ISSN: 2456-2912
VET 2024; 9(3): 507-510

www.veterinarypaper.com
Received: 24-03-2024
Accepted: 29-04-2024

SB Sakhare
PG Scholar, Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Parbhani, MAFSU, Maharashtra, India

SV Londhe
Assistant Professor, Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Parbhani, MAFSU, Maharashtra, India

AM Chappalwar
Assistant Professor, Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Parbhani, MAFSU, Maharashtra, India

SN Rindhe
Assistant Professor, Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Parbhani, MAFSU, Maharashtra, India

RN Waghamare
Assistant Professor, Department of Veterinary Public Health & Epidemiology , College of Veterinary and Animal Sciences, Parbhani, MAFSU, Maharashtra, India

VK Munde
Assistant Professor, Department of Animal Nutrition, College of Veterinary and Animal Sciences, Parbhani, MAFSU, Maharashtra, India

DP Patil
Assistant Professor, Department of Veterinary Pharmacology and Toxicology, College of Veterinary and Animal Sciences, Parbhani, MAFSU, Maharashtra, India

Corresponding Author:
SV Londhe
Assistant Professor, Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Parbhani, MAFSU, Maharashtra, India

Development and quality assessment of chicken meat cookies enriched with various levels of rice flour

SB Sakhare, SV Londhe, AM Chappalwar, SN Rindhe, RN Waghamare, VK Munde and DP Patil

DOI: https://dx.doi.org/10.22271/veterinary.2024.v9.i3g.1467

Abstract
The present study was conducted to evaluate the physico-chemical properties and sensory evaluation of different levels of rice flour added chicken meat cookies. The chicken meat cookies were formulated by replacement of wheat flour with different levels (10%, 20%, and 30%) of rice flour. Sensory analysis showed that control and T_2 had similar scores in appearance, flavor, texture, crispiness, taste, and overall acceptability. No significant differences (p>0.05) were found in appearance, flavor, and texture between control and T_1, T_2, and T_3. Crispiness and taste scores showed no significant difference between control and T_2, but T_1 and T_3 differed significantly. Overall acceptability was significantly higher (p<0.05) for chicken meat cookies with 20% (T_2) rice flour as comparable to control. Significant differences were found in baking yield between control and rice flour-incorporated chicken meat cookies, with T_2 having the highest yield. Bulk density was significantly higher (p<0.05) in T_2 and T_3 compared to control. Significantly increased moisture and ash percentages (p<0.05) while decreasing protein and fat percentages (p>0.05) as rice flour incorporation increased.

Keywords: Chicken meat cookies, rice flour, crispiness

Introduction
Livestock, poultry, and aquaculture are experiencing notable growth in India, providing promising avenues for increasing farm incomes. Among these sectors, the Indian poultry industry is particularly noteworthy, witnessing rapid advancement. Egg and broiler production has grown at rates of 8 to 10% annually, positioning India as the world's fifth-largest egg producer and the eighteenth-largest producer of broilers. This expansion can be attributed to factors such as rising per capita income, urbanization, and decreasing prices in the poultry market (APEDA, 2022) [1]. The growth of India's poultry sector is further driven by rising disposable incomes and changing dietary preferences, with a shift towards animal-based protein sources like meat, eggs, and dairy. Increased awareness of health and wellness also contributes to the demand for protein-rich diets, boosting momentum in the poultry industry. Additionally, the proliferation of distribution channels has made poultry products more accessible, further stimulating sectoral growth. Poultry meat, derived from various domesticated birds such as chickens, ducks, and turkeys, plays a vital role in providing high-quality animal protein and ensuring food security. Its global demand has led to a steady increase in poultry production (Kumar *et al*., 2022 [12]. In India, poultry meat production accounts for around 45% of total meat consumption, with chicken being the dominant choice among consumers (DAHD, 2023) [6]. Recognized for its rich content of high biological value protein, iron, zinc, and B-group vitamins, poultry meat is essential for maintaining optimal health. Recent research has also highlighted the presence of key nutrients like vitamin D, further enhancing its nutritional value (Ovesen and Jakobsen, 2003) [14]. Despite these advancements, India faces challenges related to malnutrition, including underweight conditions, micronutrient deficiencies, and rising rates of overweight and obesity (Meenakshi, 2016) [13]. The changing food landscape, characterized by shifts in snacking habits and increased eating out, presents both opportunities and challenges in addressing these nutritional

issues (Baker and Friel, 2016) [5]. The consumption of snack foods, characterized by energy-dense options like bread, biscuits, and cookies, is on the rise. Among these, cookies are popular for their convenience and taste, although they often lack essential nutrients like minerals and dietary fibre. Introducing protein-enriched meat into bakery products, especially during baking, offers a potential solution to enhance nutritional content and product quality. While research on fortifying biscuits with dietary fibre and animal proteins is limited, various non-meat ingredients have been explored for developing meat-based snacks. Wheat and rice, essential cereal crops in India, play vital roles in bakery product development. Wheat's gluten contributes to dough quality, while rice flour offers gluten-free properties suitable for individuals with celiac disease (Amin *et al.*, 2020) [3].

