PROCESS UPGRADATION OF BOTTLE GOURD AND PUMPKIN KHEER


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ABSTRACT

In all 180 combinations each for bottle gourd and pumpkin were formulated using various levels of vegetables, sugars and methods of preparation. About 37 to 40 per cent households and small sweet makers prepared vegetables based kheer in urban and semi-urban areas. Five combinations were studied for process upgradation, chemical composition and sensory evaluation. Typically bottle gourd kheer had greenish shade while pumpkin kheer had yellowish shade. The shreds and cubes of both vegetables become soft during cooking which imparts characteristic chewy texture to the vegetable based kheer. All vegetable kheer samples tested low level of fat and high level of carbohydrate content than control. The total solid and carbohydrate content was higher in kheer prepared from bottle gourd while protein content was higher in control and kheer prepared from pumpkin.

Key words: Bottle gourd, Pumpkin, Kheer, Process, Upgradation, Sensory evaluation.

INTRODUCTION

Traditional Indian products include several innovative blends used in the preparation of variety of milk-based delicacies. Kheer a sweet milk-rice confection finds mention as payasa in Buddhist-Jain literature in 400 BC. It is known as payasam in South India and payesh in Bengal, Aneja, et al. (2002). Unnikrishnan, et.al. (2000) reported characteristics of different varieties of payasams. Vegetables and milk are important food groups for Indians. Most of vegetable based indigenous milk products are region or custom specific. In spite of significant dietary and nutritional role, their preparations are under trade secret with unorganized sector, Changade, et. al. (2003). Vegetable is the food group that imparts appetizing flavour, texture and appealing colour to the dairy food. Vegetable food group contributes indigestible fiber, vitamins and minerals such as calcium and iron. It is also low in fat and has low calorific value. Moreover, they are beneficial in maintaining acid-alkaline balance in body and thus can help to reduce the role of medicine for betterment of health. Considering the growing awareness of consumers towards the functional and health foods, the technology for vegetable based products i.e. blending milk solids with vegetables was undertaken for diminishing the likelihood of nutritional deficiencies and to add more variety of food in the diet of population. Bottle gourd is very useful for relief in urinary disorders. In cooked form, it is diuretic, sedative and antibilious. The pumpkin and juice of its seeds are useful in maintaining the health of prostate gland. It is powerful anti-helmintic or remover of worms from digestive tract.

MATERIALS AND METHODS

A survey was undertaken to identify traditional technologies for preparation of cereal and vegetable based milk products. The area was grouped in two parts i.e. urban (District location) and semi urban (Tahsil location). Each group was further divided into two sub parts i.e. small sweet makers or halwais and households. Accordingly 12 district and 22 Tahsil locations of Maharashtra state were visited and data were collected from 254 small sweet makers / halwais and 248 households who prepared kheer. On the basis of the survey organized, sixty different combinations of vegetables + sugar level were considered for three processes viz; a)
boiled in water, b) steamed and c) boiled in milk for each vegetable in the form of cubes and in the form of shreds i.e. in all 180 combinations each for bottle gourd and pumpkin were formulated and, replicated twice, to decide the levels of major and minor ingredients in the upgraded process. All 360 combinations were offered for sensory evaluation considering the average preference given by the judges; the following four combinations were selected for study along with control.

T1, *Kheer* prepared by boiling in milk 25% bottle gourd cubes and 16% sugar by weight.

T2, *Kheer* prepared by boiling in milk 27% bottle gourd shreds and 17% sugar by weight.

T3, *Kheer* prepared by boiling in milk 25% pumpkin cubes and 12% sugar by weight.

T4, *Kheer* prepared by boiling in milk 27% pumpkin shreds and 12% sugar by weight.

T5, *Kheer* prepared by the basmati rice using 5% rice and 7% sugar (Control).

The treatments of steaming and boiling bottle gourd (*Lagenaria siceraria*) and pumpkin (*Cucurbita moschata*) in the form of cubes or shreds in water scored poorly and hence not considered. The mixed milk was procured from the local Government milk scheme, and examined for fat, total solids, acidity and pH by the methods of BIS, (1981). The average percent values for different constituents were fat 4.0±0.3, total solids 12.0±0.5, acidity 0.13±0.01 and pH 6.7±0.1. The fresh vegetables viz; bottle gourd, pumpkin along with sugar, almond, cardamom, saffron, basmati rice etc. were procured from the local market. All treatments along with control were replicated five times. The *kheer* was prepared following the process and specifications as shown in Fig. 1 and Fig. 2.

