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DEVELOPMENT OF WHEY BASED PROBIOTIC MANGO BEVERAGE

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ABSTRACT

In the present investigation an attempt was made to develop whey based probiotic mango beverage. Mango juices were blended to whey beverage at various levels such as 5, 10 and 15 per cent and results revealed that 15 per cent level of addition was optimum. In the process of optimization of sugar level, various levels such as 8, 10 and 12 per cent were tried and 10 per cent was highly acceptable. In the process of optimization of probiotics 1, 2 and 3 per cent were tried and 3 per cent was found to be preferable. The final optimized beverage samples were stored at ambient and refrigeration temperature. The control sample when stored at ambient temperature showed a keeping quality of 2 days and at refrigerated temperature, it was up to 6 days. Whereas the keeping quality of whey based probiotic mango beverages at ambient temperature was 3 days and at the refrigeration temperature it was up to 21 days.

KEYWORDS: Mango juices, whey, Sugar, Probiotics.

INTRODUCTION

A beverage or drink is a form of liquid which has been prepared for human consumption. The basic factor considered is the nutritive and therapeutic values, which make them popular and acceptable. At present fruit beverages are generally synthetic flavoured, bottled and sold in the market. If this could be substituted with fruit juice and dairy whey, it will be more beneficial to the consumer, dairy industries and fruit growers.

Utilization of milk by-products obtained during the manufacturing of various milk products is an important aspect of dairy processing and needs to be addressed for the survival of dairy industry.

Whey is one such by-product which is obtained during the manufacture of cheese or paneer. Interest in the use of whey has increased owing to its high nutritional and functional properties. A whey drink can replace much of the lost organics and in organics to the extracellular fluids and is a genuine thirst quencher. Being a rich source of lactose, whey is a good fermentation medium for a number of fermented products (Jain *et al*., 2013).

Many attempts have been made on utilization of whey in the formulation of various dairy products but, still there is lot of scope to explore the possibilities for its utilization in beverages particularly in health based energy drink production (Singh *et al*., 2009).

Fruit juice is composed of water, soluble solids, vitamins and minerals, pectin substances, pigments and a small degree of proteins and fats. Juices are products for direct consumption and are obtained by the extraction of cellular juice from fruit. Beverages based on fruit juices are currently receiving considerable attention due to their growing market potential.

Mango (*Mangifera indica*) is a seasonal fruit grown in tropical regions and is regarded as one of the most important fruits of Asia. In mango fruit pulp, the antioxidant vitamins A and C, vitamin B6 (pyridoxine), folate, other B vitamins and essential nutrients, such as potassium, copper and amino acids with other phytonutrients, such as the pigment antioxidants–carotenoids and polyphenols and omega-3 and omega-6 polyunsaturated fatty acids. (Beristain *et al*., 2006).

Probiotics are defined as “live microorganisms that when administered in adequate amounts confer a health benefits on the host” (FAO, 2001). Probiotics are the live microbial feed supplement, which beneficially affect the host animal by improving the intestinal microbial balance (Fuller, 1989).The incorporation of probiotics into the fermented products is to increase the number and activities of those microorganisms that presumably possess health-promoting properties and re-establish the normal intestinal microflora (Gaare *et al.,* 2012).

In recent years, fermentation of different fruit juices by probiotic lactic acid bacteria was studied by several authors. Results revealed that since fruit juices are rich sources of saccharides, they may be served as a suitable medium to cultivate probiotic lactic acid bacteria to enhance the health benefits of the food products. Probiotic bacteria are included as components of the starter cultures for non dairy foods (Mousavi *et al*., 2011).

A research study on the development of Mango whey based probiotic beverage was undertaken with the following objectives.

1. To optimize the level of addition of Mango juice, Sugar & Probiotics in the whey based beverage.
2. To study the physico-chemical, sensory & microbiological evaluation of the developed whey beverage
3. To study the shelf life of the formulated whey beverage.