Materials and Methods

The experiment was conducted in the Department of Livestock Products Technology, COVAS, Parbhani, India. Freshly slaughtered chicken meat was procured from local market. Meat was kept in refrigerator at 4±1 °C for 24 hours till further use. The various ingredients such as wheat flour, vanaspati ghee (Dalda), rice flour, milk powder, sugar, glucose, vanilla essence, baking powder and salt were purchased from the local market of Parbhani. The culture media used in the study were procured from Hi Media Laboratories (P) Ltd, Mumbai and Tulip Diagnostics (P) Ltd, Goa, India. Low density polyethylene films (200 gauge) were purchased from local market of Parbhani.

Preparation of chicken meat powder

The meat was minced by passing once through a presterilized meat mincer. The minced meat was then kept in a hot air oven for 20–22 hours at 60–65 °C to remove the residual moisture. The dried meat was finally ground in a food grinder to form meat powder. This meat powder was then immediately packed in low-density polyethylene (LDPE) bags for further use.

Preparation of chicken meat cookies

The chicken meat cookies were prepared as per the method prescribed by Sai Manohar and Haridas (1999) [17], with slight modifications. Preliminary organoleptic trails were conducted to standardized the process of chicken meat cookies and based on that best chicken meat cookies selected for further studies. Chicken meat powder, wheat flour, rice flour and other ingredients were weighed accurately as per formulated in Table1. All the ingredients were evenly mixed individually to achieve the desired consistency for the dough. The dough was then rolled out on a wooden board using rolling pins. Using a cookie mold, the dough was cut into various shapes. These shaped cookies were baked in the microwave oven at 150–160 °C for 20 minutes. After baking, the cookies were cooled to room temperature and promptly packaged.The chicken meat cookies incorporated different levels of rice flour in replacement of wheat flour were abbreviated as: Control-Cookies with 50% wheat flour and 50% chicken meat powder, T_1-Cookies with 40% wheat flour, 10% rice flour and 50% chicken meat powder, T_2- Cookies with 30% wheat flour, 20% rice flour and50% chicken meat powder, T_3-Cookies with 20% wheat flour, 30% rice flour and 50% chicken meat powder.

Analysis of cookies

Developed chicken meat cookies were evaluated for various physico-chemical properties as per standard procedure. The semi-trained sensory panellists, consisting of academic staff members and students from the College of Veterinary and Animal Sciences, Parbhani, were involved in assessing the quality of spent hen meat cookies on the basis of sensory attributes, viz., appearance, flavour, crispiness, texture, taste, and overall acceptability, using an 8-point descriptive scale (Keeton, 1983) [9], where 1 denoted extremely poor and 8 denoted extremely desirable. The plain lukewarm water was given for mouth rinsing in between sensory of two samples. Baking yield was estimated by recording the difference between the pre and post baked weight of cookies and expressed in percentages. The bulk density was determined as per method described by Sahay and Singh (2001) [16]. A container was used whose volume was calculated by measuring its inner dimensions. The moisture, fat, protein and ash content of spent hen meat cookies were determined by following the method of AOAC (1995) [2].

Statistical analysis

The data in the form of observations generated during the study were analysed by the Analysis of Variance technique following standard procedure (Snedecor and Cochran, 1989) [19].

Table 1: Formulation of control and chicken meat cookies prepared by incorporation of different levels of rice flour

Ingredients%	Control (T_0)	10% (T_1)	20% (T_2)	30% (T_3)
Chicken meat powder	50	50	50	50
Wheat flour	50	40	30	20
Rice Flour	-	10	20	30
Vanaspati ghee	35	35	35	35
Sugar	20	20	20	20
Glucose	05	05	05	05
Milk powder	20	20	20	20
Egg albumin	20	20	20	20
Vanilla essence	02	02	02	02
Baking powder	1.5	1.5	1.5	1.5
Salt	1.5	1.5	1.5	1.5

Results and Discussion

Sensory evaluation

Sensory scores for rice flour incorporated chicken meat cookies are presented in Table 2. Statistical analysis revealed the mean scores of control and T_2 were comparable in terms of appearance, flavour, texture, crispiness, taste and overall acceptability. The results revealed that there was no significant difference ($p>0.05$) in the appearance, flavour and texture scores between the control chicken meat cookies and T_1, T_2 and T_3 chicken meat cookies. This observation is similar to Kim *et al.* (2002) [10] for quality characteristics of cookies with various levels of functional rice flour. However for crispiness and taste scores non-significant difference was found for control and T_2 and significant difference for T_1 and T_3 chicken meat cookies. These results are in close agreement with Ayo and Kajo (2016) [4] for effect of soybean hulls supplementation on the quality of acha based biscuits and Kulthe *et al.* (2014) [11] for development of high protein and low calory cookies. The overall acceptability scores were significantly higher ($p<0.05$) for T_2 as compared to other treated chicken meat cookies. The sensory panellists rated overall acceptability of chicken meat cookies with 20% rice flour as comparable to control.

