RESEARCH PAPER

Research Journal of Animal Husbandry and Dairy Science
Volume 3 | Issue 2 | December, 2012 | 81-84

Studies on sensory quality of whey potato fermented product

R.D. DARADE, J.N. KHEDKAR AND D.M. CHOUDHARI

ABSTRACT : Whey a by product generated during manufacturing of *Paneer*, *Chakka*, *Channa* can be efficiently utilized for the preparation of whey fermented product. Among the whey system the whey potato fermented product prepared from *Channa* whey (T_2) was still more acceptable as compared to other treatment studied *i.e.* T_0 (control) T_1 (*Paneer* whey) T_3 (*Chakka* whey) T_4 (Equal quantity of *Paneer* + *Channa* + *Chakka* whey + Potato + Sugar). The whey potato fermented products developed in the present studies were sensorily acceptable and comparable with *Lassi* (traditional product) without any hesitation.

KEY WORDS : Whey, Sensory evaluation, Potato, *Lassi*

HOW TO CITE THIS PAPER : Darade, R.D., Khedkar, J.N. and Choudhari, D.M. (2012). Studies on sensory quality of whey potato fermented product, *Res. J. Animal Hus. & Dairy Sci.*, **3**(2) : 81-84.

INTRODUCTION

Whey is the watery part of milk that remains after separation of curd / coagulated products that results from acid or proteolytic enzyme mediated co-agulation of milk. It is the major by-product of dairy industry, manufacturing products like *Paneer, Channa, Chakka*, Cheese, Casein, etc. In the manufacturing of these products, about 10-20 per cent portion of milk is recovered as the desired end product and remaining 80-90 per cent liquid portion is the whey. Whey is considered as an important food medium. It is rich source of carbohydrates (lactose 4-5%), minerals 0.60 per cent (Ca, P, Na, Mg etc.) and whey protein (0.3-1%). Lactose, a unique sugar from the milk has distinct role as food additives as well as pharmaceutical is cheaply separated from whey. The lactose encourages utilization of calcium, sodium, potassium, from food. Lactose used as drug carrier in pharmaceutical application and also food component in infant formulae. Despite significant gains, more than 50 per cent of whey is being thrown away as waste in gutter, through which more than 50 per cent of milk solid losses as waste.

MEMBERS OF RESEARCH FORUM

Address for correspondence :
J.N. Khedkar, Department of Animal Science and Dairy Science, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA
Email : ukmeel@gmail.com

Associated Authors' :
R.D. Darade and D.M. Choudhari, Department of Animal Science and Dairy Science, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA

Current world production of whey is estimated at about 165 MT (Anonymous, 2010[a]). The cheese whey accounts for nearly 95 per cent of total whey. Considering huge production and disposal problem of whey, the efforts were made through present investigation to assess the possibility of utilization of whey for the manufacture of whey potato fermented product.

MATERIALS AND METHODS

Plain *Lassi* was prepared as per the procedure described by Matkar (2010). The composite milk was taken in a stainless steel container. It was preheated to 35^{0}C, filtered and heat treated at 85^{0}C for 10 minutes. Milk was cooled to room temperature. Then active *Dahi* starter culture (LF-40) was inoculated under sanitary conditions of @ 2 per cent and mixed thoroughly. The inoculated milk was incubated at 30±1^{0}C temperature for12 hrs. The plain *Lassi* was prepared by breaking coagulum, addition of sugar (8%), water (10%) and uniform mixing to have desired consistency (Fig. A).

Technique for preparation of whey potato fermented product:

The whey was obtained by manufacturing of *Panner, Channa* and *Chakka*. The pH of whey systems were adjusted at par of fresh whole milk pH (6.4) by using 2%, aqueous solution of sodium bicarbonate ($NaHCo_3$). Simultaneously, boiled potato paste was prepared. The total solids of whey potato systems were adjusted at par of milk solids (12.69%) by adding nearly 30g boiled potato paste per 100 ml of whey and blended properly. The blended mixture was heated at 85^{0}C for

