DEVELOPMENT OF FORTIFIED PROBIOTIC CURD INCORPORATED TO MORINGA OLEIFERA

[1] Vibhuti P. Patel
[1] Institute of Research and development, GFSU
[1] vibhutipatel2209@gmail.com

Abstract*— Moringa oliferais the highest generally cultivated species in moringaceae family and remains generally distributed in subtropical regents of the world . Unfortunately, those are the areas where most of the people suffering from malnutrition and micronutrient deficiencies. it is known as the "Miracle tree". Lots of researchers have found that , the effects of malnutrition's it can combat , B-carotene and other vitamins, minerals and amino acids be situated in Moringa olifera. specially, M. olifera contain all the essential amino acids in addition to PUFAs including a-linolenic acid. Apart from the numerous nutritional properties, Moringa olifera are rich sources of phytochemicals which possess biological functions. Having strong anti-cancer and hypotensive activity and considered of medicinal properties. excellent source of B-carotene and other vitamins, minerals and amino acids that can combat the effects of malnutrition. Therefore, M. olifera can be processed in different ways and can be applied in food industry as a functional food ingredient.In current time , people of all age groups required different types of vitamin , minerals , protein etc. which are sufficient available in moringa Dahi. Deterioration of milk-based products (dahi) is connected with changes in the environmental factors during storage. The physico-chemical properties or characteristics of the dahi are affected by the production technological parameters like incubation, process, culture addition and storage temperature and time. Dahi is one of the most popular options of all ours global liked by all age groups. It's resole health problem and also provides enough nutrition at a low cost to a large population. An experimentation planned to monitor the durability of certain dairy products was store temperatures (-4 ◦C) within their shelf life and nutritive value. The culture added into MPP dahi sample and incubated to 38 ◦C temperature. The Samples of fortified MPP dahi tested during 22 days. During experimentation stages, depending on the product, pH and acidity value of the product, in addition to sensory analysis (taste, colour and body texture), along with microbiological safety, was investigated. The results be in view the products stored at 2◦C appeared considerable acidity (decreases pH value), changed sensory evaluation properties, and had higher no. of aerobic bacteria, after 22 days, resulted in larger amount of whey separated, decrease viscosity and decrease acidity. The physico-chemical and microbial attribute of moringa Dahi prepared by moringa pod powder and flavour A & B is showed in current study. it was prepared from standardized milk. Moringa pod powder added at different level 0.5% , 1.00% ,1.5% of milk. Various analysis parameters were analyzed by one-way ANOVA to obtained optimum result prepared moringa Dahi was subjected to chemical and microbial analysis to evaluate the suitability of Dahi were sample carbohydrate (8.98 %) , protein (4.62 %), fat (4.45 %), TS (14.58), acidity (0.67 %) , pH (4. 6) . based on the result it was indicated that beneficial component of high protein is Dahi. Moringa powder made them more favorable choice for dairy technologist to develop Dahi especially for healthy food..

Index Terms—*About four key words or phrases in alphabetical order, separated by commas.*

I. INTRODUCTION

Development of scientific in consciousness the correlation between health and nutrition has an increase effect on consumer's behaviour to nutrition which has resulted in the enhancement of the functional food concept .Functional dairy products can be introduced as dairy products including notable concentrations of functional components that provide a specific benefits of human health beyond the essential other nutrients (Drozen and Harrison, 1998).In india, dahi and dahi- like products occupy a focal position in the daily diet of people. Approximately 7.0% of total milk produced in India is utilized for making dahi and dahi-like products intended for direct consumption.[6]The fermented milk products is in demand and it has been estimated that about 10% of total milk produced in India is used for preparation of traditional fermented milk products among all the traditional products, dahi is one of the most extensively consumed fermented milk. dahi has valuable therapeutic properties and aids in curing gastrointestinal disorders. The composition of dahi depends on composition of milk used and the extent of dilution. On an average, dahi can contain fat ranging from 3.0 to 3.5%, T.s ranging from 16.0– 18.0% and acidity varying from 0.65–0.90 % LA[1]. dahi contains significant amounts of milk proteins and nutritive value of fermented milk products is derived from the nutrients among different metabolites manufacture by lactic acid bacteria throughout fermentation besides the nutrients available from milk.[4]

The order of customers change from time to time. This can be due to demands for improving food safety, upgraded shelf life, command for foods having special attribute in terms of nutritional value, satisfaction and improved taste. Fitness is a major concern of customers; therefore, producers are finding new ways to incorporate natural and pioneering ingredients such as vegetables into dairy products for fitness benefits. A range of pioneering petition are known to increase nutritional quality of food including novel materials and nutrient delivery apparatuses [7]. To further improve the therapeutic and nutritional value of dahi, it is necessary to incorporate natural and innovative ingredients such as vegetable

products.