MATERIALS AND METHOD

The following materials and ingredients were used in this investigation for the development whey based probiotic mango beverage. Fresh cow's milk was procured from the Students Experimental Dairy Plant, Dairy Science College Bangalore for the preparation of paneer and the whey separated out was used for the research work. Paneer whey was used from Students Experimental Dairy Plant, Dairy Science College, and Bangalore. Fresh Fruits were procured from Bangalore local market and mechanically fruit juice was extracted. Good quality cane sugar was procured from the local market. Packaging material used for packaging of whey based probiotic fruit beverage is of standard size (200 ml glass bottles).

Anyalsis: The chemicals and reagents used were mainly of highest purity and analytical grade. All the aqueous reagents used were freshly prepared.

The following chemicals were employed in the experimental work, Ammonium Hydroxide (Concentrated), Ethyl Alcohol (95%v/v), Hydrochloric acid 0.01M, Hydrochloric acid- 6M, Petroleum Ether (Boiling point range 40-60ºC, Sodium Hydroxide- 0.1N, Strontium Hydroxide- 0.1N, Sodium Hydroxide- 0.5M, Sulphuric acid (concentrated), 90% Gerber's Sulphuric acid, Amyl alcohol, Fehling solution-A & B, 0.5% Standard Lactose solution, 0.5% Methylene blue indicator, 50% sulphuric acid, Copper sulphate and potassium sulphate (1:2 ratio), 2% Boric acid solution, Mixed indicator i.e., Methylene blue and methyl red (1:2), 0.02 N Hydrochloric acid, 0.1 N Sodium hydroxide, Sodium chloride, Phenolphthalein indicator.

Media used for microbiological study: The readymade media used for microbiological analysis. VRBA for enumeration of coliforms, Malt Extract Agar (MEA) for enumeration of yeast and mold and Bifidobacterium Agar (BA) for enumeration of Bifidobacterium bifidum from Himedia Laboratories private limited, Mumbai were used for enumeration.

Methods

Various methods followed for optimizing the process to prepare whey based probiotic fruit beverage.

Procedure for the production of paneer whey

Paneer was prepared as per the method suggested by Bhattacharya et al., (1971) with slight modifications. The standard milk is heated to 90^0C/no hold, and then cooled to 70^0C. Two per cent citric acid solution is added to milk with vigorous stirring initially then gently stirring till the completion of coagulation. Then coagulant added milk was left for 5 minutes undisturbed. Afterwards the clear whey was separated by filtering through muslin cloth and the collected whey was used for further study.

Procedure for the production of paneer whey beverage

Paneer whey beverage was prepared as per the method outlined by Shankarlingaiah (2014) Standardized milk was heated to 90°C/no hold, and then cooled to 70°C followed by addition of 2 per cent citric acid with gentle stirring till the complete coagulation. This was left for 5 to 10 mins undisturbed. The clear whey was then separated and the clear whey was added with 6 per cent sugar followed by pasteurization.

Preparation of fruit juice

Good quality fruits were procured from Bengaluru local market and fruits were subjected for washing and then peeled. Fruit juice was extracted manually by using mixer and filtered by using muslin cloth and it was pasteurized at 72°C for 15 seconds.

Optimization of Mango fruit juice for the preparation of whey based probiotic fruit beverage

The fruit juice was tried at different levels viz., 5, 10, and 15 per cent on whey basis and served to the in house panel of 5 trained judges to optimize the fruit juice level.