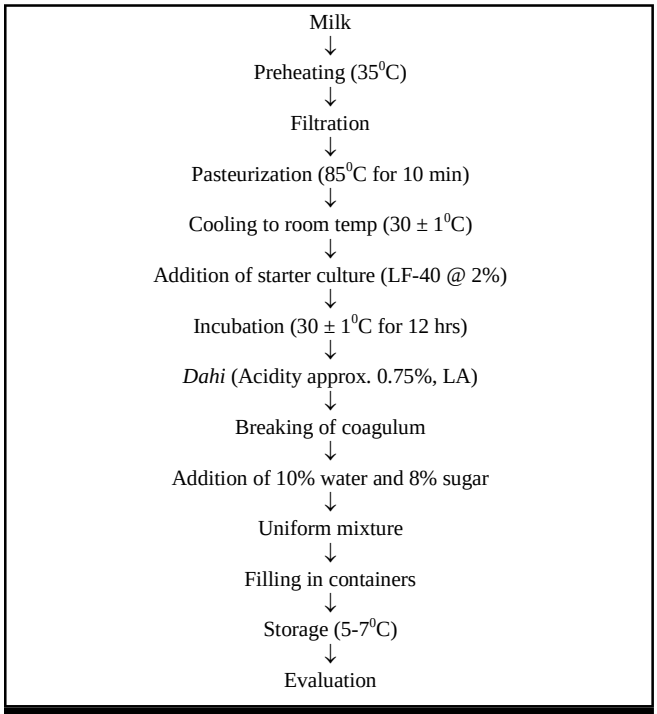

Fig. A : Flow diagram for preparation of plan *Lassi*

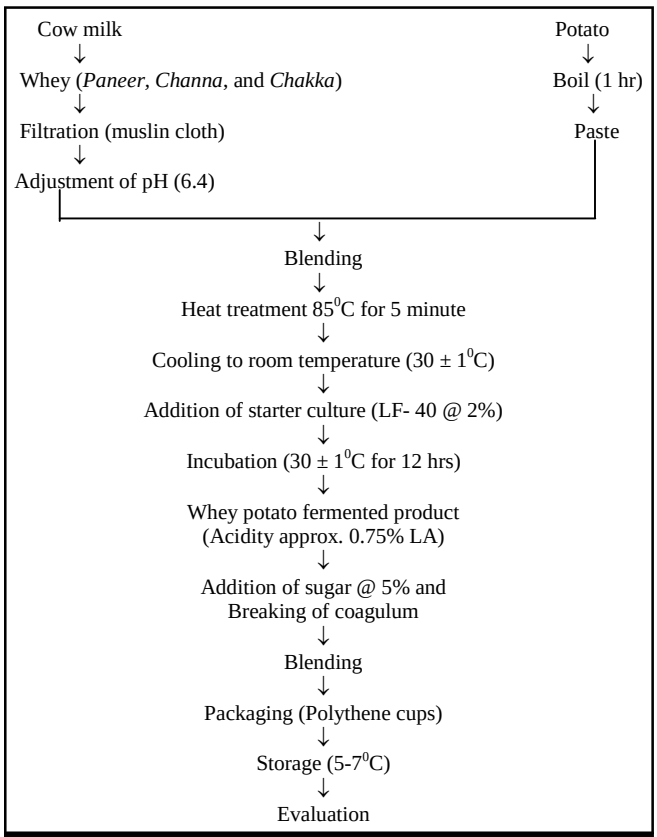

Fig. B : Flow diagram for preparation of whey potato fermented product

5 minute and cooled to room temperature (30±1^{0}C). Active starter culture (LF-40) was inoculated under hygienic condition, @ 2 per cent, mixed properly and incubated at 30±1^{0}C temperature for 12 hrs. for fermentation to have approximately 0.75 per cent acidity. On fermentation, sugar at the rate of 5 per cent was incorporated and mixed thoroughly. A food grade polythene cups (100 ml) was used for packaging the finished product. The filled cups were preserved at refrigerator temperature *i.e.* 5-7^{0}C till evaluation (Fig. B).

