

STUDIES ON EFFECT OF WHEY PROTEIN CONCENTRATE (WPC) ON THE PHYSICO - CHEMICAL AND SENSORY PROPERTIES OF COTTAGE CHEESE

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Abstract— In this study an attempt has been made for replacement of cream with WPC at 25, 50 and 75 per cent levels into cottage cheese during dressing with cream. Among levels 25 per cent replacement was found to have better sensory characteristics. Higher sensory score of 8.32 out of 9.00 for overall acceptability of cottage cheese was awarded. On further addition of WPC at above 25 per cent, significant reduction in sensory scores was observed. The protein content of cottage cheese increased with replacement of cream with WPC. The Protein content increased from 14.36 per cent in control cottage cheese to 15.91 per cent when WPC was added at 25 per cent level.

Key words: Whey Protein Concentrate, Cottage cheese, Proteins.

1. INTRODUCTION

The annual milk production in India as per estimated of [1] was found to be as to 155.5 million tonnes. About 55 per cent of milk in the country is being utilized for preparation of various indigenous dairy products like khoa and khoa based sweets, chhana and chhana based sweets, paneer, etc. It is estimated that about 7 per cent of milk produced in India is converted into fermented milks. Among Various fermented dairy products, cheese occupies an important place in the diet.

Cheese, the generic name for a group of fermented dairy products, produced throughout the world in a great diversity of flavours, textures and forms, have occupied a place of complacency in satisfying the palate and nutritional requirements of human beings since the time of antiquity. It began accidentally, as a simple way to preserve milk constituents and has evolved to become food of 'Haute – cuisine' with epicurean qualities. The technology of cheese making is used as a method of value addition and conversion of raw materials by microorganisms and enzymes into various types of cheese with distinct nutritional and sensory properties.

Cottage cheese is a fermented dairy product, also known as pot cheese, Dutch cheese. Nutritionally, cottage cheese is a whole some low calorie food. Cottage cheese could be a healthy part of a weight loss plan. Moreover, a high protein content found in cottage cheese (about 10 per cent by weight) also makes it a great protein source for vegetarians and those who do not like meat products [2]. Cottage cheese making, through historically appeared as a popular delicatessen in ranch houses and homes of Central Europe was first adopted by the colonial America and the modern industrial cottage cheese making originated in the United States about 1915 and until today different ways for production of this cheese

have been referred[3].Each change during Cottage cheese production may have the great influence on its composition, yield, characteristics and nutritive value.

Whey protein products have been attempted in yoghurt and various cheeses to improve the yield, nutritive value and consistency. WPC could be used to replace dried skim milk in dairy products without adverse effect on sensory properties. Utilization of WPC improves viscosity and this property can be explored to thicken foods such as soups, sauces, yoghurts and fermented beverages.

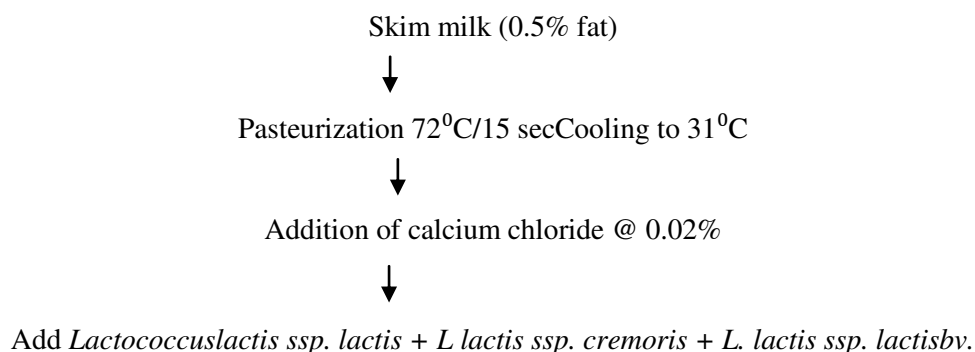
Whey proteins are rich in essential amino acids and have a high Protein Efficiency Ratio (PER) 3.6, Biological Value (BV) 104 and Net Protein Utilization (NPU) 95 and are next to egg. The nutritional and functional properties of WPC are well documented. Owing to their excellent nutritional, functional properties and therapeutic values, WPC finds numerous applications in food industry. Whey protein products have been attempted in yoghurt and various cheeses to improve the yield, nutritive value and consistency.

