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TO STUDY THE EFFECT OF DIFFERENT LEVELS OF WHEY PROTEIN CONCENTRATE (WPC) ON THE QUALITY OF PANTUA.

***Thejaswini M.L., Venkateshaiah B.V., Arun Kumar H., A. Sachindra Babu and Chandrachooda M.**

Department of Dairy Technology, Dairy Science College, Hebbal, Bengaluru, Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar.

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***Corresponding Author**
Thejaswini M. L.
Department of Dairy Technology, Dairy Science College, Hebbal, Bengaluru, Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar.

ABSTRACT

Whey protein is a mixture of globular proteins isolated from whey, the liquid material created as a by-product of cheese or paneer production. The effect of whey proteins on human health are of great interest and are currently being investigated as a way of reducing disease risk, as well as a possible supplementary treatment for several diseases. Whey protein is commonly marketed and ingested as a dietary supplement, and various health claims have been attributed to it in the alternative medicine community. In this study to replace the traditional process of making Pantua, (A Bengali Sweet) an attempt is made to enrich the product both nutritionally as well as to accomplish certain functional properties.

KEYWORDS: Khoa, Chhana, WPC, Sugar etc.

INTRODUCTION AND REVIEW

Nutritional and functional properties of WPC: Renner, 1983 reviewed whey nutrients represent a huge quantity of nutritionally rich food. Whey contains approximately 20 per cent of the original proteins of milk. In addition, it contains other proteins such as Lactoferrin, Immunoglobulin, Ceruloplasmin and milk enzymes such as lysozyme, lipase and xanthin oxidase, which are present in low concentrations. Whey proteins are one of the highest quality natural proteins and contain essential amino acids such as tryptophan, leucine,

isoleucine, threonine and lysine. Renner and Salam, 1991 stated that WPC contain about 2.5g of cysteine and 2.8g of cystine per 100g of protein. Whey proteins have higher biological value (104) as against whole egg protein (100) and casein (77). The protein efficiency ratio of whey protein is 3.6 against 3.8 of whole egg and 2.9 of casein whereas net protein utilization is 76 for whey protein as well as casein as against 94 for whole egg. Whey proteins possess good functional properties such as foaming, emulsifying, gelling and water binding (Dewit and Kessel, 1996; Jayaprakasha and Brueckner, 1999). Since whey proteins possess excellent nutritional and functional properties they are used in various foods like bread and baked foods, infant and dietetic foods, icecream and frozen desserts, cereals, soups, sauces, toppings and dressing, snack foods (Gupta 1991).

1. Composition of whey protein.

Whey protein	Per cent	Molecular weight (da)
ß-lactoglobulin	45-57	18,400
α-Lactalbumin	15-25	14,200
Bovine serum albumin	3.5-10	69,000
Immunoglobulins	4-10	1,50,000-9,00,000
Glycomacropeptide	15-20	700
Lactoferrin	3	77,000
Lactoperoxidase	0.4	78,000
Lysozyme	Traces	14,000
Growth factor	Traces	7000-8000

Source: Rajesh and Sangwan (2002)

Application of WPC in food industry

Whey proteins carry excellent functional and nutritional properties and found in much food formulations such as humanized milks, cheese, meat products, bakery foods, beverages, acid foods, fermented foods, ready to eat foods and dietetic and therapeutic applications (Gupta, 1991). Visalakshi and Mohanasundari, 2002 experimented and stated that improvement in consumer acceptability was observed with respect to ghee biscuits, cheese biscuits, diamond cuts and pizza when formulated with 10-20 per cent WPC.

Indigenous dairy products

Incorporation of WPC in traditional dairy products improves its nutritional and functional properties. Incorporation of 10-18 per cent WPC (27.4 per cent TS) in buffalo milk for the manufacture of khoa has been reported. Higher amount of WPC produced bigger grains in khoa, which is desirable property for kalakhand preparation (Reuter *et al.*, 1990).

Patel *et al.*, 1993 studied incorporation of WPC at 5 per cent in khoa showed improved sensory attributes over the control samples from cow milk with respect to rheological characteristics. Use of WPC and SMP in the ratio of 40:60 resulted in good gulab jamun and was comparable with the control samples (Vani Rai, 2000). Enriched gulab jamun was prepared by incorporating 10 per cent WPC in the mix without changing any sensory characteristics (Devaraja, 2005). Suma, 2002 reported that rasgolla enriched with 10 per cent WPC showed desirable sensory attributes and overall acceptability. Sandesh was prepared by incorporating 10 per cent WPC without affecting sensory characteristics (Mahadevaiah, 2004). Low calorie enriched diabetic sandesh secured highest score upon addition of 5 per cent level of WPC.

MATERIALS AND METHODS

Process optimization to standardize the processing parameters for the preparation of Pantua.

To standardize the enriched and low calorie Pantua different combinations of Khoa, Chhana and Maida were tried to see the acceptability of the product over the control prepared. The resultant standardized combinations were served to panel of judges along with control to adjudge the overall acceptability. Based on the sensory evaluation the best one was selected and used for the further studies.

The following ingredients were standardized to the processing parameters for the preparation of Enriched Low Calorie Pantua.

