PREPARATION OF HEALTHY FRUIT BASED CARBONATED WHEY BEVERAGES USING WHEY AND ORANGE JUICE

N. Pareek, Ankita Gupta* and R Sengar

Department of Home Science, Banasthali University, Banasthali-304 022, India

Received: 17-05-2013 Accepted: 15-12-2013

ABSTRACT
Mixing of orange juice with whey was carried out in the ratio of 70:30, 60:40 and 50:50. Carbonation of the prepared fruit juice whey drink was carried out manually. Orange juice carbonated whey drink was most acceptable in the ratio of 70:30. The nutrient analysis of most acceptable form of orange juice carbonated whey drink showed a general increase in nutrients with the addition of whey as compared to standard orange juice. This experiment conducted at household level can be commercialized to provide a healthy alternative to soft drinks and reduce the biological oxygen demand of whey.

Key words: Beverage, Orange juice, Whey.

INTRODUCTION
Beverages are consumed by all age groups to quench the thirst, as social drinks and for health and medicinal values. Non-alcoholic beverages are of various types such as fruit based drinks, synthetic drinks, sweetened aerated water or carbonated drinks and sometimes non-alcoholic beer, wine, etc.

Most of the carbonated drinks contain synthetic colour and flavouring components which are suspected to be allergenic (Taylor, 1982). Inclusion of fruit juice in the soft drinks not only imparts characteristic colour and flavour but also provides some nutrients.

The demand for soft drinks is increasing every year. This trend can be exploited by developing nutrient enriched carbonated fruit based beverages. The growing health consciousness of consumers has made the industry to introduce a variety of beverages (Dwivedi, 2009).

Whey is the by product left after the manufacture of channa and paneer in India. It is also called milk serum as the whey is the watery portion of milk (Mohanty et al, 1998). Out of the total global production 40% is still disposed as raw whey into the sewage (Hofer, 1995).

Thus, a nutritionally rich and valuable product goes as a waste if not handled properly by the dairy industry and disposed of as such with serious biological consequences. Beverage manufacturers are taking a serious look at how to add valuable nutrition to their product and ‘whey’ is an ideal option. Hence, development of such a value added product can provide a new outlet for the use of whey in a more nutritious product (Seethalakshmi and Shankar, 2009)

An attempt has been made for utilization of whey in orange juice carbonated beverage, to replace the empty calories of soft drinks. Orange juice has been chosen because of its similarity in colour to other soft drinks.

MATERIALS AND METHODS
Double toned milk (Saras Dairy) was used for preparation of whey. Coagulation of milk for preparation of paneer is a very familiar method in Indian houses. Additional care was taken to ensure hygiene and safety, during preparation and hygiene of whey and its immediate utilization. Whey was prepared according to the procedure described by Devi et al (2004).

*Corresponding author’s e-mail : ankita_loreto@yahoo.co.in and Present Address: Dept of Food and Nutrition, Institute of Home Science, Dr.B.R.Ambedkar University, Agra.

1E-mail: richasengar22jul@gmail.com and Address: Dietician, Asian Institute of Medical Sciences, Faridabad.
The fresh fully ripened oranges were procured from local market for extraction of orange juice. Orange juice was extracted by using INALSA Food Processor.

The orange based carbonated whey beverages were prepared by blending of Orange juice and whey in different proportions (70:30, 60:40 and 70:30). Plain orange juice was also kept as control during sensory evaluation.

**Different forms of Orange juice : Whey developed beverages**

<table>
<thead>
<tr>
<th></th>
<th>Orange juice : Whey</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO</td>
<td>100%</td>
</tr>
<tr>
<td>OJCW-A</td>
<td>50% : 50%</td>
</tr>
<tr>
<td>OJCW-B</td>
<td>60% : 40%</td>
</tr>
<tr>
<td>OJCW-C</td>
<td>70% : 30%</td>
</tr>
</tbody>
</table>

SO : Standard Orange juice
OJCW-A : Orange juice carbonated whey drink A
OJCW-B : Orange juice carbonated whey drink B
OJCW-C : Orange juice carbonated whey drink

Carbonation of fruit juices blended with whey as well as control fruit juice was carried out in clearline's drink maker.