The sensory evaluation of whey potato fermented products and plain *Lassi* was carried out by the panel of six semi trained judge from the staff of Department of Animal Science and Dairy Science and Department of Food Science and Technology, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri., by adopting 9 point Hedonic scale, given in BIS: 1971 and referred by Gupta (1971). The effects of treatments were assessed by Complete Randomized Design (CRD) with five treatment and four replications.

Experimental details:

- Total numbers of treatment combinations-5
- Total numbers of replications-4

Treatment detail:

T_0 - Control (dahi *Lassi*)
T_1 - *Paneer* whey + Potato + Sugar
T_2 - *Channa* whey + Potato + Sugar
T_3 - *Chakka* whey + Potato + Sugar
T_4 - Equal quantity of *Paneer* + *Channa* + *Chakka* whey + Potato + Sugar

RESULTS AND DISCUSSION

Sensory evaluation of any consumable product is an integral part of quality assurance programme. The word quality in relation to food is commonly the degree of excellence with respect to its palatability. At the time of judging of whey potato fermented products, certain quality attributes need to be considered. This includes colour and appearance, body and texture, flavour, acidity and overall acceptability. The whey potato fermented products prepared in this investigation were subjected for sensory evaluation to the panel of at least six semi-trained judges. Every sample has given code number which was changed from trial to trial, to hide the identity of the product. The mean values of the scores allotted by the judges for individual sensory attributes are presented in Table 1.

Colour and appearance:

A colour is better judged by putting it against a white background. The data on colour and appearance scores of whey potato fermented products and *Lassi* presented in Table 1, showed significant ($P<0.05$) difference in the values due to treatments. The lowest value (6.96 ± 0.16) was observed for

treatments $T_{3,}$ and it was at par with treatment T_1 (7.42 ± 0.16). Though, the highest, (7.79 ± 0.16) score was recorded for treatment $T_{2,}$ but it was at par with treatment T_0, T_1 and T_4. The fermented product prepared from *Channa* whey + potato (T_2), was appreciated highly, followed by T_0, T_1 and T_4, respectively. The meagre variations were observed within the treatments which might be due to addition of neutralizer. *Chakka* whey was highly acidic so it required more amount of neutralizer. The colour and appearance of all the samples prepared under different treatments had uniform, attractive, pleasant lemon yellow colour. This indicates that either of whey system (*Paneer, Channa* and *Chakka*) could be used for preparation of whey potato fermented product without affecting much of colour and appearance of product. No adverse effect was noticed on colour and appearance attribute of products when compared with plain *Lassi*. Unlike to this, it was experienced that incorporation of fruits and vegetables in the preparation of mango whey beverage (Hapse, 2004) and whey soup with vegetables (Kamat *et al*., 1999) improved the colour and look of the whey preparations, respectively.

Body and texture:

Non-significant variation was observed in the values of sensory scores allotted for the body and texture attribute of whey potato fermented products and *Lassi* (Table 1). This indicated that whey systems did not have any significant effect on body and texture of product. However, the whey potato fermented product under treatment $T_{2,}$ secured maximum score *i.e.* 7.54, while, remaining samples ranged in between 6.79 to 7.50 and were acceptable with varying degrees. The reason could be explained that the total solids content of whey was adjusted to the level of milk and at par. In other case, Saravankumar and Manimegalai (2002) reported that, sensory scores were affected due to the level of pineapple juice added while preparation of whey beverage.

Flavour:

Flavour is the major contributing attribute in the sensory evaluation of milk and milk product in general and fermented dairy products in particular. Flavour characteristics are considered as a voice of foods and beverage. It is sensory sensation perceived at the entrance of the alimentary and respiratory tracts. Flavour is principally composed of taste and aroma of the product. To know the flavour quality of the whey potato fermented products prepared in this study were evaluated sensorily. It is revealed from the mean values of sensory scores (Table 1), that the whey systems had significant ($P< 0.05$) effect on flavour of whey potato fermented product. This indicates that flavour of the whey potato fermented products changed as the whey system changed. The maximum score was allotted to the sample T_2 (7.63 ± 0.17) but it was at par with treatment T_0 and T_4. Whereas lowest score (6.46 ± 0.17) was observed for treatment T_3 (*Chakka* whey) and it was at par with treatment T_1. Similarly the scores of treatment T_0, T_1 and T_4 were at par with each other. Sample T_2 (*Channa* whey + potato) showed maximum liking as compared to the rest of the treatments. The observations recorded in this study are in close agreement with that of Kapse (1998), who noticed that higher flavour score was obtained for *Lassi* prepared with 80:20 proportion (milk: whey) and that of fermented whey beverage prepared with 70:30 combination of milk and whey (Mittal *et al.,* 2009).