Khoa, Chhana and Maida

Pantua was prepared by using three different combinations of Khoa, Chhana and Maida addition i.e., 40:40:20, 40:35:25, 40:30:30 respectively and adding baking powder at the rate of 0.03 per cent constant for all the three combinations. Thus prepared products were served to the panel of judges for sensory evaluation along with the control. The one, which secures highest score upon control is selected for the further study.

Process optimization to enrich the Pantua with Whey Protein Concentrate.

Whey protein posses very good functional properties such as solubility, foaming, gelling, emulsifying and water binding properties. Owing to it's functional properties it has got wide range of applications in the food industry. To enrich Pantua in this study also WPC is utilized. Previously the product was standardized with khoa, chhana and maida with that the

different combinations of WPC at 1, 2 and 3 per cent level has tried and the product which secured highest marks on sensory quality was used for further studies.

Effect of different levels of WPC on chemical quality of pantua.

The results pertaining to the effect of different levels WPC on fat, protein, total solids and ash content of pantua were presented in Table.

Fat

It was observed from the Table that there was a increase in per cent fat with respect to 1, 2 and 3 per cent WPC level. The control pantua recorded fat per cent 10.84, however there was increase in fat content of 10.94 at 1 per cent level further the fat per cent increased to 11.00 and 11.01 of 2 and 3 per cent level respectively. The statistical analysis showed that there was no significant difference between fat per cent of different levels of WPC incorporation and control pantua.

Protein

Similar to the fat percentage, protein percentage also increased which was presented in Table 5 with respect to 1, 2 and 3 per cent level, as percentage of WPC had increased. The control pantua recorded protein per cent of 7.95 as against 8.95, 9.00 and 9.03 for 1, 2 and 3 per cent levels respectively. Here the statistical analysis revealed that there was significant difference between control pantua and other these three levels.

Total Solids (TS)

There was a gradual increase in total solids with the increase of WPC per cent with respect to all the treatments. The average TS content of control pantua was 67.78 per cent however there was a increase of total solids of 71.00 at 1 per cent level. Further 71.04 and 71.28 with respect to 2 and 3 per cent level respectively. Statistical analysis confirms that there was a significant difference between control and trials made with different levels WPC.

Ash

The results pertaining to the effect of different levels of WPC on ash content of pantua were presented in Table 5. The average ash content of control pantua was recorded was 0.47 against 1.41, 1.45 and 1.47 with respect to 1, 2 and 3 per cent levels respectively. There was a increase in ash content with increase in WPC level. The statistical analysis also proved that there was a significant difference between control and other levels of enriched pantua.

Table: Effect of different levels of WPC on chemical analysis of Pantua.

% WPC	TS (%)	Fat (%)	Protein (%)	Ash (%)
0	67.78	10.84	7.95	0.47
1	71.00	10.94	8.95	1.41
2	71.04	11.00	9.00	1.45
3	71.28	11.01	9.03	1.47
C D	**1.41**	**NS**	**0.23**	**0.69**

Note: All the values are average of three trials

0: Control with no WPC incorporation

1: 1 per cent WPC incorporation

2: 2 per cent WPC incorporation

3: 3 per cent WPC incorporation

Effect of different levels of WPC on chemical quality of Pantua.

Effect of different levels of WPC on chemical quality *viz*, TS, fat, protein and ash content were discussed here.

Total Solids (TS)

It could be seen from the results that there was gradual increase in the TS content from 71 per cent to 71.04 and 71.28 per cent at 1, 2 and 3 per cent level WPC. This could be attributed to water holding capacity of WPC where absorption of moisture present in chhana by added components of WPC leading to hardness in the product. Whey protein aggregation begins with the initial swelling of the protein structures, when it is exposed to heat. As the intensity of heat treatment increases, the whey protein unfolds and aggregates with the loss of moisture (Parris *et al*., 1997).

Fat

Even though there was a increase in fat content with respect to WPC level there was no significant difference to discuss.

Protein and Ash

There was a progressive increase in the protein (7.95 to 8.95) and ash (0.47 to 1.41) when the level of WPC increased from o to 1 per cent respectively. This could be attributed to high protein (70.34 per cent) and Ash (3.70 per cent) content of WPC. This results obtained in this study were in accordance with the observation made by Vijayendra, 2006 whereas he

reported increase in protein (21.23 to 23.72 per cent) and ash (1.65 to 69 per cent) when the level of WPC increased from 5 to 15 per cent respectively.

SUMMARY AND CONCLUSION

The incorporation of WPC into Pantua mix significantly varies the chemical composition of Pantua so the chemical analysis of different levels of WPC incorporated Pantua were analyzed. This results showed that 2 per cent level incorporation was beneficial with the increase of protein percentage to 9.00 as against 7.95 in control.

Pantua prepared from 40 per cent khoa, 40 per cent chhana and 20 per cent maida was found to be optimum, and incorporation of 2 per cent WPC was found to be beneficial. against 10.84 in control similarly TS and Ash to 71.04, 1.45 respectively as against 67.78 and 0.47 in control with respect to TS and Ash content.

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