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Standardization of Technology and Quality Evaluation of Chicken Meat Biscuits

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ABSTRACT

The chicken meat biscuits were developed using refined wheat flour and various levels of meat (0, 40, 50 and 60 percent). Chicken meat biscuits prepared by replacement of refined flour with three different meat levels were of acceptable quality. On the basis of study it was concluded that product C (50% chicken meat powder) and product D (60% chicken meat powder) showed higher sensory scores and nutritional value, but mean TBA, FFA, aw, TPC etc values were reported to be higher in D as compared to C due to higher amount of moisture and higher fat percentage in D. The overall mean values showed decreasing trend for moisture, emulsion stability, cooking yield, texture profile values etc with enhancement in the level of meat. The reverse trend was also observed in the values of fat, protein, ash and water activity.

Key words: *Biscuits, Refined wheat flour, Emulsion, Physico-chemical qualities, Texture profile. Sensory scores*

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INTRODUCTION

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MATERIALS AND METHODS

Live birds were procured from Instructional Poultry Farm College of Veterinary Sciences and Animal Husbandry, DUVASU, Mathura and were brought to the Department of Livestock Products Technology. Slaughtering and dressing was carried out following the standard procedure under humane conditions in laboratory. The hot carcasses were kept in refrigerator at 4±10C for 24 hours. The chilled carcasses were deboned next day and lean meat was collected and stored at -180 C till further use. Formulations for the preparation of chicken meat biscuits and control are given in table 1.

Table 1: Formulations of control and chicken meat biscuits

Ingredients (%)	Levels of meat (%)			
	0	40	50	60
Meat powder	-	40	50	60
Refined wheat flour	100	60	50	40
Milk powder	20	20	20	20
Vanaspati ghee	35	35	35	35
Sugar	30	30	30	30
Glucose	5	5	5	5
Vanilla powder	1.5	1.5	1.5	1.5
Baking powder	1.5	1.5	1.5	1.5
Ammonia	2	2	2	2
Salt	2	2	2	2

Chilled carcass was taken out from refrigerator after 24 hours chilling, and defrosted. The defrosted chicken carcass was deboned with the help of deboning knife. All the food contact surfaces of meat mincer cum sausage maker (made up of stainless steel contact parts) were sanitized before mincing. The Approximately 3.0 kg deboned meat was minced by passing twice through 6 mm and 4 mm plate of meat mincer.

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Mince meat was dehydrated in microwave at frequency of 720 MHz for 10 minutes at one side and by turning this meat to another side and again dehydrated for 8 minutes. This dehydrated meat was then kept in hot air oven for 20 minutes to remove the residual moisture. This minced dehydrated meat was finally ground in grinder to prepare the meat powder. This meat powder was then immediately packed in presterilized LDPE bags.

Forming, mixing and baking of chicken meat biscuits: Firstly, all the ingredients (except meat powder and refine wheat flour) were weighed in proper percentage as described above. These ingredients were mixed uniformly to prepare paste like consistency. Further four types of products were developed i.e. control (A), biscuits containing 40% chicken meat (B), chicken meat biscuits containing 50% (C) and chicken meat biscuits containing 60% (D). In A, 1000 gram refined wheat flour was added while in B, 600 gram of wheat flour and 400 gram of chicken meat powder was added, in C, 500 gram of refined wheat flour and 500 gram of chicken meat powder was added where as treatment D constituted 400 gm of refined wheat flour and 600 gm of meat powder. All the treatments were uniformly mixed separately and provided with a desired consistency to prepare dough. Now, the doughs were sheeted on a wooden board with rolling pins. The dough was cut into desired shapes using biscuit cutter. These biscuits were baked in hot furnace at 2000C for 20 minutes. The baked biscuits were then cooled at 300C and temporarily packed in presterilized LDPE bags.

Analytical procedure: The pH of chicken meat biscuits were determined by the procedure of Trout et al. (1992). The yield of cooked emulsion mass was recorded as emulsion stability percent by the method as described by Baliga and Madaiach (1970). Moisture, fat, protein and ash percentage of the product were estimated as per AOAC (1995). Water activity (n=6) is determined using hand held potable digital water activity meter. Finely ground CMB is filled up (80%) in a moisture free sample cup provided along with aw meter. The sample cup is placed into the sample holder, and then sensor is placed on it for five minutes to estimate the aw value. Cooking yield was evaluated according to the method of Ozkaya and Kahveci (1990). For free acid value estimation, method described by Koniecko (1979) was followed whereas thiobarbituric acid value was measured using extraction method described by Witte et al. (1970) with slight modification. Textural properties of chicken meat noodles were evaluated using the texteometer at Goat Products Technology laboratory at Central Institute of Research on Goat (CIRG) Makhdoom, Mathura. The sensory qualities of samples were evaluated using 8 point descriptive scale (Keeton et al. 1983) by sensory semi trained panellists of nine judges to evaluate the sensory qualities of chicken meat noodles. Data were analyzed statistically on 'SPSS-16.0' software package as per standard method of Snedecor and Cochran (1994). Duplicate samples were drawn for each parameter and the experiment was replicated thrice (n=6). Sensory evaluation was performed by a panel of six member judges three times, so total observations being 29 (n=27) Data were subjected to one way analysis of variance, homogeneity test for comparing the means to find the effects between treatments.

