

Research Article

COMPARISON OF PHYSICO-CHEMICAL AND SENSORY QUALITY OF SAUSAGES PREPARED FROM SPENT DUCK AND HEN MEAT

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ABSTRACT: A study was conducted to assess the comparative quality of sausages prepared from different combination of spent duck and spent hen meats in terms of physico-chemical and sensory attributes. Sausages from 75% spent duck and 25% spent hen (T₁), 50% spent duck and 50% spent hen (T₂) and 25% spent duck and 75% spent hen (T₃) meats were prepared by standard methods. The quality parameter studies included pH, thiobarbituric acid (TBA), tyrosine value (TV), moisture (%), protein (%), fat (%) and sensory attributes. Results revealed that pH, TV, and protein showed insignificant differences between the treatments whereas TBA, moisture and fat varied significantly (p<0.05). Among the sensory attributes colour, flavour, juiciness, texture, tenderness and overall palatability showed significantly (p<0.05) higher scores except appearance for sausages made from a T₃ combination of meat. From the study, it was concluded that the overall quality of sausages prepared from the highest ratio of spent hen meat was the best followed by other combinations of meat sausages i.e. (T₃ > T₂ > T₁).

Key words: Sausages, Spent duck, Spent hen, Physico-chemical, Sensory attributes.

INTRODUCTION

In the fast-growing urban areas, due to rapid industrialization in the recent past the demand for meat, including processed meat is increasing. This offers a scope for developing and marketing a variety of processed meat in India. Ducks occupy second place to chicken for the production of eggs in India. They are mainly reared for laying purpose. Spent ducks

and hens are present in the market after 3-4 laying years. Such spent meat intended for human consumption has less juiciness, more toughness, less palatability which are the hidden reasons for unacceptability of such meat by the consumers, though there is no significant decline in its nutritive value with increase in age (De, 2001). Meat consumers and processors can benefit from the development of efficient

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and economical technology for processing undervalued meat such as spent birds' meat into value added meat products like sausages and nuggets that are palatable and reasonable in cost. It also helps to fulfill some amount of protein requirement of our country. In one previous study report, quality and shelf life evaluation of nuggets prepared from spent duck and spent hen meat was established (Rajesh Kumar *et al.*, 2015). The present study was conducted to compare quality parameters of sausages prepared from different combinations of chicken and duck meat to select the best combination for effective utilization of spent chicken and duck meat.

MATERIALS AND METHODS

Indian desi ducks (Khakhi compbell) were purchased from Birohi local market (Nadia district), West Bengal, whereas spent hen (White leghorn) from layer farm, Mohanpur campus University poultry farm, Nadia district, West Bengal, India for the study. Duck and spent hen were subjected to starvation for minimum 12 hrs by giving water alone. For each trial 6 birds (3 duck and 3 spent hens) 1.5 to 2.2 kg were used.

Culled chicken and ducks were slaughtered, deboned and chilled overnight at 4 ± 1 °C. On the following day, meats were ground and kept at -10 ± 1 °C till processing. For processing, chicken and duck meats were partially thawed in the refrigerator and minced through 10 mm plate and then through 5 mm plate of meat grinder. Three types of sausages were prepared with chicken and duck meat in proportions of 25:75 (T₁), 50:50 (T₂), and 75:25 (T₃) respectively. Rest of the ingredients in the 3 formulations were similar and their proportions in each formulation (1 kg batch) were: skin fat (10%) salt (1.5%) sodium nitrate

and nitrite (0.01%) tetra sodium pyrophosphate (0.2%) egg yolk (1.4%) curd (1.6%) sugar (1%) maida (refined wheat flour 4.3%) spices (2%) condiments (6%) and ice flakes (4.5%). Emulsions of meat with other ingredients were prepared in Stadler-bowl chopper and stuffed into goat casings. Samples were evaluated for different parameters after smoking in smoke chamber (75-80°C) for 7-8 hrs. The pH was estimated by the method of Trout *et al.* (1992). TBA and TV of samples were determined as per the procedure outlined by Strange *et al.* (1977) with slight modification. Moisture, protein and fat contents were determined as per methods of AOAC (1995). Organoleptic evaluation was carried out by a panel comprising of 15 semi-trained judges similar to the one used by Keeton (1983) and adopted by Division of LPT, IVRI (Sharma *et al.*, 1997) using 8 point hedonic scale. The experiment was repeated thrice and data obtained were statistically analyzed by Snedecor and Cochran (1989).

The spice mixture was a combination of different spices in the dry form, powdered separately and then mixed thoroughly. Spice mixture formula of Majhi (1973) with slight modification was followed.

RESULTS AND DISCUSSION

The comparative physico-chemical quality of sausage prepared from different combination of spent duck and spent hen meat is presented in Table 2. The pH and TV no. of sausages showed non-significant differences between different combinations (T₁, T₂ and T₃) of meat. In higher ratio of duck meat higher pH and TV value were observed due to higher fat content and their muscles composition. The pH of T₁ sausages was significantly higher than that of T₃ sausages. This might be due to variation in

Table 1: Ingredients of Sausages.

