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Research Article

Formulation of Whey Based Pineapple Herbal Beverages and Its Storage Conditions

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Abstract

The investigation was aimed to develop a delicious and nutritious beverage from the ripe pineapple juice and milk whey. The *M. arvensis* extract was used as a natural flavoring agent. Whey-based pineapple mint beverage was prepared with the incorporation of *Mentha* arvensis extract (0 to 3%). The storability of the beverage was studied at refrigerated, BOD and room temperature storage and changes were determined during storage at 15 days intervals up to 2 months. pH, TSS and acidity during storage was measured by standard method.. Whey quantity varied from 80 to 83ml for 100ml of the beverage depending upon the concentration of *Mentha* extract. The organoleptic scores and overall acceptability of the beverage improved with increase in *Mentha* extract from 0 to 1%. Addition of 2 and 3% *Mentha* extract decreased the beverage quality as beverage scored lower organoleptic scores. Acidity and TSS (Total Soluble Solids) content increased while pH decreased during storage. Whey based beverage prepared from pineapple with edible extract of herbal medicinal plants like *Mentha* arvensis will not have only excellent nutritional properties but will also posses therapeutic, prophylactic, antibacterial and organoleptic properties.

Keywords: Pineapple, whey, beverage, mint, storage and ANOVA test

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Introduction

Whey is the liquid remaining after the production of cheese or the removal of fat and casein (80 % of the proteins) from milk only 8% of this amount is produce directly as the by-product from skimmed milk during the production of the casein or fresh culture cheese. Whey still contains about 50% of the nutrients present in milk comprising milk sugar (lactose), serum proteins (whey proteins), minerals, a small amount of fat , and most of the water soluble minor nutrients from milk such as vitamins. Whey and whey products are used by the food industry in a wide variety of application on the basis of their excellent nutritional and functional properties. Composition and characteristic of whey are depending on the production technology of the end product and the quality of the use milk liquid. Whey consist approximately 93% of water and contains almost 50% of total solid present in the milk of which lactose in the main constituent. Lactose is the main constituent of whey while proteins present less than 1% of total solid. The proteins present in whey comprise of about 50% β-lactoglobulin 25% α-lactoalbumin and 255 other proteins with a balance spectrum of amino acid in fewer also minerals and vitamins are present. Whey is the yellow, watery liquid that separates from the curd during the cheese making process and contains nearly half of all solids found in whole milk [1]. It is estimated that during the production of one pound of cheese, approximately nine pounds of whey are produced [2]. Whevit, an orange, pineapple, lime, mango flavoured alcoholic drink from whey was developed at national dairy research institute by [3].

Whey proteins and amino acid supplements have a strong position in the sports nutrition market based on the purported quality of proteins and amino acid they provide. Recent studies employing stable isotope methodology demonstrate the ability of whey proteins or amino acid mixtures of similar composition to promote whole body and muscle protein synthesis. Studied by the [4] Whey proteins are used as replacements for egg proteins in confectionaries and bakery products, as well as milk replacers in dairy products such as ice cream. Reported by [5] that milk fat was previously the most important economic component of milk, the increased awareness in the nutritional value of whey protein has resulted in the protein becoming the most highly valued component.

Pineapple (*Ananas comosus*) is one of the commercially important fruit crops of India. Total annual world production is estimated at 14.6 million tonnes of fruits. India is the fifth largest producer of pineapple with an annual output of about 1.2 million tonnes. Other leading producers are Thailand, Philippines, Brazil, China, Nigeria, Mexico, Indonesia, Colombia and USA. Pineapple is a good source of vitamins a, b, c and also calcium, magnesium, potassium and iron. It is also a good source of Bromelin, a digestive enzyme. It is consumed fresh or in the form of juice, jam, squash and syrup. Among all forms, canned slices and juice are in much demand in India, constituting about 70% of the production. Pineapple is also known for its high level of manganese mineral is an essential element for energy production, while protecting your cell from free radicals.