In our country , Moringa pod is called as munga, saragwa or saragwe and is often referred to as Moringa in scientific name[13] . Moringa oleifera has so many medicinal uses, which have long been acknowledge in the Ayurvedic and Unani

systems of medicine.[14] Moringa pods are rich source of calcium, iron and fiber, out of which, 40% is soluble dietary fiber. Nutritionally, Moringa pods are of considerable value as sources of calcium, phosphorus and Vitamin C. Edible part of Moringa pods are rich in calcium (30 mg/100 g), phosphorus (110 mg/100 g), iron (5.3 mg/100 g) Vitamin C (120 mg/100 g)[12] . Dehydrated Moringa powder is an essential part of Indian cooking and is extensively used in many food and batter preparations since it gives a well defined palatable taste and is rich source of glutamic acid [16].

While Moringa is from time to time used in the traditional foods, information on the use in marketable products is limited. Besides, abstemiousness, aftertaste bitterness and light green colour are also serious limitations for the use of Moringa pod in food formulations[17]. In order that a product be labeled as a "good source of nutrients.

II. INCORPORATION OF MORINGA WOULD BE REQUIRED AT HIGHER LEVELS

At present, there is no research work carried out in literature on utilization of any part of Moringa in dahi. Use of dahi as a carrier for incorporating Moringa products is expected to have the following benefits: dahi like products are widely used by daily in predictable amounts by population, addition of nutrients such as Moringa is expected to cause minimum change in

sensory characteristics of dahi like product because of its acidic nature. It was envisaged that incorporation of Moringa in dahi would the outcome in rase its subsistence value by increasing its iron, vitamin C, calcium, potassium, zinc and fiber content. Therefore, study was planned to produce a value added dahi using pods of Moringa oleifera.

III. MATERIALS AND METHODS

Standardized milk having an average fat 3.5 % and average MSNF content of 11 % and Chr Hansen Exact Dahi material no: 690639 and 100223 (DVS culture , Denmark) culture was used for preparation of dahi. This culture of DVS contain mesophilic/thermophilic culture. The culture was selected based on its ability to achieve desired acidity 0.7% LA within 5 h of incubation. Moringa pod powder was collected from sumul dairy lab. Mori bnga pod collected from local market surat. The configuration of MPP had 1.7% fat, 16.0% protein, 29.21% crude fibre and 2.1% moisture. Other basic ingredients like common salt, ginger powder, black pepper, cumin powder and guava essence were procured from the local market.

IV. PREPARATION OF MPP DAHI

Fresh, good quality milk, standardized to 3.5% fat / 11 % MSNF was heated in advance to 35– 40°C, filtered through a muslin cloth, heated to 90°C for 5 min and cooled to 40+2°C. Curd was prepared using DVS starter culture which was added in the milk then in another hand take approx 50 ml of milk and moringa powder/pulp had mix it thoroughly and heat at 90◦ c and immediately cooled at 40 ◦ c then after the mixer pour in to the whole batch in the stenless steel , incorporate moringa cultured milk pour into some cups and covered it to foil paper then it can be incubated for 5 to 6 hr .after incubation we have to check the pH and it can be confirmed as ok product then it can be transferred in cold storage at -4 ◦c.

V. ANALYSIS

Fat content of dahi was determined using Mojonnier method as described in BIS Handbook [20]. Titratable acidity of the dahi was measured according to the procedure mentioned in BIS Handbook for milk [20]. The total nitrogen was determined using semimicro Kjeldahl method . Ash and Total solids (TS) content were determined by procedure described in BIS handbook . The pH values of samples were measured by use of Electronic pH meter (M/s. Mettler Toledo AG, Schwerzenbach, Model CH8603). Viscosity of product was determined by using ‘Brook field’ viscometer at 20±2°C. Iron content of MPP. Vitamin A content of pod powder and dahi were analysed by using the standard policy of AOAC[19] . The calcium content of product was measured as per method given by BIS. Potassium content of pod powder and dahi was analysed by using the standard policy of AOAC . Estimation The fibre content of pod and dahi had determined by the method narrate in EC No. 152/2009. For microbiological analysis , The techniques of plating, incubation and counting for the numbering of SPC, yeasts and moulds as well as coliforms were followed as setout by IS:1989 .