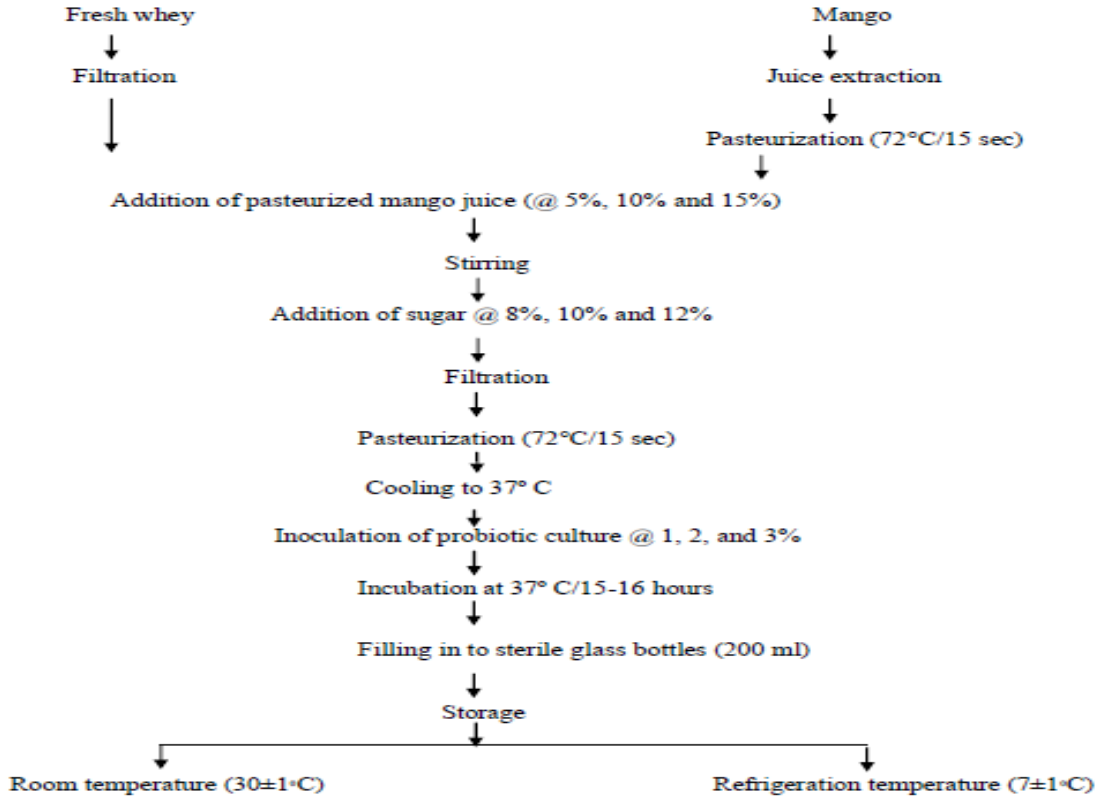
Optimization of sugar for the preparation of whey based probiotic fruit beverage

Sugar was added at various levels at the rate of 8, 10, and 12, per cent to the whey beverage.

Optimization of probiotic culture levels for the preparation of whey based probiotic fruit beverage

Bifidobacterium bifidum was added at various levels viz., 1.0, 2.0, and 3.0 per cent on fruit juice fortified whey basis.

Optimization of mango juice blended probiotic whey beverage



RESULT AND DISCUSSION

Effect of different levels of mango juice on the sensory characteristics of whey beverage

The mango juice was added to whey at three different levels viz., 5.0, 10.0 and 15.0 per cent. The experimental samples were subjected to sensory analysis by a panel of judges using 9-point hedonic scale. In case of mango juice blended probiotic whey beverage, the sensory scores regarding the effect of incorporation of mango juice for colour and appearance, body and texture, flavour and overall acceptability are presented in Table 1 and Fig 1. The highest colour and appearance score (8.33) was awarded to 15 per cent level sample compared to control (7.25) and other treated samples. There was a significant difference between the colour and appearance scores of control and treated samples probably because of more prominent colour of mango juice in whey beverage, 15 per cent level of addition was accepted. The highest body and texture score (8.25) was awarded to 15 per cent level sample compared to control (7.25) and other treated samples. Blending of mango juice at 15 per cent level was found to be optimum. Addition of 15 per cent mango juice in the whey beverage might have contributed to the better body and texture probably due to presence of more solids in mango juice.

The results obtained are in close agreement with the findings of Chavan et al., (2015), where in the study revealed that the whey based mango beverage prepared by blending 10 per cent mango juice to whey among four different levels viz., 4, 6, 8 and 10 per cent, 10 per cent was found to be better in colour and appearance and body and texture.

The flavour scores of 7.00, 7.75, 8.10 and 8.50 were awarded to control, 5, 10 and 15 per cent mango juice blended samples, respectively. It is clear from the results that 15 per cent addition secured highest flavour score, due to optimum flavour intensity. But, for 5 and 10 per cent samples the scores were significantly lower for flavour compared to 15 per cent sample probably due to the presence of low mango flavour intensity.