Materials and Methods

Development of beverage

Experiment were carried out to develop whey based pineapple mint beverage and it's qualitative the evolution of the product several physico- Chemical Parameters viz. Acidity, TSS, pH, protein, Ash, Standard plate count (SPC), coliform Test were evaluate. The beverage sample s were stored at room temperature, B.O.D and refrigerated conditions for 0, 15, 30, 45 and 60 days. Sensory quality attributes (colour, taste, flavour, Appearance, overall acceptability) of whey based pineapple mint beverage were also carried out for the sample during storage.

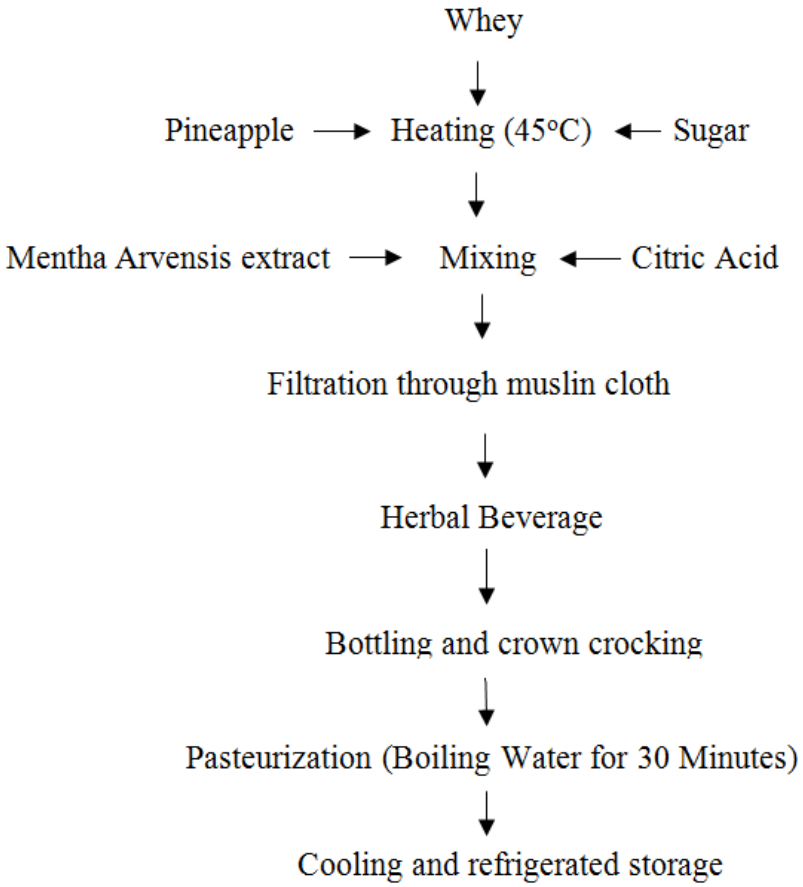

Figure 1 Process flow chart of whey based pineapple herbal (Mentha arvensis) beverages

From the studied conducted for the studies on development and storage of whey based pineapple herbal (mentha arvensis) beverage, the project work had been summarized as follows:

- Whey based pineapple herbal beverage was prepared by adding varied amount of menthe arvensis (i.e. 1%, 2%, 3%) to whey (varied from 80 to 83 ml) with constant amount of pineapple pulp (12 g) and sugar (5 g).
- The highest percentage of acidity was recorded in sample T_2. The highest pH, TSS, Protein percentage and

Ash percentage were found in sample T_3. These values were 0.92, 6.1, 16, 0.81 and 0.64 respectively. The increase in values above mentioned values was observed from sample T_0 to T_3 treatment.

