International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Development, Nutrient and Antioxidant Analysis of Probiotic Health Based Beverage Incorporating Musk Melon and Whey Water

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Abstract: ***Musk melon (Cucumis melo) is a beautiful, juicy, tasty fruit of the curcurbitaceae family which includes 825 species in 118-119 genera. It is also rich in antioxidant flavanoids such as β-carotene, Vitamin C, lutein, adenosine, zea-xanthin and cryptoxanthin and the folic acid present in the fruit is very good for pregnant women and makes the baby healthy and it helps to prevent the neural tube defects. Whey and whey based products have relatively high lactose content which forms a suitable substrate for probiotics in the intestine and it increased the absorption of calcium. An RTS beverage was prepared by using Whey water and Musk melon incorporated probiotic drink. Product developed with Whey protein at 60% incorporation received highest acceptability score. No statistically significant difference was found between the control and Whey protein incorporated Musk melon squash. The Nutrient content of V2 was higher than other variations. It study was concluded that incorporation of Whey water, Muskmelon(rich in antioxidants) and probiotic can prevent our body from various disease conditions and it has potential health benefits.***

Keywords: RTS beverage, probiotic, whey water, antioxidant, acceptability

1. Introduction

Now days people are becoming more health conscious thus awareness about functional foods is also increasing. The fruit and milk products based beverages are getting attention these days due to their nutritional status besides being delicious (Yadav *et al*., 2010). Probiotics are defined as the viable microorganisms that exhibit a beneficial effect on the health of the host by improving its intestinal microbial balance. The term probiotic is defined by a United Nation and World Health Expert Panel as live microorganisms which when administered in adequate amounts confer a health benefit on the host. Probiotics are also defined as the viable microorganisms that exhibit a beneficial effect on the health of the host by improving its intestinal microbial balance. (Arora Neha *et al*., 2012). Probiotics are viable organisms, and therefore it is feasible that they could infect the host. Historical data indicates that probiotic *Lactobacilli* and *Bifidobacteria* associated with food have been considered to be safe (Conway *et al*., 1987). Therapeutic approaches with probiotic could help to reduce the risks of infestation by specific parasites or complement classical anti-parasite treatments. Probiotic therapy has already made its way in the treatment of number of conditions-infectious, inflammatory, neoplastic and allergic (Arora Neha *et al*., 2012). The principal site of cholesterol metabolism is the liver, although appreciable amounts are formed in the intestines. Claims are strong that certain L. acidophilus strains and some *Bifidobacteria* species are able to lower cholesterol levels within the intestine. Cholesterol precipitates with deconjugated bile salts as the pH declines as a consequence of lactic acid production by the lactic acid bacteria (Marshall, 1996). *Lactobacillus bulgaricus* was the first organism to be implicated in providing benefits to human health when a bulgarian scientist Metchinoff in 1908, isolated it from yogurt cultures. He believed that this organism was the source of the improved health and longevity of those who had consumed the fermented food (Marshall, 1996). Basically the liquid portion of milk which is left after milk coagulation and removal of curd “paneer” is recognized as whey. It is greenish colored translucent liquid. It is estimated that about 3 million tones/annum of whey which is generated in India and contains 2 lacs tons of precious milk constituents. Whey is a valuable bi product obtained during manufacture of cheese, chhana, paneer, casein, and shrikhand in dairy industries and usually dumped because of unawareness of its value (Dhamsaniya and Varshney, 2013). Important components of whey are lactose, whey proteins, minerals and vitamins. Whey is composed of 40-50% of total milk solids,70% of milk sugar (lactose) 20% of milk proteins 70-90% of milk minerals and contains all the water soluble vitamins originally present in milk (Dhamsaniya and Varshney, 2013). Whey proteins control biological activities such as appetite suppression, antioxidant action. Whey also stimulates immune system, has therapeutic value and anticarcinogenic properties and helps fight against HIV infection. Whey drinks can stabilize the osmolar system of the body efficiently, however these drinks also have a thirst quenching effect (Rupner *et al*., 2009).