The highest overall acceptability score (8.33) was awarded to the 15 per cent mango juice blended sample. There was a significant difference between 15 per cent and other treated samples. It was found that increasing the mango juice level in the beverage increased the overall acceptability of the product.

Table. 1: Effect of different levels of mango juice on the sensory characteristic of whey beverage.

Levels of mango juice	Colour and appearance	Body and texture	Flavour	Overall Acceptability
Control	7.25^{a}	7.25^{a}	7.00^{a}	7.08^{a}
5%	7.75^{b}	7.50^{a}	7.75^{b}	7.75^{b}
10%	8.00^{a}	7.90^{b}	8.10^{b}	8.00^{a}
15%	8.33^{a}	8.25^{a}	8.50^{a}	8.33^{a}
CD(P≤0.05)	0.54	0.40	0.45	0.50

Note: Values are average of three trials

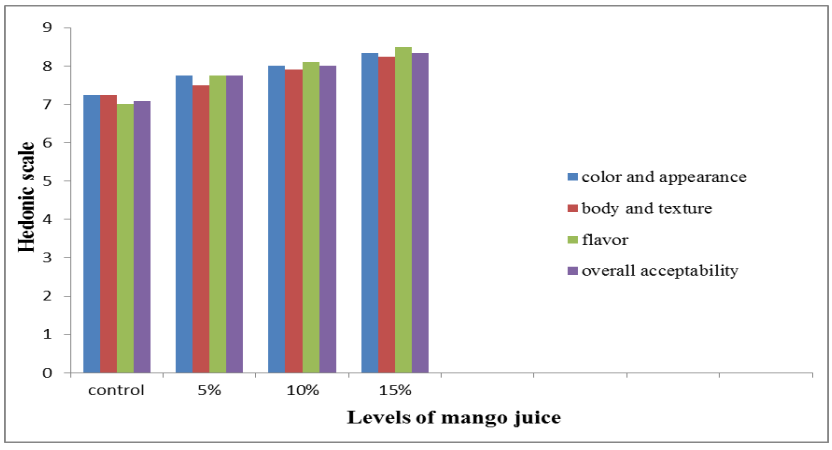


Fig. 1: Effect of different levels of mango juice on the sensory characteristics of whey beverage.

The results obtained are in agreement with the findings of Babar et al., (2008), where in the study revealed that ready to serve beverage prepared by blending the chakka whey and mango pulp in the proportion (85:15) was found better in almost all physicochemical and sensory quality parameters as compared to the other combinations. Similarly, Yalcin et al., (1994) observed that in chhana whey beverage, increased concentration of mango juice was acceptable due to more prominent colour.

Effect of different levels of sugar on the sensory characteristics of mango juice blended whey beverage: The sugar was added to mango juice blended whey beverage at three different levels viz., 08, 10 and 12 per cent. The experimental samples were subjected to sensory analysis by a panel of judges using 9-point hedonic scale. The sensory scores regarding the effect of incorporation of sugar for are presented in Table 2 and Fig 2.

Significantly ($P<0.05$) higher flavour scores were awarded to 10 per cent compared to other treated samples. The lowest flavour score was awarded to 8.0 per cent sugar level probably due to low sweet taste. At 12 per cent sugar level sample secured low score may be due to higher levels of sweetness. In case of colour and appearance there was no significant change with increase in sugar level and in case of body and texture there was a significant difference among the samples. Overall acceptability the scores significantly increases with increase in sugar levels up to 10 per cent, above that there was significant decrease in sensory scores due to more sweetness and thick consistency of the sample. Therefore the sample at 10 per cent sugar level had good body and texture with optimum sweetness and was adjudged as best.

Table. 2: Effect of different levels of sugar on the sensory characteristics of mango juice blended whey beverage.

