The Bioscan 10(1): 183-186, 2015
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

PANEER WHEY BASED JELLY CONFECTION

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KEYWORDS
Jelly
Confection
Hydrocolloids
By-products
Pollution

Received on :
15.10.2014

Accepted on :
18.01.2015

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ABSTRACT
Paneer whey testing 6.36% total solids was used at different levels viz., 0% (T1), 25% (T2), 50% (T3), 75% (T4) and 100% (T5) with colour (0.1%), flavour (0.2%), citric acid (1%), high methoxyl pectin (1.5%) and ground sucrose (47.5%) for making jelly confection. Mixture of each treatment was concentrated till reaches to 65°Brix and allowed to set in sterilized stainless steel circular moulds at 28-32°C. Intact jelly mass was cut manually into $2 \times 0.7 \times 0.8$ cm^3 size pieces and twist wrapped manually in polypropylene wrappers. Highest overall acceptability score (7.48 ± 0.71) was allotted to treatment T3. Optimized product obtained using 50% paneer whey. Paneer whey was acceptable up to 100% replacement of water without adversely affecting sensory quality of the product. Results showed scope for enhancing nutrients level of jelly confection, economic benefit to the dairy plants through utilization of whey at its production point mitigating whey disposal and environmental pollution problems.

INTRODUCTION

Majority of people have a sweet tooth and find every reason to celebrate occasions with sweets which is why 'confectionery industry' is bound to be the largest and most popular among the food processing sector (Thakkar, 2011). Healthy ingredients are added to brands to produce functional products (Wright, 2007).

Whey is one of the largest by-products of world dairy industry (Changade *et al.,* 2012). Several attempts are made to incorporate whole whey in many food products for the economic benefit of dairy industry, to utilize valuable nutrients for human consumption (Mathur and Shahani, 1979). Food manufacturers are increasingly viewing whey products as an ideal means of achieving added value but because of high mineral content and low pH, use of acid whey pose considerable difficulties and therefore remain unutilized (Gupta, 2008).

Whey is high in organic matter with biological oxygen demand varying from 39,000 to 48,000 ppm which is 200 times more as compared to domestic sewage (Sahu *et al.,* 2005). Out of 85 million tonnes of global production, 40% is still disposed as raw whey in to sewage (Dhawale *et al.,* 2009). Primary treatment of 5 lakh liters of whey would cost $10,000 per day (Khamrui and Rajorhia, 1998). Today it is not possible to dump whey because of environmental pollution and it is not economically feasible to build a purification plant leaving us with only one alternative, 'to utilize whey' (Knipschildt, 1977). Diversification of whey solids to human food chain employing cost effective technologies appear to be the best alternative to utilize whey (Changade *et al.,* 2012).

Jelly is a confectionery product that includes soluble solids in the form of sugar as well as pectin (Patrella, 2008). It is commonly relied on to add palatability of the diet, especially in lower income groups (Human, 1949). It gives pleasant mouth feeling, good looking product appearance, high acceptability to food products and satisfy craving for sweets (Ognean *et al.,* 2007). Normally jellies are prepared from combinations of gelling agent, synthetic flavours, sugar or glucose syrup and acidified with citric acid (Imeson, 2010). They can be manufactured with many interesting variations using hydrocolloids principally, arabic gum, starch, gelatin, agar and pectin (Booth, 1997). Considerable work has been done throughout the world to utilize whey for producing WPC, whey powder, lactose (Changade *et al.,* 2012), hydrocolloid 'xanthan gum' (Nikam *et al.,* 2011), as an efficient carbon and nitrogen source (Kumari and Dhingra, 2013) etc. However, Sharma and Raghuwanshi (2003) concluded that whey cannot be utilized in preparation of fruit preserves. Rao *et al.* (2003) and Sharma (2014) also agreed with this finding due to perishable nature of fruits whereas Patel and Arora (2005) stated that the native functional virtues of whey proteins along with the fiber functionality of pectin will greatly elevate the status of dairy products for the benefit of consumers of all age groups.

Pectin is a valuable by-product from fruit wastes (Raj *et al.,* 2012). It is most complex polymer of plant cell polysaccharides and in a normal western diet, around 4-5 g pectin is consumed each day with worldwide annual consumption around 45 million kilograms (Willats *et al.,* 2006). Pectin is finding more and more use in the confectionery and pharmaceutical industry (Imeson, 2010). The power of pectin to revolutionize

structure of sol system to generate gel network along with its plant-originated nature and numerous health benefits resulted in its ever-growing applications for creating edible gelled systems (Haghighi and Rezaei, 2012). Jellies made from pectin have several advantages over those made from other hydrocolloids (Baker and Olliver, 1952).