The sensory evaluation of various products was done using nine point “Hedonic scale” developed by Quarter master of Food and Container Institute and recommended by Gupta (1976) for food and dairy products. Chemical analysis was done according to the procedures described by Ranganna; 2004. The results recorded were statistically analyzed using sample standard deviation procedure as reported by Snedecor and Cochran (1994). Every time 4-5 kg finished product was made and cooled to ambient temperature and then transferred to refrigerator till it reaches serving temperature (8-10°C). The product obtained was divided into two lots, one lot was used for sensory evaluation and chemical analysis while another lot was utilized for deciding the microbial qualities, shelf life and consumer acceptance of the product.

**RESULTS AND DISCUSSION**

**Identification of traditional technologies:** It was observed that, 63% of small sweet makers produce cereal based (Rice/wheat) *kheer* and 37% manufacture vegetable based *kheer*. However, at household level 60% make cereal-based *kheer* only, rest also prepare vegetable based *kheer* (40%) (Table 1). Both type of *kheer* is prepared occasionally or on demand or during season.

**Process upgradation:** The *Kheer* was prepared by boiling bottle gourd and pumpkin in the forms of cubes and shreds in milk following the process and specifications as detailed Fig.1, Fig.2, Fig.3 and Fig.4. De et al. (2001), reported method of manufacture for *kheer* using cow milk. The best quality *kheer* could be prepared from buffalo milk (Chaudhary, 1989). A ready mix for *kheer* made by using roasted *suji*, sugar and whole milk powder was demonstrated by Singh and Shurpalekar, (1989).

**TABLE 1.** Traditional *Kheer* makers from urban and semi-urban area of Maharashtra.

<table>
<thead>
<tr>
<th>Small Sweet Makers / Halwais</th>
<th>Kheer of milk and vegetable blend</th>
<th>Kheer of milk and cereal blend</th>
<th>Total</th>
<th>Household</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban area</td>
<td>56 (42%)</td>
<td>76 (58%)</td>
<td>132</td>
<td>37 (42%)</td>
<td>52 (58%)</td>
</tr>
<tr>
<td>Sub urban area</td>
<td>37 (30%)</td>
<td>85 (70%)</td>
<td>122</td>
<td>61 (32%)</td>
<td>98 (62%)</td>
</tr>
<tr>
<td>Total</td>
<td>93 (37%)</td>
<td>161 (63%)</td>
<td>254</td>
<td>98 (40%)</td>
<td>150 (60%)</td>
</tr>
</tbody>
</table>
FIG. 1. Process for bottle gourd kheer (Cubes and Shreds)

Receiving of milk, filtration, clarification
↓
Pasteurization (63°C / 30 min) in Jacketed Kettle
↓
Continue heating with slow agitation,
till cubes soft / shreds loses stiffness
(70 - 75°C / 20-25 min.)
↓
Sucrose addition @ 16% cubes & 17% Shreds
↓
Continue heating (75-80°C / 10 min.)
↓
Mixing
↓
Heating in jacketed kettle
↓
Add dry fruits, cardamom powder @ 1%
↓
Concentrate till 29-31% T.S. for cubes & 30-32% for shreds
↓
Balance tank
↓
Filling of cups and covered with lid
↓
Storage (4-5°C)

FIG. 2. Process for pumpkin kheer (Cubes and Shreds)

Receiving of milk, filtration, clarification
↓
Pasteurization (63°C / 30 min) in Jacketed Kettle
↓
Continue heating with slow agitation,
till cubes soft / shreds loses stiffness
(70 - 75°C / 20-25 min.)
↓
Sucrose addition @ 12%
↓
Continue heating (75-80°C / 10 min.)
↓
Mixing
↓
Heating in jacketed kettle
↓
Add dry fruits, cardamom powder @ 1%
↓
Concentrate till 25-27% T.S.
↓
Balance tank
↓
Filling of cups and covered with lid
↓
Storage (4-5°C)
**FIG. 3. Process for pumpkin kheer (Cubes)**