Levels of sugar	Colour and appearance	Body and texture	Flavour	Overall Acceptability
Control (6%)	7.75^{a}	7.50^{a}	7.75^{a}	7.75^{a}
8%	7.83^{a}	7.90^{b}	8.10^{b}	8.00^{b}
10%	8.10^{a}	8.16^{a}	8.25^{a}	8.33^{a}
12%	7.91^{a}	7.75^{a}	7.75^{b}	7.50^{b}
CD($P\leq0.05$)	NS	0.40	0.47	0.56

Note: Values are average of three trials

NS – Non significant

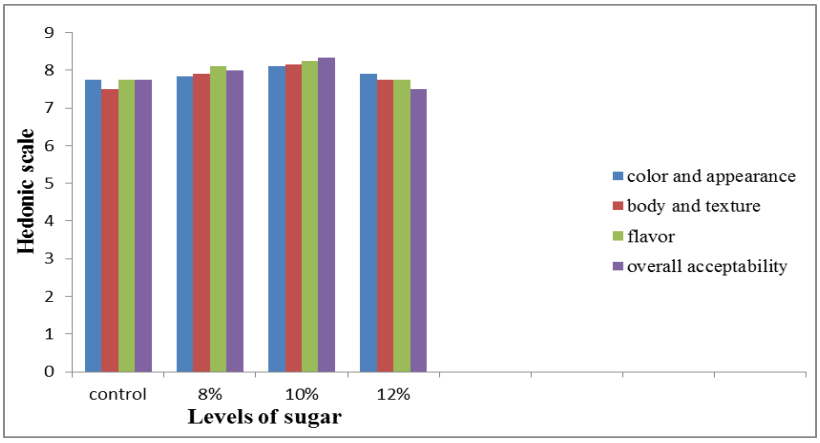


Fig. 2: Effect of different levels of sugar on the sensory characteristics of mango juice blended whey beverage.

Similar findings were observed by Mahesh (2015) in his study on flaxseed oil fortified probiotic whey beverage by using 10 per cent was found to be best regarding sensory and other physico-chemical characteristics.

Effect of different levels of probiotic culture on the sensory characteristics of mango juice blended whey beverage

The probiotics were added to mango juice blended whey beverage at three different levels viz., 1.0, 2.0 and 3.0 per cent.

The sensory scores regarding the effect of incorporation of probiotics for colour and appearance, body and texture, flavour and overall acceptability are presented in Table 3. Addition of probiotics at the rate of 3.0 per cent was found to be optimum for the preparation of whey based probiotic fruit beverage in terms of all sensory attributes. Lower level of addition of probiotics other than 3 per cent have resulted in unacceptable body texture and flavour properties of the beverage. Lower levels of probiotics resulted in weak fermented flavour due to decreased viability of probiotics. Similar findings were observed by Mahesh (2015) in his study on flaxseed oil fortified probiotic whey beverage by using 3 per cent Bifidobacterium bifidum which was found to be best regarding taste and other physical characteristics.

Table. 3: Effect of different levels of probiotics on the sensory characteristics of mango juice blended whey beverage.

Levels of probiotic culture	Colour and appearance	Body and texture	Flavour	Overall Acceptability
Control	7.08[a]	7.16[a]	7.33[a]	7.66[a]
1%	7.25[a]	7.50[b]	7.50[a]	7.75[a]
2%	7.66[a]	7.75[a]	7.75[b]	7.90[b]
3%	8.00[a]	8.16[a]	8.33[a]	8.50[a]
CD(P≤0.05)	NS	0.33	0.55	0.43

