7.15	6.45	6.40	6.95	7.15	6.65	**6.79[c]**
T_3A_3	6.95	6.30	6.25	6.85	6.95	6.50	**6.63[cd]**
Mean	**7.22**	**6.60**	**6.55**	**7.10**	**7.23**	**6.87**	**6.93**

The fat contents decrease significantly with increase in level of Arrowroot powder. Highest fat was recorded in treatment T_0A_0 (7.33%) and lowest in case of treatment T_3A_3 (6.63%). The treatment T_0A_0, T_1A_1, T_2A_2 and T_3A_3 contain 7.33, 6.97, 6.79 and 6.63 per cent fat respectively. The fat content of Shrikhand declined from 7.3 per cent to 6.63 per cent on addition of Arrowroot powder from 5 per cent to 10 per cent. The final product has less fat in it than chakka had. This was mainly because sugar, which contains no fat, was added to 70 per cent of the chakka during the production of shrikhand. The statistical interpretation of data reveals that the results are statistically significant at 1 per cent level of probability.

Table 3. **Protein Content of Probiotic shrikhand (%).**

	R-I	**R-II**	**R-III**	**R-IV**	**R-V**	**R-VI**	**Mean**
T_0A_0	7.20	7.50	8.20	8.00	7.10	7.75	**7.62[a]**
T_1A_1	6.80	7.20	7.75	7.75	6.65	7.00	**7.19[ab]**

T_2A_2	6.65	7.00	7.50	7.30	6.50	6.50	**6.90^{c}**
T_3A_3	6.50	6.50	6.90	6.95	6.30	6.00	**6.52^{cd}**
Mean	**6.78**	**7.05**	**7.58**	**7.50**	**6.63**	**6.81**	**7.06**

From the data presented it was observed that, , protein content showed decreasing trend. The increase in level of Arrowroot powder resulted in decreased in protein content. Highest protein was found in treatment T_0A_0 (7.62%) and lowest in case of treatment T_3A_3 (6.5%). The treatment T_0A_0, T_1A_1, T_2A_2 and T_3A_3 contain 7.62, 7.19, 6.90 and 6.52 per cent protein respectively. This was due to the reason that Arrowroot powder contained small amount of protein. Thus, there was a significant drop in the protein content of shrikhand due to an increase in Arrowroot powder level, as evidenced by the observation that treatment differences are statistically significant at the one per cent significance level.

Table 4. **Ash Content of Probiotic shrikhand (%).**

	R-I	**R-II**	**R-III**	**R-IV**	**R-V**	**R-VI**	**Mean**
T_0A_0	0.75	0.70	0.80	0.85	0.65	0.60	**0.70^{c}**
T_1A_1	0.86	0.85	0.90	0.95	0.80	0.78	**0.86^{b}**
T_2A_2	0.95	0.96	1.05	1.20	0.96	0.86	**1.00^{ab}**
T_3A_3	1.08	1.20	1.15	1.35	1.09	1.00	**1.15^{a}**
Mean	**0.91**	**0.9275**	**0.975**	**1.0875**	**0.875**	**0.81**	**0.93**

The critical perusal of Table indicates that the ash showed increasing trend during the study. The ash increased significantly with the increase in level of Arrowroot powder. The significantly higher per cent of ash due to Arrowroot powder high per cent of ash. Highest ash was recorded in treatment T_3A_3 (1.15%) and lowest in case of treatment T_0A_0 (0.70%). The treatment T_0A_0, T_1A_1, T_2A_2 and T_3A_3 contain 0.70, 0.86, 1.00 and 1.15 per cent ash respectively. The statistical interpretation of data reveals that the results are statistically significant at 1 per cent level of probability.

Table 5. **Titrable acidity of Probiotic shrikhand (%).**

	R-I	**R-II**	**R-III**	**R-IV**	**R-V**	**R-VI**	**Mean**
T_0A_0	1.15	1.35	1.28	1.40	1.25	1.20	**1.27^{b}**

T_1A_1	1.00	1.20	1.22	1.30	1.20	1.15	**1.18^{ab}**
T_2A_2	0.88	1.12	1.18	1.25	1.18	1.14	**1.13^{ab}**
T_3A_3	0.85	1.10	1.12	1.18	1.15	1.13	**1.09^{c}**
Mean	**0.97**	**1.19**	**1.20**	**1.28**	**1.19**	**1.15**	**1.17**

The data pertaining to the Titrable acidity of shrikhand prepared with different level of Arrowroot powder shows gradually decreasing in per cent acidity of shrikhand.

The data presented in Table 4.13 indicated that the acidity showed decreasing trend during study. Highest acidity was recorded in treatment T_0A_0 (1.27%) and lowest in case of treatment T_3A_3 (1.09%). The treatment T_0A_0, T_1A_1, T_2A_2 and T_3A_3 contain 1.27, 1.18, 1.13 and 1.09 per cent acidty respectively. This was due to the Arrowroot powder.

Chemical composition of Probiotic shrikhand

Total Solids

Total solids content gradually increases with increasing level of Arrowroot powder. The treatment T_0A_0, T_1A_1, T_2A_2 and T_3A_3 contain 61.21, 61.65, 62.50 and 63.18 per cent total solid respectively.

Fat

The fat per cent significantly lower due to Arrowroot powder. The treatment T_0A_0, T_1A_1, T_2A_2 and T_3A_3 contain 7.33, 6.97, 6.79 and 6.63 per cent fat respectively.

Protein

The increase in level of Arrowroot powder resulted in slightly decrease in protein content. Highest protein was found in treatment T_0A_0 (7.62%) and lowest in case of treatment T_3A_3 (6.5%). The treatment T_0A_0, T_1A_1, T_2A_2 and T_3A_3 contain 7.62, 7.19, 6.90 and 6.52 per cent protein respectively.

Ash

The ash increased significantly with the increase in level of Arrowroot powder. Highest ash was recorded in treatment T_3A_3 (1.15%) and lowest in case of treatment T_0A_0 (0.73%).

The treatment T_0A_0, T_1A_1, T_2A_2 and T_3A_3 contain 0.73, 0.86, 1.00 and 1.15 per cent ash respectively.

Titrable acidity

The acidity showed decreasing trend during study. Highest acidity was recorded in treatment T_0A_0 (1.27%) and lowest in case of treatment T_3A_3 (1.09%). The treatment T_0A_0, T_1A_1, T_2A_2 and T_3A_3 contain 1.27, 1.18, 1.13 and 1.09 per cent acidty respectively. This was due to the Arrowroot powder.

Conclusion:

In respect to physico-chemical properties of Probiotic Shrikhand prepared with utilization of Arrowroot powder showed decreases in Protein, Fat and Titrable acidity. with increase in level of Arrowroot powder. While Total solid and Ash was increases with increase in level of Arrowroot powder.

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