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Effect of Pepper powder on physico-chemical quality of enrobed Chhana balls during refrigerated storage at 4±1 °C

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Abstract

Battering and breading of any food products enhances the flavor, adds a crispy texture, and helps retain the moisture of the food during cooking. The enrobing of Paneer served as Paneer pakoda is most common dishes made available in hotels particularly in North India. Chhana balls were prepared by acid heat coagulation of milk and later added different levels of pepper (0.5%, 1.0% and 1.5% w/w) along with salt (2.0%) at the time of preparing Chhana balls. The balls were enrobed in standardized batter mix and were deep fat fried at 130-140°C for 2-4 min. The products were subjected to physico-chemical evaluation during refrigerated storage at 4±1 °C. As days of storage increased, the moisture content of products is decreased. The pepper treated product significantly ($p<0.05$) had higher moisture content on overall mean values. The higher ash content of Pepper treated product might be due to might be due to rich source of calcium, magnesium, phosphorus, sodium, potassium and iron as well in pepper powder. The overall pH value in treatment is non significantly lower. The overall mean value of pepper treated sample had significant ($p<0.05$) lower TBARS value that control. The black pepper treated sample had lower Tyrosine value compared to control in all storage days.

Keywords: Enrobing, Chhana balls, pepper, Physico-chemical quality

Introduction

Enrobing is the process of dipping and coating with a layer of batter or breading followed by deep fat frying. Battering and breading of any food products enhances the flavor, adds a crispy texture, and helps retain the moisture of the food during cooking. Common examples include chicken nuggets, fish fingers, and breaded pork chops. The enrobing of Paneer served as Paneer pakoda is most common dishes made available in hotels particularly in North India. The enrobing balls made from Chhana, product made by coagulating milk adds value and provide variety to consumer as a dish. Pepper is used in the form of powder, broken or whole as seasonings and fairly as nutrition (Sung *et al.*, 2012) [9]. The oils and oleoresins components in black pepper (*Piper nigrum*) prevents the growth microbes in orange juice (Kapoor *et al.*, 2014) [4]. Kapoor *et al.*, 2012 [4] and Zou *et al.*, 2015 [12] made report on antibacterial effect of the pepper extracts to inhibit food spoilage. An effort was made to know the effect of incorporating pepper powder on physico-chemical quality of value added Enrobed Chhana balls.

Materials and Methods

Chhana was prepared by heat (80 °C) coagulation of whole milk (4.5% fat and 8.5% Solid Not Fat) with citric acid (2% solution) using standard procedure. Later Chhana balls were prepared by incorporating different levels of pepper (0.5%, 1.0% and 1.5% w/w) along with salt (2.0%). The balls were enrobed in standardized batter mix (bengal gram flour: 80g, corn flour: 20 g, salt: 5 g, spice mix: 5 g, baking soda: 0.5g and water: 100g) (Table 1) were deep fat fried at 130-140 °C for 2-4 min. The products were packed in a polyethylene pouches and stored in a refrigerator at 4±1 °C. The products were subjected to physico-chemical evaluation during refrigerated storage at 4±1 °C at intervals of 0,5,10 and 15 days. The per cent content of

moisture, protein, ether extract and ash of products were analyzed as per the procedures of AOAC (1995) [2] the estimation of thiobarbituric acid (TBA) value was done according to Witte, *et al.* (1970) [10] and tyrosine value as per Strange *et al.* (1977) [8].

For measuring pH 10 gm of the sample was homogenized with 50 ml distilled water for one min. using pestle and mortar. The pH was measured using digital pH meter equipped with a combined glass electrode. Analar grade and Food grade chemicals procured from Qualigens/Merk/BDH/Hi-media (INDIA) were used in the study. The data were analyzed on computer using statistical software packages developed by following the procedures of Snedecor and Cochran (1989) [7]. Data were subjected to two way analysis of variance and means were compared by Duncan's multiple range tests at 5% significance level.

Results and Discussion

The mean $\pm$ SE for different physico-chemical parameters of Enrobed Chhana balls during refrigerated storage are presented in Table 2. As days of storage increased, the moisture content of products is decreased. The pepper treated product had significantly ($p<0.05$) higher moisture content compared to control on overall mean values. The content of per cent protein, Ether extract and ash content increased and the effect was significant ($p<0.05$) on overall mean storage days between days 0 and day 10 and day 0 and day 15. This might be due to loss of moisture from the products at refrigerated storage since polyethylene packaging material is moderate water vapour transmission rate (WVTR). Not much variation in content of moisture, protein, and Ether extract between control and treatment has observed except overall mean treatment of ash and moisture content in treatment was significantly ($p<0.05$) high. The reason might be due to composition of pepper which contains 4.3 % fat and rich source of calcium, magnesium, phosphorus, sodium, potassium and iron as well Black pepper is also rich source of Pottasium (0.66%), Calcium (0.20%), Phosphorous (0.16%) Magnesium (0.16%), and consists of carbohydrates 65.0%), fats (24%) (Anindya Goswami & Neelesh Malviya, 2020; Noel K J *et al.*, 2023) [1, 6].