1. Receiving of milk, filtration, clarification
   - Pasteurization (63°C for 30 min) in Jacketed Kettle
   - Slow agitation, complete mixing, continue heating till cubes become soft (70 - 75°C for 20-25 min.)
   - Sucrose addition @ 12%
   - Continue heating (75-80°C for 10 min.)
   - Mixing
   - Heating in jacketed kettle
   - Add dry fruits, cardamom powder @ 1%
   - Concentrate till 25-27% T.S.
   - Balance tank
   - Filling of cups and covered with lid
   - Storage (4-5°C)

**FIG. 4. Process for pumpkin kheer (Shreds)**

1. Receiving of milk, filtration, clarification
   - Pasteurization (63°C for 30 min) in Jacketed Kettle
   - Continue heating with slow agitation, till shreds lose stiffness and become soft (70 - 75°C for 20-25 min.)
   - Sucrose addition @ 12%
   - Continue heating (75-80°C for 10 min.)
   - Heating in jacketed kettle
   - Add dry fruits, cardamom powder @ 1%
   - Concentrate till 25-27% T.S.
   - Balance tank
   - Filling of cups and covered with lid
   - Storage (4-5°C)
Wheat porridge and rice pudding (Kheer) developed by Vijaya Rao et al. (1994) Product description and technology of bottle gourd dessert (Lauki Kheer) consist of milk, sugar, khoa and seedless bottle gourd was reported (Aneja et al. 2002).

**Sensory Evaluation:** Bottle gourd and pumpkin kheer samples were evaluated for colour, flavour, sweetness, body and texture, mouth feel and overall acceptance. Irrespective of type of vegetables and method followed, treatment T1 scored highest (8.00) for overall acceptance followed by T3 (7.71) T2 (7.64) T4 (7.21) T5 (6.79). Bottle gourd Kheer prepared by boiling 25% bottle gourd cubes in milk with 16% sugar scored highest (8.00) and the Kheer prepared by boiling the 27% bottle gourd shreds in milk with 17% sugar scored (7.64) which is more than control (6.79). Kheer prepared by boiling 25% pumpkin cubes in milk with 12% sugar scored (7.71) and the Kheer prepared by boiling the 27% pumpkin shreds in milk with 12% sugar were preferred more than control (Fig. 5). Typically bottle gourd kheer consist of greenish shade while pumpkin kheer has yellowish shade. Shreds and cubes of both vegetables become soft during cooking which imparts characteristics chewy texture to the vegetable based kheer. In all treatments, T3 was more viscous and uniform in appearance and consistency, similar results was reported by Aneja et al. (2002), for bottle gourd dessert. Treatment T1 scored highest for colour, sweetness and mouth feel while treatment T3 score highest for Flavour, Body and Texture. For overall acceptance treatment T1, T2, T3 and T4 scored more than T5 (Control). From above it can be concluded that bottle gourd and pumpkin can be used for preparation of kheer in form of shreds or cubes.

**Chemical Composition:** Average values recorded with respect to various chemical constituents of different treatments are described in Table 2. Observations recorded revealed that total solids and carbohydrate content is higher in kheer prepared from bottle gourd (T1 and T2) while protein and carotene content is higher in kheer prepared from pumpkin (T3 and T4). However all vegetable kheer were lower in fat content and higher in carbohydrate content than the control (rice kheer). Phosphorus and iron content was less in vegetable kheer. Unnikrishnan et al. (2000), observed wide variations in the chemical composition of payasams collected from different sources. Values recorded in the present investigation are lower for total solids and higher for protein, probably because of different processing conditions followed.

**CONCLUSION**

On the basis of the preferences given by the panel of judges Treatment T1 scored highest for overall acceptance of bottle gourd kheer. All treatments were analyzed for different constituents, both vegetable kheer samples tested low level of fat and high level of the carbohydrate content than control. Total solids and carbohydrate content was higher in kheer prepared from bottle gourd while protein content of pumpkin and control kheer was nearly equal. The highest iron content was recorded with control kheer.

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