The enrichment of cottage cheese by replacement of cream with WPC will increase the total amount of nutrients and proteins in cottage cheese and thus enhances the quality and overall acceptability of the product. Therefore, an attempt has been made to prepare cottage cheese from cow milk. WPC was used to partial replacement of cream to obtain low fat and high protein product without affecting the sensory properties.

II. MATERIALS AND METHODS

Skim milk: Pasteurized cow milk was procured college dairy farm. **WPC:** Fresh spray dried Whey Protein Concentrate having 80 per cent protein was procured from Mahaan Proteins Ltd., New Delhi, India was used for the enriched dressing of cottage cheese. **Starter cultures:** Cultures such as *Lactococcuslactis ssp. Lactis*, *L lactis ssp. cremoris* and *L. lactis ssp. lactisbv. diacetylactis* and in the form of freeze dried direct Vat set (FD-DVS) was obtained from Chr. Hansen Laboratories, Denmark.

Method of manufacture of cottage cheese enriched with WPC: Cottage cheese samples were prepared by replacing cream with WPC at the time of dressing at the rate of 25, 50 and 75per cent levels and the control cottage cheese was prepared by using skim milk with no replacement of dressing cream with WPC(Fig 1). The cottage cheese was manufactured was described by[4]. The resultant cottage cheese was subjected for various chemical analysis and served to a panel of judges along with then control to judge the sensory characteristics and overall acceptability. Based on sensory evaluation the best combination was selected.



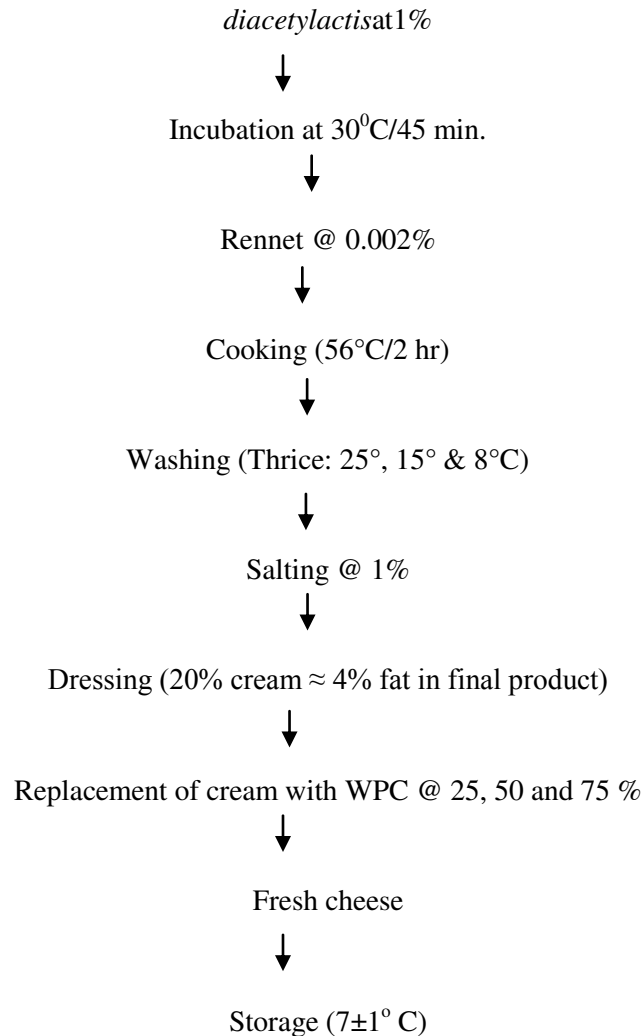


Figure 1: Flow diagram for the preparation of cottage cheese enriched with WPC

Analytical procedure: The fat content was determined by Gerber method. The protein and moisture content of the samples were determined as per [5].