Note: Values are average of three trials

NS – Non significant

Probiotics: *Bifidobacterium bifidum*

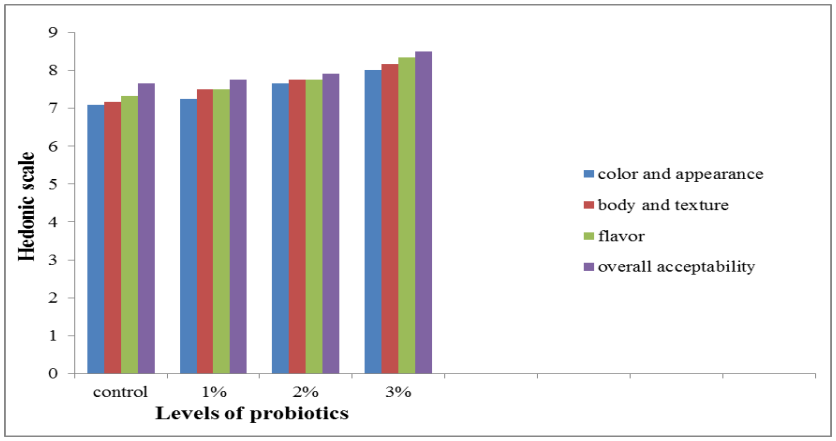


Fig. 3: Effect of different levels of probiotics on the sensory characteristics of mango juice blended whey beverage.

Chemical Composition of whey beverage and whey based probiotic mango beverage The chemical composition values of whey beverage (control) and whey based probiotic fruit beverages are tabulated in Table 4. From the result, it is clear that there was significant increase in the components level of the fruit juice blended probiotic beverages, when compared with the control. The total solids increased due solids present in the fruit juices and addition of sugar also has contributed to the total solids content of whey based probiotic fruit beverages. In case of fat content there was no significant difference between control and whey based probiotic fruit beverages. This may be due to low content of fat in fruit juices. The protein content increased in whey based probiotic fruit beverages compare to control and this could be due to the presence of proteins in fruit juices. Ash content increased in whey based probiotic fruit beverages compare to control which could be due to the presence of solids in the fruit juices. Whey based probiotic fruit beverages the lactose content decreased

compared to control and this may be due to conversion of lactose in to lactic acid in whey based probiotic fruit beverages. Farhan and Rongen (2014) quoted similar findings with the fortification of guava pulp with whey which resulted in better quality and increased nutritional benefits with the increasing components of total solids, fat and protein content.

Table. 4: Chemical composition of whey based probiotic fruit beverage.

Constituents (%)	T_0	T_1
Total solids	11.48	15.84
Fat	0.18	0.20
Protein	0.34	0.87
Lactose	4.85	1.73
Ash	0.58	0.74

Note: Values are average of three trials

Probiotic incubated at (37^oC/15-16 hours)

T_0 = Whey beverage (control)

T_1 = Mango juice blended probiotic whey beverage

Physico-chemical properties of whey based probiotic fruit beverage

The physico-chemical properties of whey beverage (control) and whey based probiotic fruit beverages are presented in Table 5.

The variation in pH and acidity, could be due to decreased lactose content in probiotic whey beverages. Acidity of whey based probiotic fruit beverages with addition of mango juice increased probably due the acidic nature of fruit juices. In case of viscosity, whey based probiotic fruit beverages showed increased viscosity probably due to the presence of solids in the fruit juices. There was no significant change in water activity in between whey based probiotic fruit beverages and control. The results obtained are in close agreement of the results of Nupur and Gandhi (2009) who found that probiotic whey beverage gave desirable results with highest sensory scores for overall acceptability and increased physicochemical properties when compared to control.

Table. 5: Physico-chemical properties of whey based probiotic fruit beverage

Properties	T_0	T_1
pH	5.10	3.20
Acidity(%LA)	0.22	0.62
Specific gravity	1.04	1.06
Viscosity(cp)	1.06	1.89
Water activity(a_w)	0.99	0.98

Note: Values are average of three trials

Probiotic incubated at (37°C/15-16 hours)

T_0 = Whey beverage (control)

T_1 = Mango juice blended probiotic whey beverage

Storage studies

The final products of whey beverage and whey based probiotic fruit beverage samples were stored at ambient temperature and refrigeration temperature by using sterilized glass bottles as a packaging material, in order to check the storage stability and microbiological quality of whey beverages.

Effect of storage on acidity of whey based probiotic fruit beverage stored at ambient temperature (30±1^{0}C).

The chemical analysis carried out daily for whey beverage and whey based probiotic obtained results are tabulated in the Table 6.

