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## Effect of incorporation of nutraceutical ingredient whey protein concentrate (WPC) on the quality of paneer spread

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### Abstract

Paneer spread is a new paneer based product and spreadable at refrigeration temperature. In this study an attempt has been made to identify the functional, sensory and nutritional properties of the product by incorporating WPC at 2, 5, 10 and 15 percent level. Among the various levels tried 10% level was found to be optimum with improved in stability in spreadability, significantly lower fat (17.26) than control (18.13%) and significantly higher protein (18.13%) than control (15.04) and better mouth feel was noticed in WPC incorporated paneer spread.

**Keywords:** Paneer, sensory, whey, spread and WPC

### Introduction

Paneer is one of the most popular traditional dairy products. As per data from FAOSTAT, milk production was 209.96 million tons (MT). It accounted for 21 percent of the global output. Paneer is popular traditional heat and acid coagulated dairy product. It is mainly used as a base material for the preparation of large number of culinary dishes in almost all parts of the country. About 45-50 percent of total milk produced is converted into variety of traditional milk products by heat and acid coagulation, heat desiccation and fermentation. Indian traditional products market is estimated to be more than Rs. 6,500 crores (Patil, 2004) [6]

Whey nutrients represent a huge quantity of nutritionally rich food. In spite of its high nutritional quality, whey is still being largely wasted and not used for human consumption. One hundred kilogram's of whey protein contain about 2.5 g of cystine and 2.8 g of cysteine. Whey protein contains all the essential amino acids including isoleucine, lysine, threonine, and tryptophan (Irvine *et al.*, 1984) [4]. The protein efficiency ratio of whey protein is 3.6 against 3.8 of whole egg and 2.9 of casein. Net Protein Utilization is 76 for whey.

There are mainly two types of spreads available in the domestic market, namely, butter and cheese spreads. Since Butter is a high fat, most of the consumers particularly fat conscious group is hesitant to consume butterfat because of the possibility of coronary heart diseases. High cost of butter in addition to its high-saturated fatty acids, cholesterol contents, high calorific value and poor spreadability at room temperature below 15° C limits its consumption (Prajapati *et al.*, 1991) [8]. Cheese spread, though meets all the nutritive requirements of the people of all age groups but not so popular among Indian population.

### Materials and Method

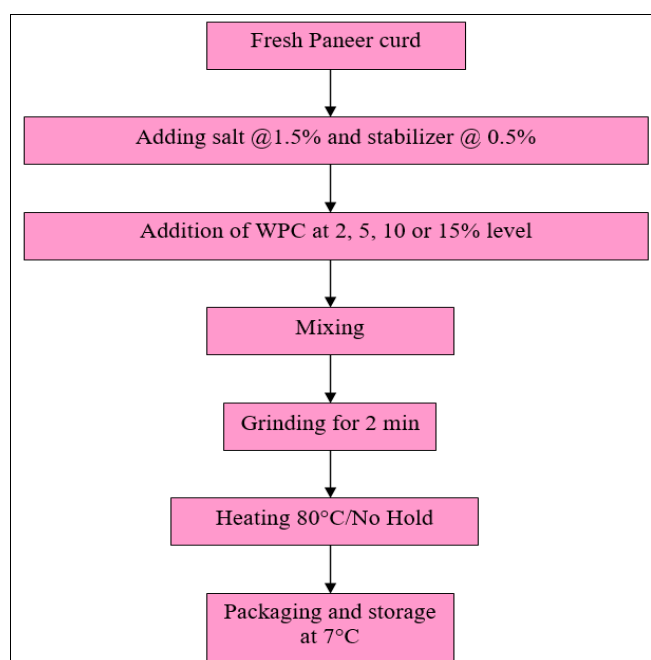
**Milk:** Fresh cow's milk was procured from the Students Experimental Dairy Plant (SEDP) and the milk was standardized to 4.5% fat and 8.5% Milk Solis Not Fat (MSNF) by adding calculated amount of fresh cream and or skim milk powder and product was prepared as showed in the flow chart-1.