III. RESULTS AND DISCUSSION

The effect of replacement of cream with WPC at different levels on sensory characteristics of cottage cheese are presented in table 1: WPC when replaced with cream dressing up to 25 per cent level awarded comparable sensory scores for colour and appearance, body and texture, flavour and overall acceptability of cottage cheese. Table (1) reveals that the colour and appearance scores of all treated and control samples were statistically non-significant ($P \leq 0.05$). Replacement of fat with WPC up to 75 per cent level leads to slight decrease in the sensory scores for colour and appearance, body and texture and flavour. Judges opined that the cottage cheese prepared at higher

levels of WPC above 50 per cent were slightly dull and lacked glossiness. Similar results were reported by [6], who used above 10 per cent WPC in the development of chhana (Indian soft cheese) spread.

Table (1) reveals that in cottage cheese replacement of cream with WPC significantly influence the body and texture. The highest body and texture score of 8.35 out of 9.00 was awarded to 25 per cent replacement as against control. At higher levels reduction in the score could be due to the absorption of free moisture, body and texture became drier and highly viscous. [7] reported that whey protein concentrate powder was added to milk in the ratio of 0.15 and 0.30 per cent levels for the preparation of mozzarella cheese. Best mozzarella cheese resulted by adding WPC in ratio 0.30 per cent into the milk, significantly lower hardness by improving texture and functional properties of mozzarella cheese.

The maximum flavour and overall acceptability score of 8.00 and 8.32 was awarded for cottage cheese prepared by incorporated with 25 per cent levels of replacement fat with WPC. Further addition of WPC at above 25 per cent showed significant difference in sensory scores. This may be probably due to the reduction of milk fat at higher levels of replacement of fat with WPC, due to Characteristic flat flavour of WPC. Similar findings were reported by [8] where yoghurt prepared by replacing the MSNF with WPC up to (70 per cent) was found to be good mouth feel, firmer with less syneresis, secured highest sensory scores with respect to flavour.

The effect of incorporation of Whey Protein Concentrate on the composition of cottage cheese are presented in table 2: The progressive decrease in the fat from 3.61 to 1.82 was observed in the experimental cottage cheese samples with the increase in incorporation of whey protein concentrate levels. This could be due to the decrease in the addition of cream by increasing whey protein concentrate levels during dressing of the cottage cheese.

Replacement of fat with WPC in cottage cheese showed no significant effect on moisture and water activity of the cottage cheese. The protein content of 15.91 per cent was recorded when WPC was replaced with cream dressing at 25 per cent replacement of cream with WPC. This may be due to WPC itself contains proteins, not only improves the functional properties but also increases the nutritional characteristics. The pertaining results of present investigation are in argument with the observations made by [9].

Replacement of milk fat with WPC (%)	Colour and Appearance	Body and Texture	Flavour	Overall acceptability
Control	8.11 ^a	8.17 ^a	8.20 ^a	8.10 ^a
25	7.61 ^a	8.35 ^b	8.00 ^a	8.32 ^b
50	7.78 ^a	7.50 ^c	7.33 ^b	8.01 ^a
75	7.53 ^a	7.31 ^c	6.66 ^c	7.78 ^c
CD(P≤0.05)	NS	0.23	0.45	0.16

Table 1. Effect of replacement of fat with whey protein concentrate (WPC) on sensory characteristics of cottage cheese

Replacement of milk fat with WPC (%)	Moisture (%)	Fat (%)	Protein (%)	Water activity (a _w)
Control	68.91 ^a	4.01 ^a	14.36 ^a	0.970 ^a
25	66.90 ^a	3.61 ^a	15.91 ^a	0.968 ^a
50	63.21 ^a	2.37 ^b	18.55 ^b	0.965 ^a
75	60.15 ^a	1.82 ^b	20.12 ^b	0.960 ^a
CD(P≤0.05)	NS	1.42	2.39	NS

Table 4. Effect of replacement of fat with whey protein concentrate on chemical characteristics of cottage cheese

VI. CONCLUSION

The consumption of fermented dairy products is increasing in recent years, mainly due to excellent nutritional and therapeutic properties. The nutritive value of cottage cheese is comparatively better than some of the dairy products. Therefore various types of cottage cheese have been investigated not only to improve the functional properties but also enrich the nutritional characteristics. From this investigation it was concluded that the cottage cheese can be prepared by 25 per cent replacing fat with Whey Protein Concentrate with improved physico- chemical, sensory and nutritional aspects of the product. Consumption of this developed cottage cheese not only improves the nutritional status but also improves the therapeutic properties.

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