Musk melon is a beautiful, juicy, tasty and delicious fruit popular for its nutritive and medicinal properties. The Cucurbitaceae family includes squash, pumpkins, cucumbers, Musk melons, watermelons, and gourds. *Cucumis melo* (Cantaloupe or Musk melon) is one of the most important cultivated cucurbits, which is native to India and Africa. It is a spreading, annual, more or less hairy vine. It grows well in all the tropical and subtropical areas of the

world, but prefers hot climate. Musk melon is recommended for the treatment of cardiovascular disorders, as a diuretic, stomachic, anti-tussive and as a vermifuge (Parle Milind and Singh Kulwant, 2011). The phytoconstituents from various parts of the plant include β -carotenes, apocarotenoids, ascorbic acid, flavonoids, terpenoids, chromone derivatives, carbohydrates, amino acids, fatty acids, phospholipids, glycolipids, volatile components and various minerals. *Cucumis melo*, in addition to its superior consumer preference, is an extremely healthful food choice as they are rich in ascorbic acid, carotene, folic acid, and potassium as well as a number of other human health-bioactive compounds (Lester & Hodges, 2008). *Cucumis melo* has been shown to possess useful medicinal properties such as analgesic, anti-inflammatory, anti-oxidant, free radical scavenging, anti-platelet, anti-ulcer, anti-cancer, anti-microbial, hepato-protective, diuretic, anti-diabetic, anthelmintic and anti-fertility activity. Thus, it is evident that Musk melon fruit possess a wide range of useful medicinal properties, which can be exploited clinically (Parle Milind and Singh Kulwant, 2011). Pharmacological studies conducted on *Cucumis melo* indicate its immense potential in the treatment of conditions such as pain, inflammation, cardiovascular disorders, liver diseases, cancer, coughs, and dysuria. Musk melon exhibits excellent anti-oxidant potential. It is very clear that this plant has tremendous popularity now and also holds extraordinary promise for the future (Parle Milind and Singh Kulwant, 2011).Hence this study was carried out to develop the value added probiotic and whey incorporated with the musk melon juice was nutritious, anti-oxidants rich and economically valuable and easily available to the public sector.

2. Materials and Methods

2.1 Preparation of musk melon juice and whey water

Selected fresh, ripened musk melon fruits were washed well and chopped into small pieces to prepare the pulp from the fruit after the removal of seeds. The juice was extracted from the pulp with the help of juicer and stored in the refrigerator. Whey water was prepared with the help of standard procedures. The musk melon squash was standardized in three variations were prepared by adding 50%, 40% and 30 % of whey water to 50%, 60 % and 70 % of musk melon juice. The prepared beverage was pasteurized at 80°C for 15 mins to destroy the pathogenic microorganisms. The probiotic microorganism (*L.bulgaricus*) was inoculated and incubated at 37°C for 48 hrs and added in the beverage. The prepared beverages were filled in bottles (200ml) which were sterilized with boiling water and then filled aseptically and sealed again dipped in hot water for few seconds in order to avoid any contamination. Filled bottles were cooled and stored in refrigerated conditions for storage studies.

2.2 Organoleptic evaluation

Organoleptic evaluation is a scientific method that evokes, measures, analyzes the products as perceived through the senses of sight, smell, taste and sound. Prepared beverage was given to 25 semi trained panel members for evaluating the organoleptic characteristic of the product. Sensory characteristics of the products such as colour, appearance, flavor, taste and acceptability were evaluated. A nine point hedonic scale was used for sensory evaluation.

2.3 Nutrients Analysis

The nutrient analysis was analyzed for control sample and most accepted scores of Whey water incorporated musk melon squash. The parameters selected for the analysis like energy, protein, fat, calcium, iron, phosphate, β-carotene, Vitamin C, casein and total antioxidant activity. The physico-chemical constituents like acidity, pH, TSS, total sugar, reducing sugar were analyzed with standard procedures of AOAC (1995).

2.4 Microbial Analysis

Total plate count (TPC) and Gram staining was recorded over a 15 days interval for 60 days for shelf life analysis.

2.5 Statistical analysis

Statistical analysis was used in estimating the value of unknown characteristics to check the populations for drawing interferences. Nutrient analysis and the sensory evaluation of the prepared samples were conducted and the results were tabulated and statistically analyzed by using standard deviation and Annova –one way method.

3. Results and Discussion

3.1 Organoleptic Evaluation of the Prepared Samples

Sensory evaluation consists of judging the quality of food. Qualities of foods are evaluated by sensory organs- eye, nose, and mouth or by the use of instruments. By the sense of sight, the size, shape, appearance, and color of foods could be perceived.

