Effect of sugar and papaya pulp on self life of whey beverage

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(Received: July 23, 2014; Revised received: October 29, 2014; Accepted: October 30, 2014)

Abstract: 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 along with its shelf life, 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°C as refrigerated temperature for four storage periods (0 day, 5 days, 10 days and 15 days). This process replicated three times. The findings of study imply that the different levels of sugar and storage periods affect the sensory attributes (flavour, colour & appearance, sweetness, and overall acceptability) and chemical content (moisture, fat, lactose, sucrose and total solids) but papaya pulp does not affect total solids content of beverage. The interaction of sugar and papaya pulp affect significantly all the attributes of sensory and chemical qualities except sweetness. Whereas interaction of sugar with storage periods and papaya pulp with storage periods affect non-symmetrically all sensory attributes and some chemical content except overall acceptability. The overall interaction of sugar, papaya pulp and storage periods non-significantly affected of all sensory attributes (flavour, colour & appearance and sweetness) and all chemical attributes (fat, protein, lactose, sucrose, ash and total solids) except overall acceptability.

Key words: Whey, Papaya Pulp, Sugar, Storage periods

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 solids (Parekh, 2006). 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 etc. Panesar et al. (2007)

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 quality. The production of a beverage from whey butter cheese and acerola juice has been shown to have good commercialization potential, uniting the benefits provided by the former with those of later, including the ingestion of essential amino acids and increasing the vitamin C content, resulting in a product of differentiated nutritive value (Cruz et al., 2009).

Whey may be considered as the watery substances remaining after coagulation of the casein in the milk, either through the addition of acid (in casein manufacture) or through addition of protease such as chymosin (in cheese manufacture). The composition of whey will vary considerably depending on the source of milk and the manufacturing process involved. 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 matter, (Beucler et al., 2005). 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. Papaya skin, pulp and seeds also contain a variety of phytochemicals, including lycopene and polyphenols. In preliminary research, danielone, a phytoalexin found in papaya skin, pulp and seeds also contain a wide range of phytochemicals, including lycopene and polyphenols. In preliminary research, danielone, a phytoalexin found in papaya fruit, showed antifungal activity against Colletotrichum gloesporioides, a pathogenic fungus of papaya (Echeverri et al., 1997). 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 (Natty Netsuwan 2013). In Thai cuisine, papaya is used to make Thai salads such as som tam and Thai curriessuch as kaeng som when still not fully ripe. In Indonesian cuisine, the unripe green fruits and young leaves are boiled for use as part of lalab salad, while the flower buds...
are sautéed and stir-fried with chillies and green tomatoes as Minahasan papaya flower vegetable dish. Papayas have a relatively high amount of pectin, which can be used to make jellies. The smell of ripe, fresh papaya flesh can strike some people as unpleasant. The black seeds of the papaya are edible and have a sharp, spicy taste. They are sometimes ground and used as a substitute for black pepper. In some parts of Asia, the young leaves of the papaya are steamed and eaten like spinach. In some parts of the world, papaya leaves are made into tea as a treatment for malaria. Antimalarial and antiplasmodial activity has been noted in some preparations of the plant but the mechanism is not understood and no treatment method based on these results have been scientifically proven (Titanji et al., 2008). 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 (8%, 10% and 12%) and three level of papaya pulp (10%, 20% and 30%) used for preparation of Papaya Pulp Based Whey Beverage. These samples were stored at 5°C as refrigerated temperature for four storage periods (0 day, 5 days, 10 days and 15 days). 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 cloth Deore et al. (2008). For the preparation of whey, the heated milk (84°C) 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 Beverages 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 obtained during the study were subjected for analysis of variance (ANOVA) as described by Snedecor and Cochran.

Result and discussion

The sensory attributes score and chemical attributes of the product are depicted in table-1. The effect different level of papaya pulp on flavour scores found to be significant and the effect of sugar and storage periods on flavour also found to be significant. On other hand the combination of papaya pulp and sugar was found to be significantly affected to the flavour (Kumar et al., 2005). The interaction effect of papaya pulp and storage periods, sugar and storage periods and overall combined interaction effect were found to be affected non-significantly (Maity et al., 2008). Colour and appearance of papaya pulp based beverage was significantly affected by various level of papaya pulp along with various levels of sugar, storage periods and also interaction effect of papaya pulp with sugar. The colour and appearance was found to be unaffected by the interaction of papaya pulp and storage periods, sugar and storage periods and overall combined interaction of papaya pulp, sugar and storage periods (Dhawale et al., 2009). Sweetness of the beverage was found to be significantly affected with various levels of sugar, different levels of papaya pulp and storage periods. The non-significant effect of sweetness was noticed in between the interaction effect of sugar and papaya pulp, papaya pulp and storage periods, sugar and storage periods and overall combined interaction of papaya pulp, sugar and storage periods.

