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Effect of Fat Levels of Milk on The Yield, Recovery of Solids and Sensory Attributes in Bhadawari Buffalo Milk Paneer

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In this study, fat content in the Bhadawari buffalo milk was maintained at 4.5 %, 5.0% , 5.5% and 6.0% levels to prepare paneer. The paneer samples prepared were subject for evaluation of sensory attributes like flavour, body and texture, and colour and appearance. The yield of paneer samples and recovery of fat and total solids were also reported. Investigation was replicated thrice. The data thus obtained were subjected for statistical analysis using factorial CRD and tested at 5% level of significance. Fat levels of milk had a significant effect on all above characteristics of study, except colour and appearance. This study concluded as Bhadawari buffalo milk of 5.0 to 6.0% fat should be used for the manufacturing of good quality paneer.

Key Words: Body and texture, flavour, organoleptic, sensory attribute, total solids

Introduction

India is considered as an agrarian country in which a major proportion of population is vegetarian. Milk plays an important role in the diet of such persons as a source of animal proteins. Paneer is an important indigenous product which is obtained by heat treatment of milk followed by acid coagulation using suitable acid viz. citric acid, lactic acid or sour whey. The whey formed is removed through filtration and pressing.

Review of Literature

India is the largest milk producer in the world with a production of 198.4 MT in 2019-20, which increased by 5.7 per cent in the last fiscal (Anonymous 2021). About 55% of the total production is buffalo milk. Traditional dairy products have played an important role in social, economic and nutritional well being of society. The importance of milk and milk products has been recognized since Vedic times and it is considered to be complete food (Gupta 1999). About half the milk produced is consumed in the liquid form and the remaining is used to prepare products such as ghee, curd, butter, khoa, paneer, cheese, chhana, ice cream and milk powders.

Paneer represents one of the soft varieties of the cheese family and is used in culinary dishes/snacks. About 5% of milk produced in India is converted into paneer. Paneer contains all the milk constituents except for loss of some soluble whey proteins, lactose and minerals. Paneer has a fairly high level of fat (22–25%) and protein (16–18%) and a low level of lactose (2.0–2.7%) as reviewed by Kumar et. al. (2014). Paneer contains on average 0.79% calcium and phosphorus 0.52% in paneer (Srivastav and Singh 2020). Paneer must be uniform and have a pleasing white appearance with a greenish tinge when made from buffalo milk and light yellow when made from cow milk. Desai (2007) described the desirable sensory attributes for paneer. It must have a characteristic blend of the flavour of heated milk and acid, i.e. pleasant, mildly acidic and sweet (nutty). Its body and texture must be sufficiently firm to hold its shape during cutting/slicing, yet it must be tender enough not to resist crushing during mastication, i.e. the texture must be compact and smooth;

According to Prevention of Food Adulteration Rules (PFA 2010), paneer means the product obtained from cow or buffalo milk or a combination thereof by precipitation with sour milk, lactic acid or citric acid. It shall not contain more than 70% moisture and the milk fat content shall not be less than 50% of the dry matter. Milk solids may also be used in preparation of the product. Bureau of Indian Standards (BIS 1983) also specifies a minimum of 50% fat on dry matter basis but a maximum of 60% moisture in paneer. In order to achieve these requirements, buffalo milk having 5–6% fat is deemed to be most suitable (Sachdeva and Singh 1988).

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Need and objective

Buffalo milk is preferred over cow milk for the production of paneer because it provides better body and texture as well as higher recovery of all the nutrients and greater nutritive value. Among the various breeds of buffaloes in UP, Bhadawari buffalo is the most important. Its native place is Bhadawari state of Agra district and adjoining area of Gwalior and Etawah. Animals are also found scattered in the surroundings of Jamuna and Chambal river. Bhadawari buffalo milk known for high fat content (recorded as high as 13%) is not suitable as such for the manufacture of paneer due to its high fat content. It has been reported that desirable body and texture in paneer is not obtained if it is prepared from milk highly rich in fat. Bhattacharya et. al. (1971) reported that the higher fat level in milk, the higher losses in paneer whey. The cost of production of paneer is also higher which is a major hurdle in popularization of paneer in the middle and lower class of society. On the other hand, awareness due to high milk intake has become apparent due to coronary complications. Without standardization of milk, uniformity in the composition and sensory attributes of the finished product cannot be obtained. Under the circumstances, a reduction in fat content of milk to the extent to achieve the legal standards in paneer, offers great promise to solve aforesaid problems.