Physico-chemical properties

The physico-chemical properties of rice flour incorporated chicken meat cookies are presented in Table 2. There was significant difference observed inbaking yield of both control and rice flour incorporated chicken meat cookies. No significant difference was observed in treatment chicken meat cookies. The T_2 group had higher baking yield as compared to other treatments. This might be due tooptimal gelatinization, leading to a desirable texture in T_2 (Gao *et al*., 2014) [7]. The bulk density significantly affected by rice flour incorporated chicken meat cookies. The bulk density of the control group was significantly lower ($p<0.05$) than that of T_2 and T_3.This might be due to the relative ratio of protein, carbohydrates and lipids that made up the flours and interaction between such components (Islam *et al.*, 2012) [8].

Proximate analysis

Mean moisture and ash percentage significantly increased ($p<0.05$) and other proximate composition like protein and fat percentage decreased significantly ($p>0.05$) with rice flour incorporation in chicken meat cookies. Increase in moisture in treatment chicken meat cookiesmight be due to greater ability of rice flour to retain water (Richa *et al.* 2020) [15]. The Gao *et al.* (2014) [7] stated that rice flour typically contains high minerals content which contributed to increase in ash percentages as rice flour incorporation increases. The significant decrease in protein and fat percentage in chicken meat cookies incorporated with rice flour in the increasing levels might be due to lower protein and fat content of rice flour compared to wheat flour (Sirichokworrakit *et al.*, 2015) [18].

Table 2: Effect of addition of different level of rice flour on sensory attributes of chicken meat cookies

Level of chicken meat powder (%)	Organoleptic evaluation					
	Appearance	Flavour	Texture	Crispness	Taste	Overall acceptability
Control	$7.52^{a}\pm0.01$	$7.81^{a}\pm0.01$	$7.79^{a}\pm0.02$	$7.89^{a}\pm0.02$	$7.71^{a}\pm0.01$	$8.18^{a}\pm0.03$
T_1-10%	$7.38^{b}\pm0.02$	$7.65^{a}\pm0.03$	$7.33^{b}\pm0.04$	$7.64^{b}\pm0.01$	$7.56^{c}\pm0.0.01$	$7.72^{b}\pm0.03$
T_2-20%	$7.65^{a}\pm0.1$	$7.85^{a}\pm0.02$	$7.86^{a}\pm0.01$	$7.95^{a}\pm0.02$	$7.74^{a}\pm0.0.02$	$8.23^{a}\pm0.02$
T_3-30%	$7.45^{a}\pm0.02$	$7.72^{a}\pm0.09$	$7.50^{a}\pm0.01$	$7.71^{c}\pm0.02$	$7.65^{b}\pm0.0.03$	$7.87^{a}\pm0.02$

Mean with common superscripts did not differ significantly ($p<0.05$)
n = 6, Control= Cookies with 50% wheat flour and 50% chicken meat powder,
T_1=Cookies with 40% wheat flour, 10% rice flour and 50% chicken meat powder,
T_2= Cookies with 30% wheat flour, 20% rice flour and50% chicken meat powder,
T_3= Cookies with 20% wheat flour, 30% rice flour and 50% chicken meat powder

Table 3: Effect of addition of rice flour on physico-chemical characteristics of chicken meat cookies

Level of rice flour in chicken meat cookies (%)	Physico-chemical characteristics	
	Baking yield	Bulk density
Control (0%)	$77.66^{b}\pm0.48$	$0.74^{b}\pm0.003$
10%	$91.98^{a}\pm0.01$	$0.77^{a}\pm0.001$
20%	$92.52^{a}\pm0.2$	$0.78^{a}\pm0.005$
30%	$91.69^{a}\pm0.2$	$0.79^{a}\pm0.003$

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

Table 4: Effect of addition of rice flour on proximate composition of chicken meat cookies

Treatments	Proximate composition of cookies			
	Moisture	Fat	Protein	Ash
Control	$2.86^{c}\pm0.1$	$25.17^{a}\pm0.2$	$14.72^{a}\pm0.24$	$2.02^{c}\pm0.05$
T_1(10%)	$3.10^{bc}\pm0.1$	$22.30^{b}\pm0.4$	$11.90^{b}\pm0.35$	$2.26^{bc}\pm0.10$
T_2(20%)	$3.25^{ab}\pm0.1$	$19.10^{c}\pm0.2$	$9.96^{c}\pm0.19$	$2.41^{b}\pm0.12$
T_3(30%)	$3.52^{a}\pm0.12$	$17.45^{d}\pm0.5$	$8.62^{d}\pm0.28$	$2.76^{a}\pm0.1$

Mean with different superscripts differ significantly ($p<0.05$)

Conclusion

Chicken meat cookies incorporated with 20% rice flour in replacement of wheat flour acceptable for sensory evaluation, physico-chemical attributes and proximate composition.