RESULTS AND DISCUSSION

Physico-chemical properties of emulsion and chicken biscuits

Emulsion stability and cooking yield: Both values for control and treated products overall showed non significantly decreasing trend with increase in level of meat from 0 to 60 percent. The lowest overall mean emulsion stability value among all the treatments was found in product containing maximum level of meat. Singh et al. (2002) found the emulsion stability of chicken snack containing 60% chicken meat to be 93.91% which was found to be lowest among all the treatments. Hughes et al. (1996) also reported that addition of chicken meat decreased emulsion stability in preparation of frankfurters prepared by replacement of oat fibers. The lowest overall mean baking yield value among all the treatments was found in the products containing maximum level of meat. It may be due to higher moisture percentage (75%), as per Sharma, (1998) in meat as compared to refined wheat flour (10-10.5%). Singh (2011) also reported decrease in baking yield with increase in meat level during preparation of chicken meat biscuits. The present study is also in agreement with Sharma and Nanda (2002) who concluded that cooking yield of chips prepared by taking 95% chicken meat was lesser than other formulations containing lower meat percentage.

Table 2: Emulsion stability of emulsion and cooking yield of chicken biscuits containing various levels of meat (Mean±SE)

Ingredients (%)	Levels of meat (%)			
	0	40	50	60
Emulsion stability	96.16±0.35	94.08±0.30	93.16±0.16	92.00±0.42
Cooking yield	85.50±0.44	81.66±0.44	79.83±0.27	76.58±0.30

Physico-chemical characteristics: The overall values of moisture, fat, protein, ash and water activity showed significantly ($P<0.05$) increasing order with increase in level of meat. However, pH values were in decreasing trend and no significant effect of meat level was observed in TBA and FFA values. The decline in pH with increased meat contents was due to the acidic nature of chicken meat. This finding was very well agreed with the reports of Chin et al. (2012) who incorporated surimi powder in wet yellow noodles preparation. The increased moisture contents with increased meat level might be due to high moisture contents in chicken meat as compared to the flour used. This finding was in favour of the reports given by Zayas (1997) on functionality of proteins in food. The increased protein content in biscuits with higher level of meat might be due to higher protein level in meat as compared to flour used. Similar trend of increased protein contents with increase in fish meat in fish noodles was also reported by Peranginagin et al. (1995) on dried noodles incorporated with surimi. The overall mean contents of fat were in the increasing order with the increase level of meat in biscuits which might be due to higher contents of fat in chicken meat in comparison to the flours used. Khare (2011) also found increase in fat content with increase in meat replacement during the preparation of chicken meat noodles. The increased ash content in biscuits having higher level of meat might be due to higher level of minerals. Dallas (2006) also found increase in ash content with increase in surimi powder replacement during the preparation of noodles. The increased water activity of biscuits might be due to higher level of nutrients availability for the growth of microbes and higher moisture level. This finding is in agreement with Paula et al. (2010) who reported increasing trend of aw in Toscana sausages. The non significant effect of meat level on TBA and FFA was due to lower activity of microbes in fresh products.

Table 3: Physico-chemical properties of chicken biscuits containing various levels of meat (Mean±SE)

Ingredients (%)	Levels of meat (%)			
	0	40	50	60
pH	$6.72^{a}\pm0.01$	$6.65^{b}\pm0.01$	$6.59^{c}\pm0.00$	$6.56^{d}\pm0.00$
Moisture (%)	$2.72^{a}\pm0.03$	$2.91^{ab}\pm0.00$	$2.97^{b}\pm0.00$	$3.00^{c}\pm0.00$
Fat (%)	$34.86^{a}\pm0.11$	$37.08^{b}\pm0.05$	$38.14^{c}\pm0.16$	$39.25^{d}\pm0.06$
Protein (%)	$12.81^{a}\pm0.04$	$33.71^{b}\pm0.10$	$35.57^{c}\pm0.15$	$37.35^{d}\pm0.14$
Ash (%)	$2.64^{a}\pm0.03$	$2.69^{ab}\pm0.01$	$2.72^{ab}\pm0.01$	$2.75^{b}\pm0.03$
Water activity (aW)	$0.20^{a}\pm0.00$	$0.22^{b}\pm0.00$	$0.30^{c}\pm0.00$	$0.32^{d}\pm0.00$
TBA value	0.08 ±0.00	0.08 ±0.00	0.08 ±0.00	0.20 ±0.12