VI. MICROBIAL ANALYSIS

Yeast and mould count, coliform count and total count (was determined as per manual of Dairy Bacteriology ICAR 1972) [23][25].

VII. STATISTICAL ANALYSIS

The data obtained during different phases of this study was analysed using completely randomized analysed using Analysis of Variance (one way ANOVA) and Critical difference (C.D) in excel software. [3]

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VIII. SENSORY EVALUATION

The product was submit to the sensory evaluation by semi-expert panel of 10 jury using a 9 point hedonic scale scorecard. The selection criterion was that the subject had to be familiar with the product as well as show similar kind of behavior between sensory evaluation sessions. Dahi (100 gm) were served in odorless disposable polystyrene cups with lids. The samples were tempered to - 4±2°C. The cups were labeled with random 3digit codes. The order of presentation of samples was randomized across judges. Sensory analysis was conducted in isolated booths illuminated with incandescent light in a sensory evaluation lab maintained at 23±2°C

IX. RESULTS AND DISCUSSION

Data gathered on the various aspects were calculated and analyzed statistically using the method of analysis of variance and important difference technique. Various forms of Moringa viz. fresh pulp and dried pod powder were studied for feasibility and suitability for use in Moringa dahi keeping commercialization in the view. Pulp was found to be unsuitable as inefficient mechanical extraction and lower in nutrients as the husk/skin was removed resulting in loss of fibers and vitamins. Therefore it was decided to add dried pod powder. MPP was procured from seven sources and based on preliminary screening, the most acceptable MPP was selected. The results obtained from the analyzed data are presented under physico-chemical parameters, microbiological characteristics and Statistical analysis.

X. SELECTION OF MODE OF ADDITION OF MORINGA IN DAHI

Considering the manufacturing process for dahi was envisaged that there are three possible ways to add Moringa in to dahi as: (a) Before heat treatment of milk; (b) After heat treatment of milk but before fermentation and (c) Directly into the culture milk. To select the mode of addition of MPP in dahi dahi was manufactured according to the procedure standardized. and MPP was added @ 1.5% in culture milk.in the preliminary samples during investigation of the three levels, it was observed that addition of MPP before heat treatment of milk and before fermentation resulted in adverse effect sensory characteristics of the product. Therefore, addition of MPP before heat treatment of milk was not considered. To find out the effect of addition of Moringa before and after fermentation, calculated amount of MPP was added at two different stages. Before addition, MPP was mixed with potable water at 40°C (about 10 times the wt. of MPP) and heated to 90°C for 1 min for proper dissolution. In one experiment the dissolved MPP was directly added to milk after heat treatment but before addition of starter culture and in the other, it was directly incorporated into the dahi. The results presented in Table 1 represent the influence of stage of addition of MPP on the sensory attributes of dahi. It can be seen from Table 1 that addition of MPP before fermentation in dahi resulted in a significantly lower flavour, color and appearance, body and overall acceptability scores compared to when added before fermentation. It was found that addition of MPP before fermentation resulted in a product with very harsh astringent flavour and uneven body and texture with pronounced whey separation. Therefore, it was decided to add the dissolved MPP directly into before fermentation.

Sr No	TMS	Acidity	Colour And Appearance	Flavour	Body And Texyure	Overall Acceptabiity
			OUT OF 9			
1	14.5	0.75	8	7	8	8
2	15.6	0.91	8	8	8	8
3	15.2	0.60	7	6	7	7
4	15.57	0.90	8	7	8	8
5	14.58	0.91	7	7	7	7
6	15.62	0.75	8	8	8	8
7	16.2	0.76	7	7	8	7
8	15.22	0.75	8	8	8	8
9	15.68	0.70	7	7	8	8
10	15.96	0.60	7	7	7	7

TABLE 1: SENSORY SCORE OF MORINGA FORTIFIED DAHI (MPP)

XI. RESULT OF TEST

The color and appearance, flavour, body and texture, acidity, and overall acceptability score of product was observed in the range from 7-8, 6-8, 7-8, 7-8 (out of 9) respectively. And acidity 0.60 -1.35 %LA. is show in table 1 and 2. The effect of coefficients indicate the effect of the variable on the responses. The total effect of individual variable and combined effect of the variables at all levels are presented in Table 1, 2.