- The pH of whey based pineapple mint beverage decreased during storage.
- TSS of whey based pineapple mint beverage increased slightly in the storage period.
- T_0 Treatment got the highest score in organoleptic evaluation for Colour, Taste, Appearance and Overall acceptability (8 and 8 respectively.
- T_0 Treatment (13 cfu/ml) had the highest SPC (Standard Plate Count). No coliform were found in any sample.
- The costliest beverage was Treatment T_3 (19.2 Rs/ltr) as it has the highest amount of mentha arvensis.

Result and Discussion

The present study, "Preparation of Whey based pineapple mint beverage" was carried by utilizing different combinations of mentha arvensis and whey. The data collected on different aspects were tabulated and analysed statistically using Analysis & critical variance method. The significant & non-significant differences observed have been analysed critically between the treatment combinations. The following table shows the results obtained from the various analyses.

Effect on Acidity

From the perusal of data of acidity percentage in whey based pineapple mint beverage samples of different treatments and control, the highest mean acidity percentage was recorded in the whey based pineapple mint beverage sample of T_3 (0.61) followed by T_2 and T_1 and then T_0. As evident from the result of ANOVA given in **Table 1**, The F (cal) value was smaller than the table value of F at 5% level of significance. Therefore, the difference was non-significant. Thus, there was no significant effect of treatments on acidity.

The percentage acidity higher than that of whey based banana beverage prepared by [6] and it was increasing as the amount of mentha arvensis was increased as recorded by [6].

Table 1 Acidity percentage in control and experimental Whey based pineapple mint beverage of different treatments

Replications		**Treatments**			
		T_0	**T_1**	**T_2**	**T_3**
1		0.72	0.74	0.92	0.91
2		0.37	0.51	0.43	0.5
3		0.55	0.47	0.42	0.42
Mean		0.546	0.573	0.59	0.61
Range	Maximum	0.72	0.74	0.92	0.91
	Minimum	0.37	0.47	0.42	0.42
F-Test				NS	
S.Ed.(±)				0.076	

Effect on pH

From the perusal of data of pH in whey based pineapple mint beverage samples of different treatments and control, the highest mean pH was recorded in the Whey based pineapple mint beverage sample of T_3 (6.133) followed by T_2 and T_1 and then T_0. As evident from the result of ANOVA given in **Table 2**, the F (cal) value was greater than the table value of F at 5% level of significance. Therefore, the difference was significant. The significant difference thus obtained was further analyzed statistically to find out the C.D. between and within the different treatment combinations.

These values of pH were higher than that recorded by [6] for Whey based banana herbal beverage and by [7] in whey based watermelon beverage. The pH was increased and it was in accordance with the pH recorded by [6] and [7].

Table 2 pH in control and experimental Whey based pineapple mint beverage of different treatments

Replications		Treatments			
		T_0	T_1	T_2	T_3
1		5.6	5.8	6	6.1
2		5.5	5.7	5.9	6.1
3		5.5	5.8	6	6.2
Mean		5.533	5.766	5.966	6.133
Range	Maximum	5.6	5.8	6	6.1
	Minimum	5.5	5.7	5.9	6.2
F-Test				S	
S.Ed.(±)				0.036	
C.D. (P=0.05)				0.090	

Effect on Total Soluble Solids (^{o}Brix)

From the perusal of data of ^{0}Brix in whey based pineapple mint beverage samples of different treatments and control, the highest mean ^{0}Brix was recorded in the Whey based pineapple mint beverage sample of T_3 (16.033) followed by T_2 and T_1 and then T_0. As evident from the result of ANOVA given in **Table 3**, the F (cal) value was greater than the table value of F at 5% level of significance. Therefore, the difference was significant. The significant difference thus obtained was further analysed statistically to find out the C.D. between and within the different treatment combinations.

These values of TSS were found to be smaller than that recorded by **[7]** for whey based watermelon beverage. The increase in the values of TSS was in accordance with the values of TSS recorded. Reported [8] that the ascorbic acid content of Kew or Giant Kew and Mauritius varieties of pineapple varied from 6.1 to 2.6 mg /100g edible portion.

