

Standardization, Quality Evaluation and Cost of Production of Cookies Incorporated with Spent Hen Meat Powder

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Abstract: *The present study was undertaken with a view to standardize the acceptable quality of cookies with incorporation of various levels of spent hen meat powder (0%, 50%, 60% and 70%). The results showed that cookies incorporated with 50% (SHMP) exhibited higher scores for all sensory attributes than other treatments. There was significant decrease in emulsion stability and decrease in baking yield with increase in level of spent hen powder except between control and 50% (SHMP) cookies. There was significant increase in bulk density with addition of (SHMP) but non significant increase in bulk density between control and 50% (SHMP) cookies. Cost of production revealed that cost effective cookies were prepared with incorporation of 50% spent hen meat powder as compared to addition of 60% and 70% SHMP.*

Keywords: Spent hen meat powder, Sensory attributes, Cost of production, Baking yield, Bulk density, Emulsion stability

1. Introduction

Meat and meat commodities are necessary components in the diets of urbanized countries. They are significant source of proteins, vitamins and minerals [1][2]. The demand of processed meat product continues to increase with budding consumer's response and awareness of consumers about nutrition and quality [3]. The rapid increase in consumption poultry meat is due healthy image, price, availability and expansion of new products. The poultry industry has also focused on delivering various new products and introducing some traditional red meat products [4].

The meat from these "spent layers" is less tender than meat from broilers so it is mostly used in soup, stews and chicken pancakes. Spent hen meat was also used to prepare patties, sausages, meat loaves, and nuggets. Spent layer meat is a good starting material as it is an underutilized meat[5][6][7].

The word cookie word comes from the Dutch word 'koekje' means 'little cake'. The word cookie is used only in North America. In Britain, these cup cakes are known as biscuits, although English biscuits are generally smaller than North American cookies and tend to be almost crunchy rather than soft and chewy. Biscuits and cookies are generally accepted as snacks and are consumed by people of India with tea. Children like to eat these baked good, mothers use them as pacifiers and unwell people often like biscuits and cookies rather than any other foods [8].

Millets contain special position in the human diet. In recent years there has been increasing recognition of the importance of millets as the substitute for major cereal crop taking into account their low cost, nutritive value than cereals [9]. Millets are considered as „the way of life“, “food of the people” and “food for hungry”. Besides this they are rich in dietary fibre, phytochemical and micronutrients hence they are rightly called as “nutri-cereals” [10].

Looking at the benefits of finger millet flour and the possible utilization of spent hen meat in cookies will not only

increase the nutritive value of cookies but will certainly provide the meat industry an alternate sector for value addition of spent hen meat. Although lot of work has to been done improve the functional properties and nutritivevalue of cookies through changes in formulation and processing, possibility of incorporation of spent hen meat in cookies as a source of protein remains almost unexplored. Therefore present work has planned with the following objectives.

2. Material and Method

2.1 Sources of raw materials

Spent hens were procured from the Department of Poultry Science, College of Veterinary and Animal Sciences, Parbhani and various ingredients such as pearl millet flour, wheat flour, vanaspati ghee, sugar, glucose, milk powder, baking powder, vanilla powder and salt required for formulation of spent hen meat cookies were procured from the local market of Parbhancity.

2.2 Preparation of spent hen meat cookies

The spent hen meat cookies were prepared as per the method prescribed by SaiManohar and Haridas [11] with slight Modification. Bird were dressed and connective tissue, fat, tendons etc. were separated and boneless spent hen meat were packed in low density polyethylene (LDPE) bags and stored overnight at $4 \pm 1^{\circ}\text{C}$. After adequate thawing at room temperature were cut into small chunks and minced in meat mincer. Minced meat was dried in hot air oven at temperature $60-70^{\circ}\text{C}$ for 20-22 hours. The dried meat properly ground in food grinder, sieved thoroughly and moulded in dough. The dough was sheeted on a wooden board with rolling pins. The dough was moulded and cut into desire shapes using cookies cutter. Mouldcookies were baked at 155°C for 20 min., and were cooled at room temperature.

a) Sensory evaluation

The semi trained sensory panelists consisting of academic

staff member and students from College of Veterinary and Animal Sciences, Parbhani were involved to assess the quality of spent hen meat cookies on the basis of sensory attributes viz., appearance, flavour, juiciness, texture and overall acceptability using 8 point descriptive scale (Keeton, 1983) [12] where „1“ denoted extremely poor and „8“ denoted extremely desirable.

b) Physico-chemical characteristics

i. Emulsion stability

Emulsion stability of spent hen meat cookies was determined as per the procedure of Baliga and Madaiah (1971)[13]. Twenty five grams of emulsion were placed in polyethylene bag (size 12 × 10 cm), and sealed airtight. The emulsions in bags were heated in thermostatically controlled water bath (80°C) for 30 min. The bags were removed from the water bath, open at one end; cooked fluid was drained out and weighed, calculated and expressed as percent emulsion stability.