Amul Dahi	Acidity	pH	TEM.	T.N	MPP DAHI Acidity	pH	TEM	T.N
CONTROL	0.68	4.60	2.00	0.60	0.72	4.56	2.00	0.60
AFTER 2 DAYS	1.00	4.60	2.00	0.64	0.85	4.45	2.00	0.61
AFTER 7 DAYS	1.10	4.30	4.00	0.64	1.10	4.38	3.50	0.64
AFTER 12 DAYS	1.20	4.30	2.50	0.69	1.20	4.38	4.00	0.64
AFTER 17 DAYS	1.30	4.20	2.00	0.64	1.29	4.20	2.00	0.69
AFTER 22 DAYS	1.35	4.00	2.00	0.66	1.36	4.00	2.50	0.70

TABLE 2: VARIATION OF ACIDITY, PH, TEM., T.N BETWEEN AMUL DAHI AND MPP DAHI

Sample no	Coliform count cfu/gm >300 colonies not countable	Y&M count cfu/gm >150 colonies not countable	OT- (sensory evaluation base on taste, colour, appearance, flavour, body and texture, overall acceptability)	D
1	< 1	< 1	Ok	After 2
2	< 1	< 1	Ok	After 7
3	< 1	< 1	Ok	After 12
4	< 1	< 1	Ok	After 17
5	< 1	< 1	Not ok	After 22

TABLE 3 : MICROBIOLOGICAL ANALYSIS FOR

SHELF LIFE STUDY OF PROBIOTIC DAHI

XII. STANDARDIZED METHOD FOR MANUFACTURE OF MORINGA DAHI

Method for Production of MPPD the standardized method for production of MPP dahi, milk stardized at 3.5 per cent fat and SNF 11.0 per cent is taken after checking its quality criteria. Then it had pre heated at 35-40 ,°C, add flavoure and sieved , heated at 90 °C for 5 min, cooled at 40±2 °C and inoculated with DVS lactic mesophilic/ thermophilic probiotic dahi culture . milk followed by blending for 10 sec and the moringa base product was ready for incubation then filled in pre steriliezd Poly Propylene / P.S cup and cover it foil by vacume seal. incubation at 38 °C till acidity of 0.68 %LA is achieved. The dahi is then transferred to refrigerator (- 4°C) where the final acidity of 0.8 per cent LA is achieved upon cooling.

SR. NO	Parameter	unit	Goal	Lower limit	Upper limit
1	TMS	%	Is in range	6.00	10.00
2	ACIDITY OF DAHI	%LA	maximize	0.60	1.00
3	Ph	-	maximize	4.20	4.95
4	MPP	%	maximize	1.25	2.00
5	FLAVOUR	Score out of 9	maximize	6.00	8.50
6	COLOR AND APPEARANCE	Score out of 9	maximize	6.50	8.50
7	BODY AND TEXTYRE	Score out of 9	maximize	7.00	8.50
8	OVERALL ACCEPTABILITY	Score out of 9	maximize	6.25	8.50
9	ACIDITY VALUE	%LA	Is in range	0.25	0.65

TABLE 4: VARIOUS PARAMETERS CONSIDERED FOR MANUFACTIRING OF MORINGA DAHI

XIII. EVALUATION OF THE STANDARDIZED PRODUCT FOR ITS NUTRITIVE VALUE

The standardized Moringa dahi was compared with dahi prepared using the method standardized by Kumar et al., since most of the commercially available dahi have composition which is almost similar to that reported by Kumar et al. [18]. The Moringa dahi was analyzed for proximate composition, selected vitamins and minerals and microbiological quality parameters using standard methods. The energy values of both the dahi samples viz. Moringa dahi was also calculated and compared with control.

components (g/100g)	Control	%DV	MPP DAHI	%DV
TS	16.40		17.20	
Ash	0.71			
Fat	3.1	4.0	4.45	
Saturated fat	1.9	10	1.9	
Protein	4.1		4.62	10.0
Carbohydrate	4.4	2.0	8.98	
Energy (kcal)	62		73.7	
Total dietary fiber	-	0	0.467	5.0
Vitamin C	-		0.56	7.0
Vitamin A (mcg)	65		53.3	3.0
Calcium (mg)	183		100	25.0
Iron (mg)	-		0.73	12.0
Specific gravity	1.029			
Potassium(mg)			40	10.0

