

Physico-Chemical Qualities of Papaya Pulp Based Whey Beverage

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ABSTRACT

This study was conducted to evaluate the effect of keeping nutritional and functional attributes of papaya pulp potential of whey to be used in nutritious and health promoting beverage. The study by evaluating sensory and chemical quality of papaya pulp based whey beverage. There were paneer whey used as raw material, three level of sugar (8%, 10% and 12%) and three level of papaya pulp (10%, 20% and 30%) used for preparation of Papaya Pulp Based Whey Beverage. This product stored at 5^o C as refrigerated temperature. The process replicated three times. The maximum overall acceptability of papaya pulp based whey beverage was found in sample which was prepared by 10% sugar with 20% papaya pulp. Whereas, the chemical composition of papaya pulp based whey beverage, the highest total solids found in the sample made by 30% papaya pulp with 12% sugar, here total solids increased with increasing sugar content, so it can be concluded that the best quality papaya pulp based whey beverage can be prepared by 20% papaya pulp with 10% sugar. The product sample which contains 10% sugar and 20% papaya pulp having maximum acceptability and optimum level of chemical percentage.

Key words: Whey, Papaya Pulp, Sugar and Beverage.

INTRODUCTION

Whey is a nutritious by product from cheese, chhana and paneer industry containing valuable nutrients like lactose, proteins, minerals and vitamins etc. which have indispensable value as human food. Whey constitutes 45-50% of total milk solids, 70% of milk sugar (lactose), 20% of milk proteins and 70-90% of milk minerals and most importantly, almost all the water soluble vitamins originally present in milk. In India, it is estimated that about 100 million kg of whey is annually derived as a byproduct which may

cause substantial loss of about 70,000 tones of nutritious whey solids⁹ Considerable work has been done throughout the world to utilize whey for production of whey protein concentrate (WPC), whey powder, lactose, lactic acid, whey paste etc⁸. The conversion of whey into beverages through fermentation or without fermentation is one of the most attractive avenues for the utilization of whey for human consumption. In terms of functionality, whey protein enhances protein content of beverage while improving its quality³.

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According to its average composition whey is approximately 93% water and contains about 50% of total solids present in the milk of which lactose is the main constituent. Whey proteins constitute less than 1% of dry matter¹. Whey response a heterogeneous pools of proteins with wide ranging physico-chemical and functional properties. It is a complete protein with the presence of all essential and non essential amino acids.

Papaya (*Carica papaya* L.) is a commercially important crop that produces climacteric fruits with a soft and sweet pulp that contain a wide range of health promoting phytochemicals. Papaya fruit is a source of nutrients such as provitamin A, carotenoids, vitamin C, folate and dietary fibre. In preliminary research, danielone, a phytoalexin found in papaya fruit, showed antifungal activity against *Colletotrichum gloesporioides*, a pathogenic fungus of papaya. The ripe fruit of the papaya is usually eaten raw, without skin or seeds. The unripe green fruit can be eaten cooked, usually in curries, salads, and stews. Green papaya is used in Southeast Asian cooking, both raw and cooked. The smell of ripe, fresh papaya flesh can strike some people as unpleasant. Therefore, in view of keeping nutritional and functional attributes of papaya pulp potential of whey to be used in nutritious and health promoting beverage along with its storage study.

MATERIALS AND METHODS

There were paneer whey used as raw material, three level of sugar (A1=8%, A2=10% and A3=12%) and three level of papaya pulp (B1=10%, B2=20% and B3=30%) used for preparation of Papaya Pulp Based Whey Beverage⁵. These samples were stored at 5^o C as refrigerated temperature. For the Preparation of papaya pulp juice, the healthy fruits of uniform ripened and well colour were peeled off and cut into small pieces. The juice was extracted in a juicer and filtered through two layers of muslin cloth⁴. For the preparation of whey, the heated milk (84^oC) was acidified by adding citric acid (2%)

followed by continuous stirring resulting in complete coagulation of milk protein (casein). The liquid whey was filtered using muslin cloth. After that the juice of papaya pulp and whey were mixed in ratio as given in plan of work.

The sensory evaluation of various attributes was done by a panel of five expert judges using nine point “Hedonic scale” for food and dairy products. Fat content was determined by modified Gerber Centrifuge method described in BIS handbook. The protein content of Papaya Pulp Based Whey Beverage was determined by Kjeldahl method. Lactose content and sucrose content was determined by the method given by I.C.A.R. bulletin no. 70. Ash content, total solids and moisture percentage analysed as per methods in BIS. The data on sensory and chemical quality obtaining during the study were subjected for analysis of variance (ANOVA) as described by Snedecor and Cochran.