Table 3 TSS (^{0}Brix) in control and experimental Whey based pineapple mint beverage of different treatments

Replications		Treatments			
		T_0	T_1	T_2	T_3
1		15.2	15.4	15.8	16
2		15	15.2	15.8	16.2
3		15.1	15	15.5	15.9
Mean		15.1	15.2	15.7	16.033
Range	Maximum	15.2	15.4	15.8	16.2
	Minimum	15	15	15.5	15.9
F-Test				S	
S.Ed.(±)				0.103	
C.D. (P=0.05)				0.256	

Effect on Protein percentage

From the perusal of data of protein percentage in whey based pineapple mint beverage samples of different treatments and control, the highest mean protein percentage was recorded in the Whey based pineapple mint beverage sample of T_3 (0.793) followed by T_2 and T_1 and then T_0. As evident from the result of ANOVA given in **Table 4**, the F (cal) value was smaller than the table value of F at 5% level of significance. Therefore, the difference was Non significant.

Studied by [9] the liquid whey contains approximately 93% water, 1.5% fat of the total fat of milk and 100% whey protein, ash and carbohydrates of the total of that of milk. studied the experiment of the immunoglobulin's comprise 10-15% of the whey protein. They provide essential immune system enhancing benefits to infants as well as adults by [10].

Effect on Ash Content

From the perusal of data of ash content in whey based pineapple mint beverage samples of different treatments and

control, the highest mean ash content was recorded in the Whey based pineapple mint beverage sample of T_3 (0.65) followed by T_2 and T_1 and then T_0. As evident from the result of ANOVA given in **Table 5**, the F (cal) value was smaller than the table value of F at 5% level of significance. Therefore, the difference was significant. The significant difference thus obtained was further analysed statistically to find out the C.D. between and within the different treatment combinations.

Table 4 Protein percentage in control and experimental Whey based pineapple mint beverage of different treatments.

Replications		**Treatments**			
		T_0	**T_1**	**T_2**	**T_3**
1		0.69	0.73	0.81	0.81
2		0.59	0.73	0.69	0.82
3		0.73	0.67	0.81	0.75
Mean		0.67	0.71	0.77	0.793
Range	Maximum	0.73	0.73	0.81	0.82
	Minimum	0.59	0.67	0.69	0.75
F-Test				NS	
S.Ed.(±)				0.047	

Table 5 Ash content in control and experimental Whey based pineapple mint beverage of different treatments

Replications		**Treatments**			
		T_0	**T_1**	**T_2**	**T_3**
1		0.47	0.51	0.6	0.64
2		0.45	0.51	0.55	0.65
3		0.49	0.49	0.58	0.66
Mean		0.47	0.503	0.576	0.65
Range	Maximum	0.49	0.51	0.6	0.65
	Minimum	0.45	0.49	0.55	064
F-Test				S	
S.Ed.(±)				0.015	
C.D. (P=0.05)				0.037	

Conclusion

In view of the experimental results obtained during the present investigation, it may be concluded that the Whey based pineapple mint beverage made from whey, pineapple, sugar and some varying amount of Mentha Arvensis (1%, 2%, 3%) had good amount of nutrients and had no coliforms. Whey contains lactose, carbohydrates and fat. Pineapple pulp increases the deliciousness and nutritional value of the product. The addition of 3% mentha arvensis carries the cost of the preparation of beverage to 19.2 Rs/lit. This is not more than other regularly used beverages. Thus, Whey based beverage prepared from pineapple pulp in combination with edible extract of herbal medicinal plants like Mentha arvensis will not have only excellent nutritional properties but will also possess therapeutic, antibacterial and organoleptic properties. After formulation of beverage, acidity, pH and TSS values did not change appreciably and no sensory changes were found during the first 15 days of storage but after some time changes in samples during storage.

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