TABLE 5: COMPARISON OF PROXIMATE COMPOSITION AND %DV OF MORINGA AND CONTROL DAHI SAMPLE

calculated based upon a caloric intake of 2,000 calorie (8400 kj), for adults and children four or more years of age. It can be seen from 4.10 that one serving size per day of MPP DAHI could be an "excellent source of calcium" having 25 per cent DV. MPP dahi had the highest content of iron and potassium providing 12 per cent and 10 per cent DV from amongst all the three experimental samples. The DV of protein is also 10 per cent. In order to make a "good source of micronutrient", the finished product must ideally contain 10 to 19 per cent of DV per serving, since the iron and potassium content were in this range, "good source of iron and good source of potassium and protein ".

It is well known that milk and milk products are not a good source of Vitamin C, iron and fiber. so this studied triumphant in formulating a complex dahi which can called as "good source of iron, potassium and protein", with considerable amount of Vitamin C and fiber. Based on high outcome, determinately , Moringa dahi perhaps attribute as good source of calcium and exelant source of protein, potassium and iron. calculated based upon a caloric intake of 2,000 calorie (8400 kj), for adults and children four or more years of age. It can be seen from 4.10 that one serving size per day of MPP DAHI could be an "excellent source of calcium" having 25 per cent DV. MPP dahi had the highest content of iron and potassium providing 12 per cent and 10 per cent DV from amongst all the three experimental samples. The DV of protein is also 10 per cent. In order to make a "good source of micronutrient", the finished product must ideally contain 10 to 19 per cent of DV per serving, since the iron and potassium content were in this range, "good source of iron and good

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Specific gravity	1.029			
Potassium(mg)			40	10.0

TABLE 5: COMPARISON OF PROXIMATE COMPOSITION AND %DV OF MORINGA AND CONTROL DAHI SAMPLE

Analysis After Days	Variables	p-Value	Status of Null Hypothesis	Findings
After 2 Days	Colour & Appearance	0.06	Rejected	There is difference in Colour & Appearance of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Flavor	0.02	Accepted	There is no difference in Flavor of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Body & Texture	0.07	Rejected	There is difference in body & texture of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Overall Acceptability	0.05	Rejected	There is difference in overall acceptability of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
After 7 Days	Colour & Appearance	0.005	Accepted	There is no difference in Colour & Appearance of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Flavor	0.02	Accepted	There is no difference in Flavor of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Body & Texture	0.009	Accepted	There is no difference in body & texture of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Overall Acceptability	0.02	Accepted	There is no difference in overall acceptability of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
After 12 Days	Colour & Appearance	0.378	Rejected	There is difference in Colour & Appearance of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Flavor	0.06	Rejected	There is difference in Flavor of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Body & Texture	056	Rejected	There is difference in body & texture of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Overall Acceptability	0.29	Rejected	There is difference in overall acceptability of Probiotic Dahi at
After 15 Days	Colour & Appearance	0.06	Rejected	There is difference in Colour & Appearance of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Flavor	0.01	Accepted	There is no difference in Flavor of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Body & Texture	0.02	Accepted	There is no difference in body & texture of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Overall Acceptability	0.03	Accepted	There is no difference in overall acceptability of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
After 22 Days	Colour & Appearance	0.001	Accepted	There is no difference in Colour & Appearance of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Flavor	0.001	Accepted	There is no difference in Flavor of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Body & Texture	0.11	Rejected	There is difference in body & texture of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)
	Overall Acceptability	0.05	Accepted	There is no difference in overall acceptability of Probiotic Dahi at various amount of MPP in Dahi over Control (Amul Probiotic Dahi)

Table 6: FINDINGS FROM ANOVA TEST

CONCLUSION

Thus, it can be concluded on the basis of this study that formulation and method for manufacture of Moringa dahi using Moringa pod powder was successfully developed. The standardized product was found to contain higher levels of Vitamin A, Vitamin C, iron, fiber and potassium compared to dahi prepared without addition of Moringa. Based on high outcome, determinately , MPP dahi perhaps attribute as good source of calcium and good source of iron, potassium and protein. And Based on sensory evaluation score studies, the

developed products have virtuous capability for marketing. Moringa powder made them more favorable choice for dairy technologist to develop dahi especially for healthy food.

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