**Whey protein concentrate (WPC):** WPC was procured from Mahan proteins Ltd Mathura (UP). The specifications of WPC are as follows:

## Physicochemical characteristics of WPC

Colour	Cr. white
Taste	Bland
Bulk density (gm/ml)	0.41
Sediment, ADPI Disc	B
Insolubility Index, ml	1.2
Moisture	3.80
pH (10 %w/v solution)	6.62
Protein % (on dry matter)	69.25
Fat % as such	4.99
Total minerals % as such	4.57

**Microbiological characteristics:** Total plate count 700/gm, coliforms –ve/0.1gm, salmonella –ve/100 g, and yeast and mould 10/gm



**Flow chat 1:** Preparation of WPC incorporated paneer spread

## Results and Discussion

Effect of incorporation of whey protein concentrate (WPC) on the chemical quality of paneer spread is presented in the Table -1

### Chemical quality

There was a significant decrease in the moisture and fat percent of treated spreads that ranged from 62.09 to 57.33 and 17.90 to 16.87 respectively, as the level of incorporation of WPC increased from 2 to 15 percent. The decrease in the moisture and fat percent of treated spreads was mainly due to the significant increase in total solids from 37.91 to 42.67. Whereas, a significant increase in the protein percent of treated spreads from 15.92 to 21.24 was also observed. The incorporation of WPC (protein rich dairy byproduct) was mainly responsible for this increase in protein percent of treated spreads. As the level of incorporation of WPC increased, the treated spread became firmer and harder, hence penetration values decreased to 105 from 157 mm/5 S.

### Sensory Characteristics

Effect of incorporation of whey protein concentrate (WPC) on the sensory quality of paneer spread is presented in the Table -2

There was a slight, but insignificant decrease in the colour and appearance scores of treated spreads as the percent level of incorporation of WPC increased from 2 to 15 percent. Judges opined that the spreads at higher levels of WPC incorporation were slightly dull and lacked glossiness. Thapa and Gupta (1992) <sup>[12]</sup> reported that the processed cheese prepared with added WPC at 20 percent level showed significant decline in appearance score ( $p < 0.05$ ) in addition to browning of the product.

There was no significant improvement in the body and texture scores of spread prepared by incorporating WPC at 2 percent level than that of control. But at 10 percent level of incorporation, a significant increase in the body and texture scores was observed due to its good mouth feel, smooth and firm consistency, soft body and textural characteristics without any free moisture was observed. But at higher levels of WPC (W3), judges felt that spread was highly viscous and drier and hence they awarded lower body and texture scores for the spread containing 15 percent WPC. The decline in the body and texture scores may be ascribed to incorporation of higher levels WPC in the in treated spreads (Table-1 and 2) that led to higher percent of total solids in the finished product. These results are in confirmation with the findings of Sharma, *et al.*, (1998) <sup>[10]</sup>, who reported that a dried whey product used at lower levels (2 to 5 percent) in dairy products contributed to the better and desirable mouth feel attributes. Towler (1982) <sup>[13]</sup> stated that incorporation of WPC at 10 percent level to noodles helped to prevent dryness and enhanced the colour. Raju (2004) <sup>[9]</sup> developed high protein cake by incorporating WPC up to 30 percent improved sensory characteristics and functional properties. The improved colour of the cake was attributed to maillard reaction due to the interaction of lactose and proteins present in WPC. Molder and Jones (1985) <sup>[5]</sup> prepared new types of cream cheese spreads with 60 percent protein by blending cream and whey proteins and found that firmness or smoothness was comparable to that of cheese spread. Patel *et al.* (1993) <sup>[7]</sup> studied the effect of addition of WPC to cow milk during the preparation of khoa and reported that addition of WPC at 5 percent level yielded khoa with desired texture and thus product obtained was comparable to that of buffalo milk khoa. Many scientists noticed improvement in body and texture of dairy (Anon, 2003 Gupta, 1997) <sup>[1, 3]</sup> and meat (Taylor and Walsh, 2002) <sup>[11]</sup> products by incorporating WPC. The flavour scores of treated spreads improved with increase in levels of WPC up to 10 percent. At 15 percent level, flavour scores awarded by judges were significantly lower than that of control and this may probably due to lower milk fat content in spreads in addition to slightly heated and powdery flavour as reported by judges. Webb *et al.* (1983) <sup>[14]</sup> observed that browning resulted in the production of reducing, fluorescent substances and disagreeable flavouring compounds.