During storage overall mean pH increased non significantly as the storage day's proceeds. The overall pH value in treatment is non significantly lower. This might be due to the low pH of black pepper powder (4.8 to 6.0) Himabindu D and Arunkumar H (2017) also reported decrease in pH and increased acidity of cottage cheese incorporated with black pepper and he also reports that acidity increased to certain period in cottage cheese with pepper followed by subsequent raise in acidity after 12 days of storage.

The mean TBARS value for control and treatment varies between 0.23 & 0.31, 0.55 & 0.39, 0.55 & 0.23 and 0.94 & 0.78 on day 0, 5, 10 and 15 respectively. During storage the TBARS value increase progressively as day's proceeds the overall value was significantly ($P<0.05$) higher on day 15. This is due to oxidation of fat and subsequent increase in mg Malondialdehyde content in the products. The data revealed that overall mean value of treated sample had significant ($P<0.05$) lower TBARS value that control This indicated that Pepper powder has antioxidant effect. The phenolic component of black pepper is responsible for anti oxidant effect has been reported Murlidhar and Goswami (2012) [5].

The tyrosine value indicated protein degradation. The black pepper treated sample had lower Tyrosine value compared to control in all storage days. This might be due to microbial inhibition of pepper which further checked the protein degradation. The antibacterial activity Piperine may further decreased protein degradation. The antibacterial activity of piperine was reported by (Zarai *et al.*, 2013) [11]. The tyrosine value increased progressively as days precedes both in control and treated sample.

Table 1: Composition of batter mix

Sl No.	Ingredient	Weight in g
1	Bengal gram flour	80.00
2	Corn flour	20.00
3	Salt	5.00
4	Spice mix	5.00
5	Baking soda	0.50
6	Water	100.00 ml
Batter mix was made by dissolving all the ingredients in water to a proper consistency		

Table 2: Changes in physic-chemical properties of Enrobed Chhana balls during refrigerated storage

Treatments	Storage days				Overall Treatment
	Day 0	Day 5	Day 10	Day 15	
% Moisture					
C	45.51±0.28	44.89±0.26	43.09±0.10	42.10±0.51	43.89 ^A ±0.43
T	46.65±0.40	45.09±0.23	44.93±0.17	43.75±0.14	45.10 ^B ±0.33
Overall storage days	46.09 ^a ±0.58	44.99 ^b ±0.48	44.00 ^c ±0.44	42.92 ^d ±0.44	
% Protein (on Dry matter basis)					
C	20.42±1.07	21.55±0.20	21.85±0.14	23.05±0.15	21.71±0.28
T	19.69±0.28	19.87±0.34	22.96±0.10	22.89±0.43	21.35±0.49
Overall storage days	20.05 ^a ±0.21	20.71 ^a ±0.41	22.40 ^{bc} ±0.26	22.97 ^c ±0.21	
% Ether extract (on Dry matter basis)					
C	30.25±0.58	31.28±0.41	31.95±0.39	32.28±0.56	31.44±0.31
T	30.44±0.83	31.49±0.17	32.05±0.23	32.49±0.39	31.61±0.30
Overall storage days	30.34 ^a ±0.45	31.38 ^{ab} ±0.20	32.00 ^b ±0.20	32.38 ^b ±0.30	
% Ash					
C	2.47±0.16	2.57±0.16	2.82±0.40	3.29±0.08	2.78 ^A ±0.10
T	2.69±0.16	3.10±0.07	3.42±0.16	3.44±0.07	3.16 ^B ±0.10
Overall storage days	2.58 ^a ±0.16	2.83 ^{ab} ±0.14	3.12 ^{bc} ±0.12	3.36 ^c ±0.72	
pH					
C	6.15±0.05	6.30±0.08	6.37±0.07	6.27±0.06	6.27±0.03
T	6.10±0.08	6.32±0.10	6.31±0.08	6.20±0.14	6.23±0.05
Overall storage days	6.12±0.04	6.31±0.06	6.34±0.05	6.23±0.07	
TBARS					

C	0.23±0.02	0.55±0.05	0.55±0.06	0.94±0.06	0.56 ^A ±0.03
T	0.31±0.01	0.39±0.03	0.23±0.04	0.78±0.05	0.42 ^B ±0.06
Overall storage days	0.27 ^a ±0.02	0.47 ^b ±0.04	0.39 ^b ±0.08	0.86 ^c ±0.04	
Tyrosine value					
C	2.81±0.11	2.09±0.21	4.31±0.32	7.32±0.46	4.13±0.61
T	2.16±0.05	2.31±0.12	4.95±0.06	6.89±0.15	4.07±0.59
Overall storage days	2.48 ^a ±0.15	2.2 ^a ±0.12	4.63 ^b ±0.20	7.1 ^c ±0.24	

C: Control- Chhana balls without pepper treatment T: 1% Pepper treated Chhana balls

Mean ± SE with lower case letter row wise and upper case letter column wise bearing different superscripts differ significantly ($P \leq 0.05$)

Conflict of Interest

Not available

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