A nine-point hedonic scale was used to evaluate the appearance, colour, flavour, sweetness, sourness and overall acceptability of the samples. Evaluation of sensory characteristics of different proportions of whey based orange carbonated beverages was conducted by the selected 25 semi trained panel members. The juices were appropriately coded and presented to each of the panelists in a glass cup for evaluation.

**RESULTS AND DISCUSSION**

The proximate analysis was done with most acceptable ratio of developed orange based carbonated whey beverage. Total Sugar, reducing sugar, ascorbic acid, total protein, total solids, pH and titrable acidity were estimated by standard methods (Ranganna, 1986) and sodium and potassium were estimated by Flame Photometer Systronics Manual, 2010.

The results shown in the Table 1 revealed that the mean score for colour was increased with increase in concentration of orange juice. The highest score for colour was found for ‘OJCW-C’. Similar results were reported by Khurdiya, (1998), where sensory colour score was increased with increase in amount of orange concentrate.

The scores of flavour for the OJCW-B and OJCW-C were similar to the standards mean score for flavour. Holsinger et al. (1973) reported that whey flavour was most compatible with citrus flavours particularly orange. The lowest score was found in OJCW-A for flavour, appearance and sweetness due to the increased concentration of whey. The scores of sourness showed that as the percentage of orange juice was increased simultaneously the sourness was also increased. The overall acceptability of OJCW-C was highest and was liked very much. When different colours were used by Srivastava et al. (1985) for making beverages, orange colour scored highest consumer response.

‘p- values of ′t’ for various organoleptic attributes of different forms of fruit based carbonated beverage are shown in Table 2. These values exhibited a significant difference (p<0.05) in

<table>
<thead>
<tr>
<th></th>
<th>Colour</th>
<th>Flavour</th>
<th>Appearance</th>
<th>Sweetness</th>
<th>Sourness</th>
<th>Overall acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M ± S.D</td>
<td>M ± S.D</td>
<td>M ± S.D</td>
<td>M ± S.D</td>
<td>M ± S.D</td>
<td>M ± S.D</td>
</tr>
<tr>
<td>SO</td>
<td>7.7±0.27</td>
<td>7.8±0.1</td>
<td>7.8±0.20</td>
<td>7.2±0.27</td>
<td>7.6±0.1</td>
<td>7.03±0.11</td>
</tr>
<tr>
<td>OJCW-A</td>
<td>7.1±0.20</td>
<td>6.8±0.2</td>
<td>6.8±0.20</td>
<td>7.0±0.23</td>
<td>6.7±0.8</td>
<td>7.0±0.23</td>
</tr>
<tr>
<td>OJCW-B</td>
<td>7.3±0.28</td>
<td>7.4±0.2</td>
<td>7.6±0.23</td>
<td>7.5±0.24</td>
<td>7.4±0.2</td>
<td>7.6±0.70</td>
</tr>
<tr>
<td>OJCW-C</td>
<td>7.8±0.30</td>
<td>7.4±0.4</td>
<td>8.0±0.33</td>
<td>7.7±0.27</td>
<td>8.0±0.8</td>
<td>8.2±0.32</td>
</tr>
</tbody>
</table>

SO : Standard Orange juice (100%)
OJCW-A : Orange juice carbonated whey drink (50% :50%)
OJCW-B : Orange juice carbonated whey drink (60%:40%)
OJCW-C : Orange juice carbonated whey drink (70%:30%)
appearance, flavour, sourness and overall acceptability (Standard vs OJCW-A). It means that whey incorporation in fruit juice in the ratio of 50:50 was leading to significant difference in organoleptic attributes. There was no significant difference among other samples of orange juice carbonated whey drink. Mean scores for all attributes of all developed orange based carbonated whey beverage obtained in the range of 6.7 to 8.2 and result was supported by study done by Seethalaxmi (2009) where overall acceptability scores varied from 6.23 to 7.95 in the case of whey based mango beverage in different combinations of sugar and whey.