Entrepreneurship promotion in dairy and food industry is a noble concept for attracting the farmers, so as to uplift them (Cheema, 2005). Present work was aimed to study the possibility of using paneer whey in jelly confection.

MATERIALS AND METHODS

A composite sample of fresh whey (Table 1) was obtained as a by-product during paneer preparation by coagulating mixed milk using 1-2% citric acid solution as coagulant (De, 2008). Paneer whey was analyzed for total solids, titrable acidity, pH, total ash and total protein content according to the standard procedure recommended in standard methods of ISI (1981), filtered using double layered muslin cloth and separated twice using cream separator. This whey was used with potable water in different proportions for various treatments viz., 00:100 (T1), 25:75 (T2), 50:50 (T3), 75:25 (T4) and 100:00 (T5) along with different ingredients as shown in material balance (Table 2). The procedure described by Human (1949) was followed for making paneer whey based jelly confection with slight modifications. Each treatment was added with analytical grade citric acid of 'Himedia' make (RM-6826) @ 1%, food grade aqueous orange colour of 'Trishul' brand and aqueous orange flavour of 'Flying Bird' brand @ 0.1% and 0.2% respectively on weight basis. All the blends were heated and simultaneously stirred @ 25-30 rpm till reaches to 76-78°C. 'Himedia' make powder form high methoxyl pectin (RM-396) of jelly grade 150 ± 5 @ 1.5% and ground sucrose @ 15% were mixed together and added to each of the above blends at 77-82°C . Hot homogenous blends were obtained by passing each through the food processor for 5-6 seconds at 70-75°C. Homogenous mass was poured into sterilized stainless steel open pot and placed for further heating. Another lot of ground sucrose @ 32.5% by weight of total mass was added pint by pint with continuous stirring @ 25-30 rpm. Thus, a total of 47.5% ground sucrose was used for each treatment. This mixture was concentrated at 95-105 °C till reaches to 65 °Brix. Foams formed during mass heating were removed using perforated ladle. Jelly mass was filled in ¾ capacity of sterilized stainless steel circular moulds (12 cm diameter and 2 cm height) and allowed to cool and set at room temperature (28-32 °C) for 20-25 minutes. Intact jelly mass was removed and placed over sterilized stainless steel plates. The mass was cut manually to $2 \times 0.7 \times 0.8$ cm^3 size pieces using sterilized stainless steel knife. The average weight per piece was 2.5-3 g. Each piece was twist wrapped in 7×5 cm^2 polypropylene wrappers (Table 3). All the samples from five replications were subjected to sensory evaluation by a panel of five judges on 9 point Hedonic scale as per standard procedure described by Deen and Singh (2013). Data was statistically analyzed using standard method of Completely Randomized Design (Snedecor and Cochran, 1967).

Table 1: Physico-chemical properties of paneer whey

Properties	Values
Total solids	±0.04%
Titrable acidity	00.38±0.01%
pH	05.61±0.11
Protein	00.35±0.01%
Ash	00.40±0.14%

Table 2: Material balance for different treatments

Ingredient (g)	T1	T2	T3	T4	T5
Water	500	375	250	125	000
Paneer whey	000	125	250	375	500
Sugar	475	475	475	475	475
Pectin	015	015	015	015	015
Citric acid	010	010	010	010	010
Total	1000	1000	1000	1000	1000

Table 3: Specifications of polypropylene wrapper

Clarity	Translucent
Grease resistance	Satisfactory
Thickness	0.02 mm
Specific gravity	0.90
Weight	0.007 g/(cm)^2

RESULTS AND DISCUSSION

The sensory evaluation attributes viz., colour, flavour, body and texture, appearance and overall acceptability were judged, results recorded in accordance with the total scoring given by the panelists of each assortment of the new product. There was no significant difference between treatments T1, T2, T3, T4 and T5 for all the sensory attributes. The highest colour score (7.52 ± 0.65) was observed for T2 and lowest score 7.40 ± 0.81 and 7.40 ± 0.80 was recorded for T4 and T5 respectively (Fig. 1). Scores recorded for colour are according to Hussain and Shakir (2010) and Lago-Vanzela *et al.* (2011).

The score for flavour decreased with increasing level of paneer whey. Treatment T1 (Control) and T2 recorded highest flavour score 7.52 ± 0.58 and 7.52 ± 0.63 respectively (Fig. 2). The results are in line with Kumari and Sandal (2010) for whey based mango jam and Islam *et al.* (2012) for strawberry jam. Flavour scores were slightly higher than that reported by Aggarwal *et al.* (1997) for grape and guava blend jelly.