As could be seen from the results that the initial acidity of T_0 sample was 0.21 per cent, and then gradually acidity increased to 0.43 per cent and 0.67 per cent on 1st day and 2nd day, respectively. Similarly, the initial acidity of T_1 sample was 0.62 per cent initially and acidity increased to 0.65 per cent, 0.68 per cent, and 0.73 per cent on 1st, 2nd and 3rd day, respectively. The acidity of whey based probiotic fruit beverages was slightly higher probably due to the increase in lactic acid and amino acids from lactose and protein present in whey as confirmed by Suresha (2002).

Table. 6: Effect of storage on acidity of whey based probiotic fruit beverage stored at ambient temperature (30±1^{0}C).

Sample	Titratable acidity(%LA)				
	No of days of storage at (30±1^{0}C)				
	0	1	2	3	4
T_0	0.21	0.43	0.67	UA	-
T_1	0.62	0.65	0.68	0.73	UA

Note: Values are average of three trials

UA- Unacceptable

T_0 = Whey beverage (control)

T_1 = Mango juice blended probiotic whey beverage

Effect of storage on acidity of whey based probiotic fruit beverage stored at refrigeration temperature (7±1^{0}C). The chemical analysis carried out at every three days of intervals for whey beverage and whey based probiotic fruit beverage samples for acidity and the results obtained during the study are tabulated in Table 7. It can be seen from the results that the initial acidity of T_0 sample was 0.21 per cent which gradually increased to 0.44 per cent on 3rd day and further to 0.76 per cent on 6th day. In case of T_1 sample, the initial acidity was 0.62 per cent, then acidity increased to 0.63 per cent on 3rd day, 0.65 per cent on 6th day, 0.67 per cent on 9th day, 0.68 on 12th day, 0.71 and 0.73 per cent on 15th and 18th day, and 0.77 per cent on 21st day, respectively. The results revealed that control sample had a shelf life up to six days, whereas whey based probiotic fruit beverages had a shelf life of twenty one days when compared to control. The acidity of whey based probiotic fruit beverages increased with increase in storage period. The increase in acidity is probably due to increased lactic acid and amino acids content in whey. Christopher et al. (2006), noted similar findings in probiotic yoghurt using Bifidobacterium bifidum at the rate of 2.5 per cent, and observed that product shelf life was 4 weeks stored at refrigeration temperature.

Table. 7: Effect of storage on acidity of whey based probiotic stored at refrigeration temperature (7±1^{0}C).

Sample	Titratable acidity(%LA)								
	No of days of storage at (7±1^{0}C)								
	0	**3**	**6**	**9**	**12**	**15**	**18**	**21**	**24**
T_0	0.21	0.44	0.76	UA	-	-	-	-	-
T_1	0.62	0.63	0.65	0.67	0.68	0.71	0.73	0.77	UA

Note: Values are average of three trials

UA- Unacceptable

T_0 = Whey beverage (control)

T_1 = Mango juice blended probiotic whey beverage

Microbiological quality of whey based probiotic fruit beverage stored at ambient temperature (30±1^{o}C).

The experimental samples of whey beverage (control) and whey based probiotic fruit beverage were filled in sterile glass bottles and were sealed; the samples were stored at ambient temperature (30±1^{o}C). The microbiological analysis were carried out every day during storage period for coliform, and yeast and mold counts for whey beverage and coliform, yeast and mold and probiotic viability counts for whey based probiotic fruit

beverage. Microbiological quality of mango juice blended probiotic whey beverage stored at ambient temperature (30±1^{o}C).

The results pertaining to microbiological quality of whey beverage (control) and mango juice blended probiotic whey beverage results are presented in Table 8. In case of whey beverage (control), there was no growth of coliform during the storage period whereas, on 3rd day and 4th day the yeast and mold count of the sample were 2 cfu/ml and 5 cfu/ml, respectively, was observed. Similarly, in case of mango juice blended probiotic whey beverage, there was no growth of coliform during the storage period but in case of yeast and mold the count were nil up to 2nd day and on 3rd day and 4th day, the yeast and mold count of the sample was 0.10 and 0.56 (log_{10} cfu/ml), respectively. In case of viability of probiotic the initial counts decreased from 7.78 to 7.62 (log_{10} cfu/ml) on 1st day, then gradual decline in the counts were observed after three days.