Table-1: ANOVA table for sensory evaluation and chemical analysis

<table>
<thead>
<tr>
<th>SVD</th>
<th>D.F.</th>
<th>M.S.S. (Sensory evaluation)</th>
<th>M.S.S. (Chemical evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Flavour</td>
<td>Colour &amp; appearance</td>
</tr>
<tr>
<td>S</td>
<td>2</td>
<td>3.350***</td>
<td>3.646***</td>
</tr>
<tr>
<td>P</td>
<td>2</td>
<td>2.690***</td>
<td>0.555***</td>
</tr>
<tr>
<td>SxP</td>
<td>4</td>
<td>1.309***</td>
<td>1.408***</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>5.534***</td>
<td>5.866***</td>
</tr>
<tr>
<td>SxD</td>
<td>6</td>
<td>0.001h.S.</td>
<td>0.001h.S.</td>
</tr>
<tr>
<td>PxD</td>
<td>6</td>
<td>0.002h.S.</td>
<td>0.002h.S.</td>
</tr>
<tr>
<td>SxPxD</td>
<td>12</td>
<td>0.004h.S.</td>
<td>0.004h.S.</td>
</tr>
<tr>
<td>Error</td>
<td>72</td>
<td>0.018</td>
<td>0.002</td>
</tr>
<tr>
<td>Total</td>
<td>107</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*** significant at 0.1% level of significance; ** significant at 1% level of significance; * significant at 5% level of significance; N.S. non-significant

February, 2015

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with storage periods and overall interaction of pulp, sugar and storage periods of the fat content was found to be unaffected. Protein percentage of the beverage was found to be significantly affected with various level of sugar, different levels of papaya pulp and combination thereof, and storage periods. The distinct effect of interaction of sugar with storage periods, pulp with storage periods and overall interaction of pulp, sugar and storage periods of the protein content were found to be non-significant at 5\% level of significance. Lactose percentage of the beverage was found to be significantly affected with various level of sugar, different levels of papaya pulp and combination thereof, and storage periods. On other hand effect of interaction of sugar with storage periods, pulp with storage periods and overall interaction of pulp, sugar and storage periods of the lactose content were found to be non-significant at 5\% level of significance (Sangu, 2004). Sucrose percentage of the beverage was found to be significantly affected with various level of sugar, different levels of papaya pulp and combination thereof, and storage periods. The distinct effect of interaction of sugar with storage periods, pulp with storage periods and overall interaction of pulp, sugar and storage periods of the sucrose content were found to be non-significant at 5\% level of significance (Sangu, 2004). Ash percentage of the beverage was found to be significantly affected with various level of sugar, different levels of papaya pulp, and storage periods. The combination of interaction of these parameters was found to be non-significant at 5\% level of significance. (Kumar et al., 2005). While the distinct effect of interaction of sugar with storage periods, pulp with storage periods and overall interaction of pulp, sugar and storage periods of the total solids content were found to be non-significant at 5\% level of significance.

The data of present study has been shown that the main effect of flavor, colour & appearance, sweetness and overall acceptability was varied significantly (p<0.05), whereas, 1st order interaction of these parameters was found to be non- significant (p>0.05) except overall acceptability. After the analysis of table no. 2, it was noted that the main effect of fat, protein, lactose, sucrose and total solids was varied significantly (p<0.05) except pulp level of total solid, whereas the 1st order interaction of these parameter was found to be non- significant (p>0.05) except sugar and pulp interactions and interactions of ash percentage.

The findings of study imply that the different levels of sugar and storage periods affect the sensory attributes (flavour, colour & appearance sweetness, and overall acceptability) and chemical content (moisture, fat, lactose, sucrose and total solids) but papaya pulp does not affect total solids content of beverage. The interaction of sugar and papaya pulp affect significantly all the attributes of sensory and chemical qualities except sweetness. Whereas interaction of sugar and storage periods and papaya pulp with storage periods affect non-significantly all sensory attributes and some chemical content except overall acceptability. The overall interaction of sugar, papaya pulp and storage periods affect non- significantly of all sensory attributes (flavour, colour & appearance and sweetness) and all chemical attributes (fat, protein, lactose, sucrose, ash and total solids) except overall acceptability.

References