Acidity:

Acidity as a sensory attributes was one of the criteria for organoleptic evaluation of whey potato fermented products. It is revealed from the results (Table 1), that whey system had significant ($P<0.05$) effect on acidity score of whey potato fermented product and *Lassi*. Though, the treatment T_2 (*Channa* whey) appears to be obtained significantly higher score (7.71 ± 0.19) however, it was at par with T_0 and T_4 *i.e.* plain *Lassi* and equal quantity whey, respectively. Lowest score (6.79 ± 0.19) was recorded in case of treatment T_3 (*Chakka*

Table 1: Sensory evaluation of whey potato fermented products (Mean of 4 replications)

Treatments	Sensory attributes				
	Colour and appearance	Body and texture	Flavour	Acidity	Overall acceptability
			Score		
T_0	7.71 ^{b}	7.50	7.21 ^{bc}	7.42 ^{bc}	7.54 ^{b}
T_1	7.42 ^{ab}	7.29	6.92 ^{ab}	7.00 ^{ab}	6.96 ^{a}
T_2	7.79 ^{b}	7.54	7.63 ^{c}	7.71 ^{c}	7.50 ^{b}
T_3	6.96 ^{a}	6.79	6.46 ^{a}	6.79 ^{a}	6.75 ^{a}
T_4	7.46 ^{b}	7.21	7.21 ^{bc}	7.25 ^{abc}	7.25 ^{ab}
Result	*	NS	*	*	*
S.E. (±)	0.16	0.23	0.17	0.19	0.17
C.D. (P=0.05)	0.47	-	0.51	0.57	0.52

Note: Means with different superscript differed significantly from each other

* indicates significance of value at $P < 0.05$

whey) and it was at par with treatment T_1 and T_4.

Overall acceptability:

The overall acceptability is the consensus on the overall quality of the product. The samples of whey potato fermented products prepared for the study were also subjected to record the scores of overall acceptability. The data pertaining to the scores of overall acceptability are presented in Table 1 which showed significant ($P<0.05$) variation due to the treatments. The maximum score (7.54 ± 0.17) was allotted to sample T_0 but it was at par with the score of treatment T_2 (*Channa* whey based product) and T_4 (equal quantity whey based product). These indicate that products prepared either utilizing the *Channa* whey or equal volume of *Channa-Chakka-Paneer* whey could produce comparable quality products as that of plain *Lassi.* Further, it can be stated that, though the whey systems influenced on increase or decrease in overall acceptability scores, but they produced products well above the (minimum scores 6) requirement, expected by 9 point hedonic scale. Sensorily acceptable whey potato fermented product can be prepared by incorporating of boiled potato paste nearly 30 g per 100 ml of whey. The evidences from the literature indicated that, little treatments to the whey could produce refreshing and acceptable whey beverages. Grinence and Kyavichyas (1977) reported that whey beverage prepared with a mixed culture of *Streptococcus cremoris* and *Streptococcus diacetilactic* @ 1-1.2 per cent was refreshing and highly acceptable. Whereas, Kaur *et al.* (2000) stated that *Paneer* whey beverage prepared by incorporating 25 per cent carrot juice produced sensorily acceptable product. Similarly, Sakhale *et al.* (2007) reported that an adjunk prepared with 30 per cent mango juice and 70 per cent whey had highly acceptable taste and overall acceptability.

Conclusion:

The whey potato fermented products developed in the present studies were sensorily acceptable and comparable with *Lassi* (traditional product) without any hesitation.

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Received : *15.10.2012;* ***Revised:*** *04.11.2012;* ***Accepted :*** *14.11.2012*