RESULT AND DISCUSSION

The papaya pulp based whey beverage samples were analysed for the sake for examining their sensory and chemical properties. The evaluation of the beverage physical characteristics is presented in Table no.-1

Sensory evaluation

Evaluation of flavour

The maximum flavour score (8.300) was obtained in A2XB2 where as minimum flavour score was (7.100) found in A3XB1. The maximum mean score of sugar on flavour (7.933) was found in A2 while minimum mean score of sugar (7.300) was found in A3. The effect of papaya pulp on whey beverage was obtained as maximum score (8.033) in 20% papaya (B2) pulp where as minimum score (7.333) was obtained in 10% papaya pulp (B1). The effect of sugar and papaya pulp was found to be significant, these are differs significantly ($p < 0.05$, $CD = 0.200$) each other. The interaction effect of sugar and papaya pulp did not differ significantly. Optimum level of sugar and papaya pulp develops pleasant flavour. Kumar, *et al*⁶, 2005 was

agreed with 10 % sugar level in whey beverages.

Evaluation of Colour & Appearance

The maximum colour & appearance score (8.300) was obtained in A2XB2 where as minimum colour & appearance score was (7.200) found in A3XB1. The maximum mean score of sugar on colour & appearance (8.000) was found in A2 while minimum mean score of sugar (7.333) was found in A1. The effect of papaya pulp on whey beverage was obtained as maximum score (7.967) in 20% papaya (B2) pulp where as minimum score (7.467) was obtained in 10% papaya pulp (B1). The effect of sugar and papaya pulp was found to be significant, these are differs significantly ($p < 0.05$, $CD = 0.200$) each other. The interaction effect of sugar and papaya pulp did not differ significantly. Colour and appearance was depended on added sugar and papaya pulp. Maity, *et al*⁷, was reported that colour and appearance was based on added constituents.

Evaluation of Sweetness

The maximum sweetness score (8.300) was obtained in A2XB2 where as minimum sweetness score was (7.300) found in A3XB1. The maximum mean score of sugar on sweetness (8.067) was found in A2 while minimum mean score of sugar (7.467) was found in A3. The effect of papaya pulp on whey beverage was obtained as maximum score (7.933) in 20% papaya (B2) pulp where as minimum score (7.533) was obtained in 10% papaya pulp (B1). The effect of sugar and papaya pulp was found to be significant, these are differs significantly ($p < 0.05$, $CD = 0.200$) each other. The interaction effect of sugar and papaya pulp did not differ significantly. Kumar, *et al*⁶, was reported that 10 % sugar level was suitable level for whey beverages.

Evaluation of Overall Acceptability

The maximum Overall Acceptability score (8.300) was obtained in A2XB2 where as minimum Overall Acceptability score was (7.200) found in A3XB1. The maximum mean score of sugar on Overall Acceptability (8.000) was found in A2 while minimum mean score of sugar (7.367) was found in A3. The

effect of papaya pulp on whey beverage was obtained as maximum score (7.978) in 20% papaya (B2) pulp where as minimum score (7.444) was obtained in 10% papaya pulp (B1). The effect of sugar and papaya pulp was found to be significant, these are differs significantly ($p < 0.05$, $CD = 0.200$) each other. The interaction effect of sugar and papaya pulp did not differ significantly. Overall acceptability was depending on added level of sugar and papaya pulp in whey, average percent of sugar and papaya pulp got highest acceptability. Dhawale, *et al*⁵, totally agreed with this finding.

Evaluation of Fat Percentage

The maximum fat percentage (0.440) was obtained in A1XB1 where as minimum fat percentage was (0.390) found in A2XB3. The maximum mean percentage of sugar on fat percentage (0.420) was found in A1 while minimum mean percentage of sugar (0.400) was found in A3. The effect of papaya pulp on whey beverage was obtained as maximum percentage (0.430) in 10% papaya (B1) pulp where as minimum percentage (0.390) was obtained in 30% papaya pulp (B3). The effect of sugar and papaya pulp was found to be significant, these are differs significantly ($p < 0.05$, $CD = 0.001$) each other. The interaction effect of sugar and papaya pulp did not differ significantly. Fat was increases with higher percentage of whey in beverage. The result was in agreement with those of Bhavsagar, *et al*².