On the basis of highest mean scores obtained for overall acceptability OJCW-C was selected for further nutrient analysis.

The nutrient analysis was performed for standard samples and most acceptable forms of orange based carbonated whey beverage (OJCW-C). The parameters selected for analysis were total solids, pH, acidity, vitamin C, protein, total sugar, reducing sugar, sodium and potassium. The result of nutrient analysis of most acceptable form of orange based carbonated whey beverage is shown in Table 3.

Beverages were designed to be similar in all aspects to commercial beverages. There was a general increase in nutrients with the addition of fruit juices in whey. Protein was higher in OJCW-C as compare to the standard sample and value of protein was 1.1%. Holsinger et al (1973), reported in their study that an orange flavoured carbonated whey beverage contained 1.5% whey proteins obtained by reverse osmosis from whey. Total protein in whey was 0.62-0.63% (Singh et al., 2005). While analyzing the sodium and potassium, Orange juice carbonated whey drink (70:30) had highest value.

It was concluded that whey could be successfully incorporated in fruit juice with carbonation. The orange fruit based carbonated whey drink will turn out to be beneficial for mass consumption due to their nutrients and also prove to be an alternate to popular soft drinks. The fruit juice carbonated whey drink seems to hold good promise in the manufacture of value added nutritious beverages. Such beverages are highly acceptable as refreshing flavoured drinks. The new product so formulated is expected to provide a profitable outlet for whey hitherto getting wasted. The procedure employed for preparation of the drinks was simple, convenient and economical. It can be utilised by dairies to find a solution to the problem of untreated whey.

TABLE 2: ‘p- values of t’ for various organoleptic attributes of different forms of fruit based carbonated beverage compared with standard fruit juice

<table>
<thead>
<tr>
<th>p- values of t</th>
<th>Colour</th>
<th>Flavour</th>
<th>Appearance</th>
<th>Sweetness</th>
<th>Sourness</th>
<th>Overall acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO vs OJCW-A</td>
<td>0.111</td>
<td>0.035*</td>
<td>0.002*</td>
<td>0.446</td>
<td>0.008*</td>
<td>0.002*</td>
</tr>
<tr>
<td>SO vs OJCW-B</td>
<td>0.346</td>
<td>0.446</td>
<td>0.558</td>
<td>0.397</td>
<td>0.224</td>
<td>0.346</td>
</tr>
<tr>
<td>SO vs OJCW-C</td>
<td>0.681</td>
<td>0.346</td>
<td>0.759</td>
<td>0.095</td>
<td>0.272</td>
<td>0.346</td>
</tr>
</tbody>
</table>

* - Significant at 5% level.

TABLE 3: Nutrient content of most acceptable forms of fruit based carbonated whey drinks.

<table>
<thead>
<tr>
<th>Most acceptable forms of fruit based carbonated whey drinks</th>
<th>Total Solids g/100g</th>
<th>pH</th>
<th>Acidity %</th>
<th>Vitamin C mg/100g</th>
<th>Protein g/100g</th>
<th>Total sugar g/100g</th>
<th>Reducing sugar g/100g</th>
<th>Na ppm</th>
<th>K ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO</td>
<td>7.9</td>
<td>4.16</td>
<td>0.41</td>
<td>45</td>
<td>0.70</td>
<td>10.85</td>
<td>8.25</td>
<td>117</td>
<td>230</td>
</tr>
<tr>
<td>OJCW-C</td>
<td>8.7</td>
<td>4.03</td>
<td>0.61</td>
<td>45.1</td>
<td>1.1</td>
<td>15.19</td>
<td>11.25</td>
<td>202</td>
<td>370</td>
</tr>
</tbody>
</table>

SO : Standard Orange juice (100%)
OJCW-C : Orange juice carbonated whey drink (70%;30%)
REFERENCES