Table 1: Organoleptic evaluation of the prepared samples

S. No.	Criteria	Control	V_1	V_2	V_3
1	Color and appearance	8.54±1.073	6.78±1.507	7.35±0.78	7.16±1.27
2	Flavor	8.16±1.06	6.75±1.24	7.44±1.04	6.43±1.38
3	Consistency	8.45±1	7.04±1.20	7.26±1.02	7.34±1.12
4	Taste	8.34±1.322	6.78±1.392	7.61±0.912	6.36±1.075
5	Overall acceptability	8.38±1.220	6.88±1.0967	7.67±1.224	6.56±1.260

V_1 - 50 % Musk melon juice and 50 % Whey water V_2 - 60 % Musk melon juice and 40 % Whey water

V_3- 70 % Musk melon juice and 30 % Whey water C - 50 % Musk melon juice and 50 % Whey water

From the sensory evaluation it is revealed that control got high score than other variations. The V_3 got good score in consistency (7.34±1.12), V_2 scored (7.61±0.912) in taste and overall acceptability (7.67±1.224). Compared to all the values of organoleptic evaluation V_2 got maximum score in all parameters for the evaluation. Mann, (1997) explained that standardized and formulation of whey fruit beverages using whey with different fruits like banana, pineapple and lemon among them mango beverage scored maximum for all sensory attributes and it contains 15% mango pulp 7% sugar and 78% whey.

Table3.2: Physicochemical parameters of formulated RTS beverage

S. No.	Parameter	Control	V_1	V_2	V_3
1	pH	4.1±0.12	4.3±0.92	3.6±0.56	4.6±0.64
2	Acidity	1.2±0.03	2.1±0.06	2.3±0.03	2.4±0.01
3	TSS	46±2.3	33±1.6	31±1.9	35±2.1
4	Reducing sugar	11.6±3.21	11.0±2.93	10.9±2.23	10.4±2.34
5	Total sugar	38±1.11	35.2±1.21	34±0.98	34.2±1.29

Physicochemical properties such as acidity, pH, TSS, reducing sugar, total sugar were analyzed by using standard procedure (AOAC, 1995). Freshly prepared whey water incorporated musk melon squash contained 46 of TSS in the control sample and Variation III got higher brix value 35 respectively. The total sugar score of the control and experimental sample ranged as 38g, 35.2 g, 34 g and 34.2 g respectively. Teotia *et al*. (1997) reported that total sugar of the musk melon squash was slightly decreased during 0-6 months. The reducing sugar score of the control and experimental sample ranged as 11.6g, 11 g, 10.9 g and 10.4 g respectively. The pH score of the control and experimental sample ranged as 4.1, 4.3, 3.6 and 4.6 respectively. Whey when analyzed for its composition by Baljeet *et al*. (2008) were found to contain 4.72 ±0.01 pH and acidity 0.70±0.03 and 0.98 ±0.03 content of protein. Baber *et al*. (2008) reported that chakka whey contains 1.3 % of protein and 4.514 % of lactose content and composition of whey based beverages depends on processing quality.

The TSS value of the RTS beverage was 15ºB upto 75th day of storage on 90th day slight decreased to 14.80ºB.The RTS beverage prepared from enzyme clarified musk melon juice did not show any changes in TSS during 6 months of storage life.(Teotia *et al*., 1997). An increase in acidity from 0.28to 0.34g% from mango RTS beverage and 0.25 to 0.28g% for jackfruit beverage were reported (Krishnaveni *et al*., 1998).

Table 3.3:.Nutrient analysis of muskmelon beverage

S. No.	Parameter	Control	V1	V2
1	Energy	136.97±1.07Kcal	105.00±2.09Kcal	112.80±1.06Kcal
2	Protein	0.56 ± 0.15g	2.20 ± 0.50g	2.00 ± 0.32g
4	Calcium	38.00 ±2.07 mg	48.00 ±2.08 mg	49.00±3.04 mg
5	Iron	0.16mg	0.26mg	0.28mg
6	Phosphate	16.00 ± 0.57	40.00 ± 2.08	48.00 ±1.03
7	Casein	-	1.5%	0.9%

Nutrient analysis was done by using a standard procedure. V2 got high energy value (112.80±1.06Kcal). V1 got high protein value (2.20 ± 0.50g) and V2 got high calcium content (49.00 ± 2.08 mg). Phosphate content of the V2 (48.00 ± 2.08) was high. The presence of casein was analyzed for both variations from that V1 got 1.5 % higher value. Protein content of whey carrot beverage 1.26, 1.14, 1.32 respectively but it was decreased during storage period due to ascorbic acid content (Jaspreet Kaur *et al*., 2015).