Evaluation of Protein Percentage

The maximum Protein percentage (0.358) was obtained in A1XB1 where as minimum Protein percentage was (0.322) found in A3XB3. The maximum mean percentage of sugar on protein percentage (0.348) was found in A1 while minimum mean percentage of sugar (0.332) was found in A3. The effect of papaya pulp on whey beverage was obtained as maximum percentage (0.350) in 10% papaya (B1) pulp where as minimum percentage (0.330) was obtained in 30% papaya pulp (B3). The effect of sugar and papaya pulp was found to be significant, these are differs significantly ($p < 0.05$, $CD = 0.001$) each other. The

interaction effect of sugar and papaya pulp did not differ significantly. The protein was depending on available percentage of whey in beverage. Shukla, *et al*¹², was found that the 0.34% protein in apple based whey beverage and 0.42% protein found in guava based whey beverage.

Evaluation of Lactose Percentage

The maximum Lactose percentage (4.182) was obtained in A1XB1 where as minimum Lactose percentage was (2.958) found in A3XB3. The maximum mean score of sugar on Lactose percentage (3.672) was found in A1 while minimum mean percentage of sugar (3.468) was found in A3. The effect of papaya pulp on whey beverage was obtained as maximum percentage (4.080) in 10% papaya (B1) pulp where as minimum percentage (3.060) was obtained in 30% papaya pulp (B3). The effect of sugar and papaya pulp was found to be significant, these are differs significantly ($p < 0.05$, $CD = 0.100$) each other. The interaction effect of sugar and papaya pulp did not differ significantly. Lactose is a constituents found only in whey, so it was found as available in whey. Sangu¹¹, 2004 reported that the chhana whey contained 4.02% lactose.

Evaluation of sucrose Percentage

The maximum Sucrose percentage (15.300) was obtained in A3XB3 where as minimum Sucrose percentage was (9.100) found in A1XB1. The maximum mean percentage of sugar on Sucrose (14.200) was found in A3 while minimum mean percentage of sugar (10.200) was found in A1. The effect of papaya pulp on whey beverage was obtained as maximum percentage (13.300) in 30% papaya (B3) pulp where as minimum percentage (11.100) was obtained in 10% papaya pulp (B1). The effect of sugar and papaya pulp was found to be significant, these are differs significantly ($p < 0.05$, $CD = 0.150$) each other. The interaction effect of sugar and papaya pulp did not differ significantly. Sucrose percentage was added as in various levels so it was depending on addition. Sakhale, *et al*¹⁰, noticed that 14.58% sugar was suitable for preparation of whey beverage

with mango fruit pulps.

Evaluation of Ash Percentage

The maximum Ash percentage (0.500) was obtained in A3XB3 where as minimum ash percentage was (0.350) found in A1XB1. The maximum mean percentage of sugar on Ash percentage (0.450) was found in A3 while minimum mean score of sugar (0.400) was found in A1. The effect of papaya pulp on whey beverage was obtained as maximum ash percentage (0.477) in 30% papaya (B3) pulp where as minimum ash percentage (0.343) was obtained in 10% papaya pulp (B1). The effect of sugar and papaya pulp was found to be significant, these are differs significantly ($p < 0.05$, $CD = 0.002$) each other. The interaction effect of sugar and papaya pulp did not differ significantly. Ash content in whey beverage was varies due to mineral composition of whey and pulp. Bhavsagar, *et al*², reported 0.78% ash in pine apple based whey beverage where 15% pine apple pulp used for preparation.

Evaluation of Total solids Percentage

The maximum Total solid percentage (19.460) was obtained in A3XB3 where as minimum Total solid percentage was (14.430) found in A1XB1. The maximum mean percentage of sugar on Total solid (18.240) was found in A3 while minimum mean percentage of sugar (15.040) was found in A1. The effect of papaya pulp on whey beverage was obtained as maximum percentage (17.557) in 30% papaya (B3) pulp where as minimum percentage (16.333) was obtained in 10% papaya pulp (B1). The effect of sugar and papaya pulp was found to be significant, these are differs significantly ($p < 0.05$, $CD = 0.270$) each other. The interaction effect of sugar and papaya pulp did not differ significantly. Increasing total solids percentage might be due to solubilisation of insoluble portion of the beverage as reported by Yadav, *et al*¹³.

CONCLUSION

The finding of this study has been implied that the different levels of sugar and various percentage of papaya pulp added in the whey have been affected their physical and chemical

qualities. The maximum overall acceptability of papaya pulp based whey beverage was found in sample which was prepared by 10% sugar with 20% papaya pulp. Whereas, the chemical composition of papaya pulp based whey beverage, the highest total solids found in the sample made by 30% papaya pulp with 12% sugar, here total solids increased with increasing sugar content, so it can be concluded that the best quality papaya pulp based whey beverage can be prepared by 20% papaya pulp with 10% sugar. The product sample which contains 10% sugar and 20% papaya pulp having maximum acceptability and optimum level of chemical percentage.

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