Sl. No.	Ingredients	Percentage (%)
1	Meat (Prime & non prime cuts)	68
2	Fat (Visceral fat + Skin)	10.0
3	Salt	1.5
4	STPP	0.18
5	Egg yolk	1.4
6	Nitrite	0.01
7	Nitrate	0.01
8	Sugar	1.0
9	Curd	1.4
10	Spice mix	2.0
11	Condiments	6.0
12	Refined wheat flour	4.0
13	Ice cubes	4.5
	Total	100

glycogen reserves, and quantity and quality of glycolytic enzymes in these two species of birds (Brahma *et al.*, 1984). Our observation was in agreement with the observations of Bhattacharyya *et al.* (2007). The TBA value of T₁ meat was highest followed by those prepared from T₂ & T₃. Such higher value of TBA in T₁ was due to higher percentage of fat in duck meat as compared to chicken meat. According to Rao and Reddy (1997) this higher fat content was responsible for more oxidation in the concerned sausage. Above findings are in proximity with that of Biswas *et al.* (2006).

T₃ sausages had significantly lower (P<0.05) fat content as compared to that of T₁ & T₂ but the differences were observed to be non-significant in protein content between different

combinations of sausages. The lower moisture content of T₁ from T₂ and T₃ combinations of sausages may be correlated with decreased moisture content of muscle tissues with an increase in the age of bird (Lawrie, 1991). Similarly, the higher fat content of T₁ from T₂ and T₃ may be attributed to higher fat of spent duck meat compared to spent hen (Brahma *et al.*, 1985). The difference in the protein content of different groups of sausages was observed to be non-significant but the sausage having higher ratio of spent duck meat recorded comparatively higher protein than other combinations. Our findings are in agreement with those of Biswas *et al.* (2006), who also reported higher protein content of spent duck meat than that of hen meat.

Moisture content was observed to be significantly (P<0.05) higher in sausages containing a higher ratio of spent hen (T₃) while the fat content was low as compared to the sausages having a higher ratio of duck meat (T₁). Decrease in moisture content of T₁ sausage might be due to decline in moisture of muscle tissues with advanced age, there is more collagen in spent duck as compared to spent hen (Salahuddin *et al.*, 2007). Our findings are in agreement with those reported by Lingaiah and Reddy (2001). The protein content showed the non-significant difference between the treatments, with a higher value in sausages made from a higher ratio of spent duck meat followed by other ratios of meats. Similar observations were made by Biswas *et al.* (2006) for patties from broiler and spent hen meat.

Table 3 presents the sensory quality of sausages prepared from different combinations of meats. Juiciness, texture, tenderness and overall palatability of T₃ sausages exhibited significantly (P<0.05) higher scores compared to that of T₂ and T₃ sausages. There were no

Table 2: Physico-chemical and proximate properties of sausages of different combination of meats.

Types of Sausages	Ph	TBA	TV	Moisture%	Protein%	Fat%
T1	5.87±0.06	0.358±0.005 ^b	0.25±0.01	47.97±0.13 ^a	20.52±0.20	15.90±0.37 ^b
T2	5.87±0.05	0.357±0.003 ^{ab}	0.22±0.04	49.79±0.58 ^b	20.11±0.33	14.80±0.30 ^a
T3	5.94±0.03	0.331±0.005 ^a	0.22±0.02	51.71±0.40 ^c	19.56±0.50	13.78±0.29 ^a

^{a,c} Mean±S.E. with different superscript in same column significantly differ (P <0.05).

Table 3: Sensory quality of sausage of different combination of meats.

Types of Sausages	Sensory attributes					
	Appearance	Flavour	Juiciness	Texture	Tenderness	Overall palatability
T1	7.50±0.18	6.65±0.33	7.00±0.00 ^c	7.33±0.33 ^b	6.33±0.38 ^b	7.67±0.33 ^b
T2	7.67±0.19	7.33±0.31	7.68±0.33 ^b	7.33±0.33 ^c	7.00±0.58 ^b	7.67±0.23 ^c
T3	7.33±0.17	7.33±0.33	7.67±0.88 ^c	7.67±0.65 ^c	7.67±0.33 ^c	8.00±0.58 ^c

^{a,e} Mean±S.E. with different superscript in same column significantly differ (P <0.05).

significant differences among the three types of sausages in sensory qualities like, appearance and flavour as shown in Table 3. The appearance of the T₁ was better due to its darker colour. The T₁ sausage scored an insignificantly less value in respect of flavour due to the inherent characteristic ducky odour that couldn't be masked by the spices and condiments added to prepare the emulsion. The tenderness value also didn't vary significantly (P<0.05) between T₁ and T₂ but vary significantly (P<0.05) in T₃ combination of sausage because duck meat has coarser fibers. The sausages prepared from T₃ combination scored a little higher value in respect of juiciness and this may be due to its finer fibre and higher

moisture percentage. Therefore, the overall acceptability differed insignificantly among the T₁ and T₂ types of sausages whereas T₃ varies significantly (P<0.05) providing a strong base for the acceptability of the higher ratio of spent hen (T₃) as compared to spent duck sausage (T₁). Our findings are in close agreement with that of Biswas *et al.* (2006).

CONCLUSION

From this study, it was concluded that the overall quality of sausages prepared from the combination containing the highest ratio of the spent hen (T₃) was the best and it decreased gradually as the ratio of spent duck meat was increased.

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