The spreadability scores of treated spread increased significantly than that of control as the percent level of incorporation of WPC increased (2 to 10). However, at 15 percent level, the spreadability score was lower than that of control as well as other treated spreads and this may be due to highly viscous and thick consistency in the treated (W4) samples.

The maximum overall acceptability score was awarded to W3 (92.21) prepared by incorporating WPC at 10 percent level and it was significantly superior to that of control and other

treated spreads with respect to body and texture, flavour and spreadability. The spread W3 possessed soft, smooth

consistency and was stable in spreadability.

**Table 1:** Effect of whey protein concentrate (WPC) on the composition and penetration values of paneer spread

Parameters	Percent level of WPC					C.D ( $P<0.05$ )
	0 Control	2 (W1)	5 (W2)	10 (W3)	15 (W4)	
Moisture (%)	63.15 <sup>a</sup>	62.09 <sup>b</sup>	60.93 <sup>c</sup>	59.06 <sup>d</sup>	57.33 <sup>e</sup>	0.13
Fat (%)	18.13 <sup>a</sup>	17.90 <sup>a</sup>	17.68 <sup>ba</sup>	17.26 <sup>bc</sup>	16.87 <sup>c</sup>	0.63
Protein (%)	15.04 <sup>a</sup>	15.92 <sup>b</sup>	17.05 <sup>c</sup>	18.86 <sup>d</sup>	21.24 <sup>e</sup>	0.26
Total Solids (%)	36.85 <sup>a</sup>	37.91 <sup>b</sup>	39.07 <sup>c</sup>	40.94 <sup>d</sup>	42.67 <sup>e</sup>	0.03
Penetration value (mm/5 S)	165 <sup>a</sup>	157 <sup>a</sup>	136 <sup>b</sup>	119 <sup>c</sup>	105 <sup>d</sup>	8.87

Figures with the same superscripts in a row indicates no significant difference at  $p<0.05\%$  level

**Table 2:** Effect of whey protein concentrate (WPC) on the sensory characteristics of paneer spread

Sensory attributes	Percent level of WPC					CD ( $P<0.05$ )
	0 Control	2 (W1)	5 (W2)	10 (W3)	15 (W4)	
Colour and appearance (25)	22.11 <sup>a</sup>	22.00 <sup>a</sup>	21.53 <sup>a</sup>	21.50 <sup>a</sup>	21.00 <sup>a</sup>	1.14
Body and texture (15)	12.02 <sup>a</sup>	12.00 <sup>ba</sup>	13.14 <sup>c</sup>	14.11 <sup>d</sup>	11.00 <sup>e</sup>	0.78
Flavour (45)	41.00 <sup>a</sup>	41.51 <sup>ab</sup>	42.50 <sup>c</sup>	43.10 <sup>c</sup>	38.02 <sup>d</sup>	0.64
Spreadability (15)	12.50 <sup>a</sup>	12.50 <sup>a</sup>	13.15 <sup>ab</sup>	13.50 <sup>b</sup>	12.00 <sup>c</sup>	0.91
Overall acceptability (100)	87.63 <sup>a</sup>	88.01 <sup>a</sup>	90.32 <sup>b</sup>	92.21 <sup>c</sup>	82.02 <sup>d</sup>	0.43

Figures with the same superscripts in a row indicate no significant difference at  $p<0.05\%$  level

## Conclusion

Incorporation of WPC at 10 percent level not only improves the functional properties of the paneer spread but also increases the nutritional quality (i.e 21.24 percent protein as against only 15.04 percent in control sample) hence, WPC as byproduct of dairy industry it can be incorporated during the development of paneer spread to reduce cost of production of paneer spread so, that it is economical to the dairy industry.

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