Acknowledgement

All the authors are thankful to the Associate Dean, College of Veterinary and Animal Sciences, MAFSU, Parbhani, India for providing the necessary facility to conduct this study.

References

1. (APEDA) Agricultural and Processed Food Product Export Development Authority. Poultry production in India the current secenario; c2022.
2. A.O.A.C Official Method of analysis. 15th Edition, Association of analytical chemist; c1995.
3. Amin T, Naik HR, Hussain SZ, Makroo HA, Rather SA. Effect of storage materials and duration on the physicochemical, pasting and microstructural properties of low glycemic index rice flour. International Journal of Biological Macromolecules. 2020;162:1616-1626.
4. Ayo JA, Kajo N. Effect of soybean hulls supplementation on the quality of acha based biscuits. American Journal of Food Nutrition. 2016;6(2):49-56.
5. Baker P, Friel S. Food systems transformations, ultra-processed food markets and the nutrition transition in Asia. Globalization and health. 2016;12:1-15.
6. (DAHD) Department of Animal Husbandry and Dairying 2023. Annual Report 2022-23.
7. Gao X, Zhang W, Zhou G. Effects of glutinous rice flour on the physiochemical and sensory qualities of ground pork patties. LWT-Food Science and Technology. 2014;58(1):135-141.
8. Islam MZ, Taneya MLJ, Shams-Ud-Din M, Syduzzaman M, Hoque MM. Physicochemical and functional properties of brown rice (*Oryza sativa*) and wheat (*Triticum aestivum*) flour and quality of composite biscuit made thereof. The Agriculturists. 2012;10(2):20-28.
9. Keeton JT. Effects of fat and NaCl/phosphate levels on the chemical and sensory properties of pork patties. Journal of Food Science. 1983;48(3):878-881.
10. Kim HY, Lee IS, Kang JY, Kim GY. Quality characteristics of cookies with various levels of functional rice flour. Korean Journal of Food Science and Technology. 2002;34(4):642-646.
11. Kulthe A, Pawar V, Koteccha P, Chavan U, Bansode V. Development of high protein and low calorie cookies. Journal of food science and technology. 2014;51:153-157.
12. Kumar P, Verma AK, Umaraw P, Mehta N, Sazili AQ. Processing and preparation of slaughtered poultry. In Postharvest and Postmortem Processing of Raw Food Materials. 2022, p. 281-314. Woodhead Publishing.
13. Meenakshi JV. Trends and patterns in the triple burden of malnutrition in India. Agricultural Economics. 2016;47(S1):115-134.
14. Ovesen L, Brot C, Jakobsen J. Food contents and biological activity of 25-hydroxyvitamin D: a vitamin D metabolite to be reckoned with. Annals of Nutrition and Metabolism. 2003;47(3-4):107-113.
15. Richa K, Laskar SK, Das A, Choudhury S, Hazarika M, Sonowal S, *et al*. Effect of black rice (*Oryza sativa* L.) flour on proximate composition, texture profile and microbiological qualities of chicken nuggets. Journal of Entomology and Zoology Studies. 2020;8(6):412-416.
16. Sahay KM, Singh KK. Unit operation of agricultural processing. Vikas Publication. New Delhi; c2001.
17. Sai Manohar R, Haridas OR. Effect of emulsifiers, fat level and type on the rheological characteristics of biscuit dough and quality of biscuits. Journal of Science of Food and Agriculture. 1999;79:1223-1231.
18. Sirichokworrakit S, Phetkhut J, Khommoon A. Effect of partial substitution of wheat flour with riceberry flour on quality of noodles. Procedia-Social and Behavioral Sciences. 2015;197:1006-1012.
19. Snedecor GW, Cochran WJ. Statistical Methods, 8th edi. Lowa State University Press, Amer. lowa, USA; c1989.

How to Cite This Article

Sakhare SB, Londhe SV, Chappalwar AM, Rindhe SN, Waghamare RN, Munde VK, *et al*. Development and quality assessment of chicken meat cookies enriched with various levels of rice flour. International Journal of Veterinary Sciences and Animal Husbandry. 2024;9(3):507-510.