Materials and Methods

Bhadawari buffalo milk was received from the source aseptically, tested and standardized to 4.5%, 5.0%, 5.5% and 6.0% milk fat with a SNF level of 9.5 percent by adding fresh Bhadawari buffalo skim milk. The additional requirement of SNF content was made up through spray dried skim milk powder. The paneer was prepared by the method suggested by Sachdeva and Singh (1987) and Aneja (1997). The yield (%) of paneer was reported on the basis of the same milk used for the purpose. Paneer samples were taken for the analysis as per procedure described in SP18 Part XI (1981). Sensory evaluation (flavour-50, body and texture-35, and colour and appearance-15) was done on a 100 point scale as given by Patil and Gupta (1986). Moisture content was determined by the gravimetric method adopted by Roy and Singh (1994) and fat content by Gerber's method present in IS-1224 (II) 1977. Recovery of fat and total solids were mathematically calculated using figures of fat and total solids in used milk and paneer made. This study was replicated thrice and the data thus obtained were analyzed by CRD and tested at 5% level of significance.

Result and Discussion

It is evident from the data depicted in the table that fat levels of milk had a significant effect on all characteristics in the study, except colour and appearance.

Table: Effect of fat levels of milk on the yield, recovery of solids and sensory attributes of paneer

S.No.	Characteristics	Fat Levels				Effect at 5% level of significance	SE (Diff)	CD at 5%
		4.5%	5.0%	5.5%	6.0%			
1.	Yield (%)	17.93	18.57	18.96	19.68	Significant	0.16	0.31
2.	Recovery of total solids (%)	60.89	62.54	63.51	64.56	Significant	0.32	0.63
3.	Recovery of fat (%)	92.92	92.32	91.77	90.80	Significant	0.25	0.50
4.	Flavour (50)	40.73	41.45	41.85	42.78	Significant	0.22	0.43
5.	Body and texture- (35)	28.60	29.19	29.57	29.85	Significant	0.17	0.34
6.	Colour and appearance (15)	12.43	12.54	12.53	12.58	Non Significant	0.08	NS
7.	Overall organoleptic score (100)	81.76	83.14	83.95	84.90	Significant	0.43	0.85

NS - Non Significant

The yield of paneer significantly increased with increase in each fat level of milk. Similar trend in yield of paneer had also been reported by Chawla et.al.(1987) and Pal and Yadav (1992). Increase in yield of paneer might be attributed to increase in the recovery of total solids and higher fat content in milk. The recovery of total solids in paneer was significantly increased with the elevation of each fat level of milk. The hike in recovery of total solids with increasing fat levels in milk might be attributed to the increase in fat-protein complexes during heating of milk. The recovery of fat is decreased significantly with the increase in each fat level of milk. Thus, it is obvious

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that increase in fat level in milk had an adverse effect on the recovery fat in paneer. Chawla et.al.(1987) and Roy and Singh (1994) have also found a similar trend in the recovery of fat in paneer.

The flavour score of paneer was significantly affected by the fat levels of milk. It is apparent that there was a direct relationship between the fat content of paneer and its flavour score. The corresponding values for 5.0 and 5.5 percent milk was statistically at par. This finding is in conformity with the observations of Chawla et.al.(1987), and Pal and Yadav (1992). It is well established that milk fat contributes the most pleasing flavour and taste to the product. It can further be seen from the table that the score for body and texture increased with the increase in fat levels in milk. It could be due to improvement in luster which the fat imparts to the product when present at optimum level. This finding is in close agreement with the results of Chawla et.al.(1987), and Pal and Yadav (1992). The scores for colour and appearance at different levels of fat were non significantly different. Thus, it is obvious from the results that fat levels had no influence on colour and appearance of paneer. Similar observations have also been reported by Chawla et.al.(1987) and Roy and Singh (1994). The overall organoleptic score of paneer samples is the sum of scores for flavour, body and texture and colour and appearance of the same samples. It increased with the increase in fat levels of milk. It is particularly due to improvement in flavour, and body and texture of paneer with increase in fat level of milk. The corresponding values for 5.0 and 5.5 percent milk were statistically at par.

Conclusion

The yield, recovery of total solids and total sensory score increased with the increase in fat level of milk. Since 4.5 % fat level of milk did not meet the legal requirement of fat in paneer as reported by Bhattacharya et.al.(1971) , so milk of 5.0 to 6.0 % fat may be recommended for the manufacturing of acceptable quality paneer conforming to legal standards.

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