$$\text{Emulsion stability (\%)} = \frac{\text{Weight of cookies}}{\text{Initial Weight}} \times 100$$

ii. Baking yield

Baking yield was estimated by recording the difference between the pre and post baked weight of cookies and expressed in percentages.

$$\text{Baking yield (\%)} = \frac{\text{Wt. of sample after baking}}{\text{Wt. of sample before baking}} \times 100$$

iii. Bulk density

The bulk density was determined as per method described by Sahay and Singh (2001)[14]. A container was used whose volume was calculated by measuring its inner dimensions. The container was filled with cookies and then weighed.

$$\text{Bulk density} = \frac{\text{Weight of sample (g)}}{\text{Volume of container (ml)}} \times 100$$

Cost of production of spent hen meat cookies

Production costs of spent hen meat cookies were calculated based on the common prices of spent hen meat and ingredients bought from Parbhani City's local market.

Statistical analysis

The data in the form of observations, generated during the study were analyzed by Analysis of Variance technique following standard procedure (Snedecor and Cochran, 1989) [15].

3. Results and Discussion

3.1 Sensory evaluation

The average scores with respect to sensory attributes of cookies incorporated with different levels of spent hen meat powder are depicted in Table 1. It is observed from table 1 that, the spent hen meat cookies incorporated with 50% spent hen meat powder resulted higher scores in respect to all sensory attributes as compared to other treatments.

It is revealed from observations that incorporation of spent hen meat powder (50%) in cookies did not differ significantly

($P > 0.05$) on appearance score as compare to control cookies. The highest score was recorded for spent hen meat cookies incorporated with 50% spent hen meat powder. Further addition of spent hen meat powder up to 70%, the score for appearance decreased significantly ($P < 0.05$). Similar findings were observed by Bukyaet *al* (2013) [16] for preparation of chicken biscuits and Berwal *et al* (2013) [17] for ready to eat chicken meat mince incorporated cookies.

Flavor scores of the cookies incorporated with 50% spent hen meat powder did not differ significantly ($P > 0.05$) with control cookies. Spent hen meat cookies at 50% level formulation secured significantly ($P < 0.05$) higher flavor score (7.48). Further addition of spent hen meat powder upto 60% and 70% flavor score decreased significantly ($P < 0.05$). Present findings are corroborated with Kumar *et al* (2016) [18] for preparation of chicken biscuits incorporated with wheat and oat bran and Goswamiet *al* (2017) [19] for development of nutritional carabeefcookies. The sensory scores for juiciness does not differs significantly ($P > 0.05$) upto addition of 60% level meat powder. Further addition of 70% meat powder in cookies, scores for juiciness decreased significantly ($P < 0.05$) as compared to control cookies. The higher juiciness scores (7.00) were observed in cookies incorporated with spent hen meat powder at 50% level as compared to other treatments. Present findings are in close agreement with Ayo and Kajo (2016) [20] for effect of soybean hulls supplementation on the quality of acha based biscuits.

Texture scores of spent hen meat cookies incorporated with spent hen meat powder (50%) did not differ significantly ($P > 0.05$) with control cookies. However incorporation of spent hen meat powder upto 60% and 70% level, scores for texture differ significantly ($P < 0.05$) as compared to control and spent hen meat powder added (50%) cookies. The scores for the texture of spent hen meat cookies incorporated with 50% spent hen meat powder were highest (7.42) and the least value for texture score (5.36) was observed for spent hen meat cookies incorporated with 70% spent hen meat powder. Present findings are in agreement with Atefet *al*. (2014) [21] for production and quality evaluation of nutritious high qualitybiscuits.

The sensory scores for overall palatability of cookies incorporated with spent hen meat powder (50%) did not differ significantly ($P > 0.05$) with control cookies however addition of spent hen meat powder upto 60% and 70% level, scores for overall palatability differ significantly ($P < 0.05$) as compared to control and spent hen meat powder (50%) added cookies. Among the treatments the least value (5.44) for overall palatability was observed for cookies incorporated with 70% spent hen meat powder and highest overall palatability scores (7.61) was recorded for spent hen meat cookies incorporated with 50% spent hen meat powder. This could be because of the most important attributes i.e appearance, flavor, juiciness and texture which influences the overall acceptability of spent hen meat cookies. The present observations are in agreement with Singh *et al* (2002) [22] for chicken meat added snacks and Jaiswalet *al* (2015) [23] for study of preparation of chicken meat biscuits at ambient temperature in aerobic packaging.