Body and texture score increased with the increase in level of paneer whey from 50 to 75% may be due to additional total solids from whey. The jelly confection with 75% paneer whey (T4) scored highest 7.08 ± 0.57 (Fig. 3). Results recorded are in harmony with Islam *et al.* (2012) for strawberry jelly and Hossen *et al.* (2009) for guava jelly.

The lowest score for appearance 7.36 ± 0.62 was received for jelly confection obtained from 25% paneer whey (T2) and the highest score 7.48 ± 0.62 was given to jelly confection with 75% (T4) paneer whey (Fig. 4). Similar scores for appearance were recorded for jambolan jelly (Lago-Vanzela *et al.*, 2011). The lowest score for overall acceptability 7.32 ± 0.73 was recorded for treatment T1 and highest score 7.48 ± 0.71 was allotted to treatment T3 (Fig. 5). The scores recorded are in agreement with Kumari and Sandal (2010) for whey

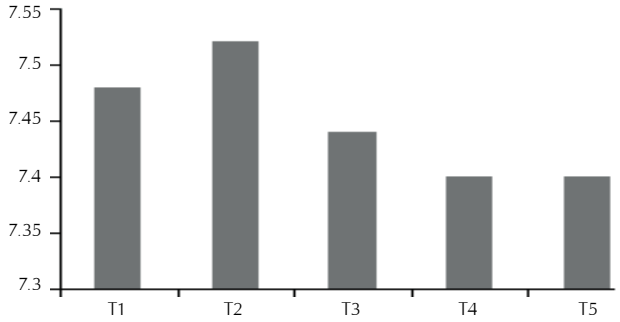

Figure 1: Scores for colour

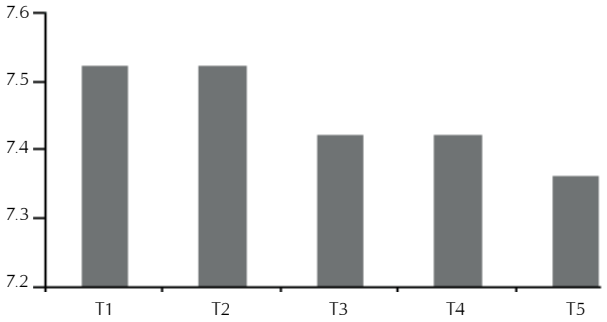

Figure 2: Scores for flavour

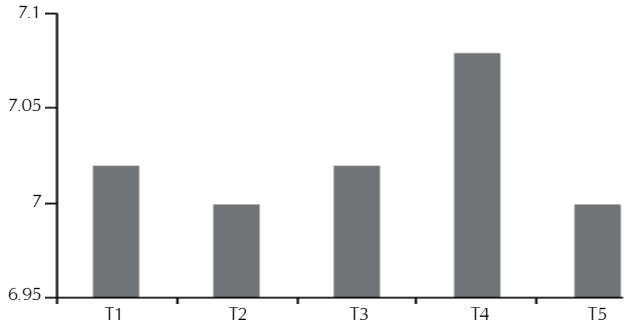

Figure 3: Scores for body and texture

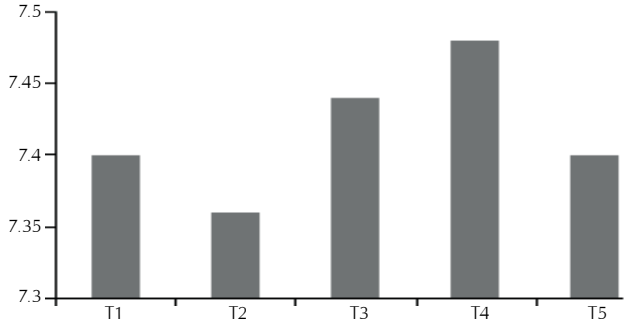

Figure 4: Scores for appearance

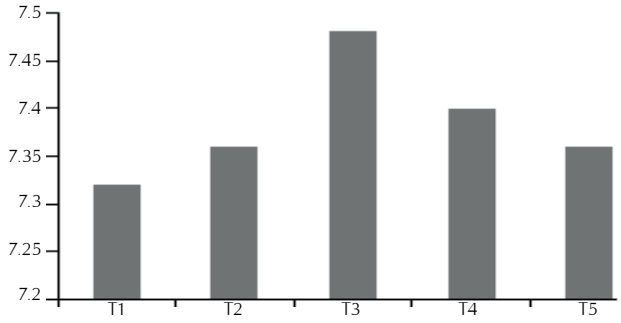

Figure 5: Scores for overall acceptability

based mango jam. Hossen *et al*. (2009) also observed similar results for guava jelly.

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