Table3.4: Antioxidant content of the whey water and probiotic incorporated muskmelon beverage

S. No.	Parameter	Control	V_1	V_2
1	Beta carotene	2569.10± 95.15c**	2800.00±123.10a**	2965.00± 37.12v**
2	Vitamin C	35.00 ± 1.01c**	22.00 ± 1.06a**	27.00 ± 1.07 b**
3	Total antioxidant value	3410.0 ± 3.43c**	5340.0± 5.39**	5400.0 ± 7.84b**

Musk melon fruit was rich in β-carotene, which synthesized Ripening process and Musk melon was contains high antioxidant value. Flavonoids and β-carotene are the major content for the antioxidant activity of musk melon. This table indicated that V_2 (5400.0 ± 7.84b) got higher value of antioxidant activity. The ascorbic content of muskmelon RTS beverage noted decreased from 18.10 to 9.75mg% after 6 months may be due to increase in acidity leading to degradation of ascorbic acid (Teotia *et al*., 1997).

4. Conclusion

An RTS beverage was prepared by using Whey water and Musk melon incorporated probiotic drink. Product developed with Whey protein at 60% (Variation II) incorporation received highest acceptability score which was selected for the Nutrient analysis. Nutrient content of V2 was higher than other variations. It study was concluded that incorporation of Whey water and probiotic *(L.bulgaricus)* can prevent our body from various disease conditions and it has wonderful health benefits. It study was concluded that incorporation of Whey water, Muskmelon(rich in antioxidants) and probiotic can prevent our body from

various disease conditions and it has potential health benefits which helps to enrich the health status of the community.

References

[1] Arora Neha, Singh Kamalji, Bilandi Ajay, Garg Tarun. Probiotic: as effective treatment of diseases, Inter. Re. J. Pharm 2012; 3 (1): 96-101.
[2] Conway PL, Gorbach Sl, Golbin BR. Survival of lactic acid bacteria in the human stomach and adhesion to intestinal cells. J. Dairy. Sci. 1987; 70:1-12.
[3] Marshall, V. M. Bioyogurt: How healthy? Dairy Industries International (1996);61(1):28–29.
[4] Pandiyan C, Annal Villi R, Kumaresan G, Murugan B, Gopalakrishnamurthy T. R. Development of synbiotic ice cream incorporating *Lactobacillus acidophilus* and *Saccharomyces* boulardii. International Food Research Journal (2012); 19(3):1233-1239.
[5] Yadav R B,Yadav B S,Kalia N. Development and storage studies on Whey based banana herbal beverage. Am. J. Food .Tech (2010);5:121-129.
[6] Dhamsaniya N.K, Varshney A.K. Development and evaluation of Whey based RTS beveragefrom ripe banana juice. J. Food. Tech (2013); 4:2-6
[7] Rupner P.S, Chavan K.D, Pawar B.K, Bhosale D.N. Sensory quality of pannier whey beverage prepared with kukum juice. J Dairying foods & Horti Sci (2009); 28:111-114.
[8] Parle Milind and Singh Kulwant. Musk Melon is eat-Must Melon. Inter. Re. J. Pharmacy (2011); 2 (8): 52-57.
[9] AOAC official methods of analysis. 17th Edition. Association of Official analytical Chemists, (2000), Washington.
[10] Baber R B, Salunkhe D D, Chavan K D, ThakareV.M. Utilization of pomegranate juice for the Preparation of Chakka whey beverage. J Dairy foods& Horti. Sci (2008);27:87-93.
[11] Baljeet S Y, Ritika B Y,Sarita R.Studies on Development of whey based pine apple and bottle gourd mixed Herbal beverage. Int. Food. Res (2013); 20(2):607-612
[12] Mann, E J. Dairy beverages. Dairy Ind. Intl. (1997); 59(11):16-22
[13] Krishnaveni A,Manimegalai G, SaravanakumarR. Storage stability of jackfruit RTS in different packaging materials. Beverage and Food World (1997);24(1):29-37
[14] Teotia MS, Kaur S, Berry S K. Utilization of Musk melon RTS beverage from enzyme clarified juice. Indian Food Packers (1997); 51(1):11-17
[15] Jaspreet Kaur, Bhavnita Dhillon, Shruti Puri. Development of health based based functional Whey drink incorporating carrot, beetroot, mint and ginger. Beverage and Food World (2015); 42(4):41-44