Table 1: Effect of addition of spent hen meat powder on sensory attributes of spent hen meat cookies

Level of SHMP (%)	Sensory attributes				
	Appearance	Flavour	Juiciness	Texture	Overall palatability
0%	7.10 ^a ±0.02	7.27 ^a ±0.05	6.62 ^{ab} ±0.10	7.40 ^a ±0.12	7.58 ^a ±0.07
50%	7.25 ^a ±0.06	7.48 ^a ±0.13	7.00 ^a ±0.23	7.42 ^a ±0.07	7.61 ^a ±0.09
60%	6.14 ^b ±0.22	6.00 ^b ±0.18	6.22 ^{bc} ±0.15	5.92 ^b ±0.15	6.26 ^b ±0.25
70%	5.52 ^c ±0.21	6.05 ^b ±0.23	5.66 ^c ±0.27	5.36 ^c ±0.19	5.44 ^c ±0.14
CD	0.45	0.48	0.41	0.59	0.46
SE±	0.16	0.16	0.14	0.19	0.20

Means with common superscripts did not differ significantly ($p < 0.05$)

3.2 Physico-chemical Properties

The results with respect to emulsion stability, baking yield and bulk density of cookies influenced by incorporation of different levels of spent hen meat powder (0%, 50%, 60% and 70%) are presented in table 2.

Table 2: Effect of addition of spent hen meat powder on physicochemical characteristics of spent hen meat cookies

Level of spent hen meat powder	Physico-chemical characteristics		
	Emulsion stability (%)	Baking yield	Bulk density
0%	94.87 ^a ± 0.16	90.80 ^a ± 0.20	0.56 ^a ± 0.01
50%	92.67 ^b ± 0.08	90.23 ^a ± 0.23	0.57 ^a ± 0.01
60%	89.80 ^c ± 0.52	88.52 ^b ± 0.18	0.60 ^b ± 0.00
70%	87.33 ^d ± 0.89	86.60 ± 0.17	0.62 ^c ± 0.00
CD	1.56	0.59	0.02
SE±	0.53	0.20	0.01

Means with common superscripts did not differ significantly ($p < 0.05$)

Result denoted that emulsion stability of cookies decreased with the increase in level of spent hen meat powder. The emulsion stability of the control cookies recorded significantly ($P < 0.05$) higher (94.87) than the other treatments. Lowest value of emulsion stability was recorded for 70% spent hen meat cookies (87.33). The decline in emulsion stability might be due to addition of spent hen meat powder. The results obtained in this study were in agreement with Singh *et al.*, (2002) [22] in quality of chicken snacks containing broiler spent hen meat, rice flour and sodium caseinate and similar findings were noted by Jaiswal *et al* (2014) [24] for study of physico-chemical properties of chicken meat biscuit at ambient temperature in aerobic packaging.

The baking yield varied significantly ($P < 0.05$) between control cookies and spent hen meat cookies incorporated with 60% and 70% spent hen meat powder, but there were no significant difference ($P > 0.05$) observed for baking yield between control cookies and cookies incorporated with 50% spent hen meat powder. The highest baking yield was observed for control cookies (90.80) and lowest baking yield (86.60) was recorded for spent hen meat cookies added with 70% spent hen meat powder, this might be due to higher moisture percentage in spent hen meat powder. These

findings are corroborated with Jaiswal *et al* (2014) [24] for study of physico-chemical properties of chicken meat biscuit at ambient temperature in aerobic packaging and Goswami *et al* (2017) [19] for development of nutritional carabeef cookies.

The control cookies showed lowest value for bulk density and highest bulk density was recorded for cookies incorporated with 70% spent hen meat powder. The non significant ($P > 0.05$) increasing trend was observed for bulk density upto 50%. Further addition of 60% and 70% spent hen meat powder in cookies significantly differs with control and 50% spent hen meat powder added cookies. This might be due to high weight mass of the spent hen meat powder. These findings are agreed with observations of Lee *et al* (2003) [25] for physical evaluation of popped cereal snacks with spent hen meat and Bukya *et al.* (2013) [16] for standardization and evaluation of physical properties of chicken biscuits.

3.3 Cost of Production of Spent Hen Meat Cookies

The overall cost for the production of 1kg control cookies was Rs. 98.46/- and 50% incorporated spent hen meat powder cookies was Rs. 110.96 /-. Similarly the overall cost of production for 1kg cookies incorporated with 60% and 70% was Rs. 113.49/-, Rs. 115.98/- respectively. Thus, we can say that cookies incorporated with 50% spent hen meat powder had lower cost of production than cookies incorporated with 60% and 70% spent hen meat powder.

The higher cost of production for cookies incorporated with spent hen meat powder as compared to control cookies is mainly due to use of spent hen meat which is Rs. 90/Kg. Similar observation was recorded by Berwal and Khanna (2013) [26] for production of value added chicken meat mince incorporated cookies.

Based on the above observations, a highly acceptable, value added, nutritionally rich and cost effective cookies were prepared with incorporation of 50% spent hen meat powder without adversely affecting its quality.

4. Conclusion

From study, it is concluded that cookies prepared with incorporation 50% of spent hen meat powder were acceptable with regard to sensory quality and physico-chemical characteristics. Cookies incorporated with 50% spent hen meat powder are more acceptable and cost effective as compared to cookies incorporated with 60% and 70% spent hen meat powder.

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