Texture profile values: Replacement of refined wheat flour with different levels of chicken meat powder (40, 50 and 60 percent) had significant effect ($P<0.05$) on work of shearing of chicken meat biscuits compared to control. The mean work of shearing values decreased with increase in chicken meat incorporation due to higher moisture content in meat as compared to refined wheat flour as meat contain 75% of water on an average and refined wheat flour contains around 13.29% of moisture (Baljeet et al.2010). This study is in agreement with Khare (2011) who found non significant decrease in work of shearing and hardness of chicken meat noodles with increase in chicken meat content. Replacement of refined wheat flour with different levels of chicken meat powder (40, 50 and 60 percent) had highly significant effect ($P<0.01$) on shear force value of chicken meat biscuits compared to control (A). The highest overall mean shear force value among all the treatments was found in control and then showed decreasing trend with increase in level of meat. This finding can be correlated with the values of work of shearing obtained in present study itself, as work is positively proportionate to force applied as per the formula $W = f X d$. so the mean shear force value was found higher in control due to lower moisture content and higher work of shearing value. Chin et al. (2012) found decreasing value of noodle hardness and they concluded that it might have been due to the higher water contents in surimi.

Table 4: Texture profile analysis values of chicken biscuits containing various levels of meat (Mean±SE)

Ingredients (%)	Levels of meat (%)			
	0	40	50	60
Work shearing value	3.60a±0.02	3.53b±0.01	3.51b±0.00	3.46c±0.00
Shear force values	60.71a±1.29	57.45a±0.79	53.42b±0.46	48.51c±0.33

Mean values bearing different superscripts within the row differ significantly ($P<0.05$)

Sensory evaluation scores: The highest mean values of colour and appearance was in 40 percent meat biscuits, texture was best in control whereas highest scores for flavour, meat flavour intensity, mouth coating, saltiness were in 60 percent meat level biscuits. The overall acceptability scored highest in chicken biscuits containing 50 percent meat. The analysis of variance among the products showed non significant difference in colour and appearance as well as in texture scores of all the product types. However, control biscuit was significantly ($P<0.05$) different from the biscuits containing 50 and 60 percent of meat while non significant different was observed in between control and 40 percent meat level biscuits.

The differences in values of various meat levels might be due differences in suitability of meat in emulsion preparation. These findings were very well in the agreement of Yu (1990) reports with the incorporation of animal proteins in flour based products.

Table 5: Sensory scores of chicken biscuits containing various levels of meat (Mean±SE)

Ingredients (%)	Levels of meat (%)			
	0	40	50	60
Colour and appearance	6.51±0.09	6.59 ±0.10	6.48 ±0.12	6.37 ±0.10
Texture	6.14±0.10	6.00 ±0.11	5.92 ±0.12	5.81±0.11
Flavour	5.62^{a} ±0.09	5.81^{ab}±0.09	6.11^{b} ±0.09	6.14^{b} ±0.10
Meat flavour intensity	0.00^{a} ±0.00	5.22^{a} ±0.08	5.66^{b} ±0.09	5.77^{b} ±0.08
Mouth coating	5.22^{a} ±0.08	5.48^{ab}±0.09	6.11^{b} ±0.10	6.11^{b} ±0.10
Saltiness	5.74^{a} ±0.08	5.88^{ab} ±0.08	6.00^{bc} ±0.05	6.03^{c} ±0.03
Overall acceptability	5.62^{a} ±0.09	5.81^{ab} ±0.07	6.29^{bc} ±0.10	6.11^{c} ±0.08

Mean values bearing different superscripts within the row differ significantly (P<0.05)

Microbiological profile: Plfurelrorjlfdoo|#ghyhorshg vqdfnv#zhuh#txlwh#vwdeoh#dqg#frxqwv#zhuh#yhu|#ohvv#iru wrwdo#sodwh#frxqw#zkloh#q#\ hdvw#dqg#prg##Vwdsk|orfrffdo dqg#Vdoprqhood#frxqw#ghwhfwhg#lq#wkhvh#elvfxlwv1#Wwdo#sodwh frxqwv#zhuh#qrq#vljqlilfdqwo|#gliihuhqw#dprqj#hdfk#rwkhu dvqg#frxqwv#lq#wkh#udqjh#ri#31:<œ3159#wr413<œ31551

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