Table. 8: Microbial quality of mango juice blended probiotic whey beverage tored at ambient temperature (30±1^{0}C).

No of days	Whey beverage		Mango juice blended probiotic whey beverage		
	Coliforms	Y&M	Coliforms	Y&M	Probiotics
	(cfu/ml)		(log_{10} cfu/ml)		
0	Nil	Nil	Nil	Nil	7.78
1	Nil	Nil	Nil	Nil	7.62
2	Nil	Nil	Nil	Nil	7.55
3	Nil	2	Nil	0.10	7.21
4	Nil	5	Nil	0.56	7.09

Note: Values are average of three trials

Probiotics: *Bifidobacterium bifidum*

Shareef (2013), in his microbiological study on pasteurized whey beverage, has concluded that shelf stability of whey beverage and pine apple blended fermented whey beverage was two days and three days, respectively at ambient temperature. Microbiological quality of mango juice blended probiotic whey beverage stored at refrigeration temperature (7±1^{o}C).

The results pertaining to microbiological quality of whey beverage (control) and mango juice blended probiotic whey beverage results are presented in Table 9. In case of whey beverage (control), there was no growth of coliform during the storage period whereas, on 9th day the yeast and mold count of the sample were 3 cfu/ml was observed. Similarly in case of mango juice blended probiotic whey beverage, there was no growth of coliform during the

storage period but in case of yeast and mold the counts were nil up to 21st day, and on 24th day yeast and mold count of the sample was 0.58 log_{10} cfu/ml. In case of viability of probiotic organism, the initial counts decreased from 7.78 to 7.69 (log_{10} cfu/ml) on 3rd day, then gradual decline in the counts were observed after 21 days.

Table. 9: Microbial quality of mango juice blended whey beverage stored at refrigeration temperature (7±1^{0}C).

No of days	Whey beverage		Mango juice blended probiotic whey beverage		
	Coliforms	Y&M	Coliforms	Y&M	Probiotics
	(cfu/ml)		(log_{10} cfu/ml)		
0	Nil	Nil	Nil	Nil	7.78
3	Nil	Nil	Nil	Nil	7.69
6	Nil	Nil	Nil	Nil	7.61
9	Nil	3	Nil	Nil	7.56
12	-	-	Nil	Nil	7.41
15	-	-	Nil	Nil	7.30
18	-	-	Nil	Nil	7.10
21	-	-	Nil	Nil	6.90
24	-	-	Nil	0.58	6.81

Note: Values are average of three trials

Probiotics: *Bifidobacterium bifidum*

But on storage beyond twenty one days yeast and mold colonies were noticed in the whey based probiotic fruit beverage samples thus indicating the spoilage of the product. Because of mold growth the probiotic viability decreased to 10^6cfu/ml, therefore the stability of the whey based probiotic fruit beverage product was found to be for twenty one days at refrigeration temperature. This increase in shelf life up to twenty one days is mainly due to the well-established fact that lower temperature results in inhibition of the microbial growth, and also because of added sugar which might have resulted in plasmolysis of the microorganisms leading to microbial inhibition.

Mahesh (2015), in his microbiological study on flaxseed oil fortified probiotic whey beverage, has concluded that shelf stability of whey beverage and flaxseed oil fortified probiotic whey beverage was for six days and twenty one days, respectively at refrigeration temperature.

CONCLUSION

It is evident from the investigation, that paneer whey can be effectively utilized for the development of whey based probiotic fruit beverage. Whey is rich in lactose, minerals and

water soluble vitamins; it can be effectively utilized in the preparation of beverages by employing most economical and convenient process of fermentation. Fruit juices are rich source of vitamins and minerals play a role in the delivery of nutrients identified as important to maintain health and disease prevention. Whey can be found successful for the development of whey based probiotic fruit beverage with optimum sensory characteristics. The nutritious beverages with better storage life could be developed by addition of whey up to certain extent. Whey based probiotic fruit beverage have excellent colour, flavour and stability was estimated to be high which means that fruit juice covered bland taste of whey very successfully. Further addition of fruit juice and probiotics will definitely improve the characteristics of whey based beverages with very good shelf life both at ambient and refrigerated storage.

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