Original Research

Development of Chicken Sausages: Value Addition to Spent Hen Meat

T. P. Pradeepa Roberts[1]*, D. L. Kusuma[2], K. V. Sucharitha[2] and R. Bharathi[3]

[1]Millet Processing & Incubation Centre, PJTS Agricultural University, Rajendra Nagar, Hyderabad, Andhra Pradesh, INDIA
[2]Food science & Nutrition, Sri Venkateswara University, Tirupathi, Andhra Pradesh, INDIA
[3]Sri Padmavathi Mahila Vishwavidyalayam, Tirupathi, Andhra Pradesh, INDIA

***Corresponding author:** pradeepa.rkvy12@gmail.com

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Abstract

India is the most popular country for the production of poultry eggs which lead to the problem with the disposal off spent hens. Utilization of such spent hen meat is a big challenge to modify into potential palatable value-added products. The present study had made an attempt to develop chicken sausages using spent hen meat. Two varieties of chicken sausages were developed viz., one without ginger garlic paste and the other with incorporation of ginger garlic paste at three percent level and stored at refrigerated temperatures (-18±1^0 c) for a period of 60 days at 15 days intervals. The sensory evaluation results on cooked samples clearly demonstrated highly acceptable scores in the fresh samples and slightly lower scores on storage. The experimental samples scored relatively better than control sample indicating the positive effectiveness with the incorporation of ginger garlic paste on enhancing the palatability as well as shelf life.

Key words: Chicken Sausages, Live Stock Products, Poultry, Spent Hen Meat, Sensory Evaluation, Value Addition

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Introduction

India occupies the number one position in livestock population especially the poultry production around 613 million. Worldwide, the egg producers dispose of 2.6 billion spent hens after their laying cycle is finished. The availability of the culled and spent hens is also increased manifold parallel with the rapid development of poultry layer industry. Spent hens are those birds whose egg laying capacity is over. The spent hen meat is usually tough, less tender and has poor functional properties due to increased collagen content and linkage (Sarvadnya *et al.,* 2018). The spent hens are considered as the byproduct of egg industry and continuous efforts are carried out to yield quality meat for higher returns. The toughness and less

palatable meat of spent hens become a striking factor need to be beneficially altered for livestock products to the benefit of producer as well as consumer. The emerging livestock product technology paved a path to produce variety of comminuted products without adhering any hinderance associated with toughness of spent hen meat (Kondaiah, 2004).

The utilization and consumption of spent hen meat by the consumers of India is much limited and makes the poultry farmers difficult in disposal of spent hens. On the other hand, the imbalance between protein supply and exploding population necessitates the search for new protein sources. In such instances, the underutilized sources of animal origin like spent hen meat found to be the one of the potential sources in view of dual benefits of economy as well as nutritive value (Sreenivasa Rao *et al.*, 2011). However, spent hen undergoes faster oxidation than boiler meat during processing and storage owing to higher content of unsaturated fatty acids. Utilization of natural spices and herbs in different forms like powders, extract of essential oils has been well documented for antioxidant properties (Reshi *et al.*, 2017). The annual poultry meat consumption has increased around 1.8 kg with the increasing number of non-vegetarians. Simultaneously the price of meat is also increasing which exerts a dire need to harvest every source of meat to reduce cost, maintain quality and meet the demand. Spent hen meat attracts the meat industry as a cheaper source. In view of challenging task to utilize the spent hen meat, the present study focused on the development of chicken sausages from spent hen meat.

Materials and Methods

The process optimization of chicken sausages was carried out at department of livestock products technology, College of Veterinary Science, Tirupati. Spent hens were obtained from the local poultry farm and slaughtered conventionally. The halved carcass was deboned and the meat was minced twice in a meat mincer (SIRMAN Model T112E) with a 4mm diameter sieve.

The chicken sausage was basically developed with the combination of minced meat, soya flour, chilli powder, salt, dry spice mix (black pepper, cloves, cardamom and cinnamon) and coriander powder. This base chicken sausage which was prepared without addition of ginger garlic paste was termed as control sample and coded as 'C'. The other type of chicken sausage was also developed with the incorporation of ginger garlic paste at 3 percent level and considered as experimental sample, 'E'. Ginger had chosen purposefully in the experimental chick sausage sample owing to the associated beneficial properties such as antioxidative, antibacterial, anti-flatulent, antimicrobial, anti-diabetic and anti-carcinogenic. High quality soy flour, chilli powder, salt, dry spices and coriander powder were obtained from local super market. The dry spices were taken in the desired proportions and grounded into a fine powder in an electric spice mixer. All the ingredients as per the formulation were added to the minced meat and thoroughly mixed in a bowl chopper. The batter thus prepared was stuffed into sheep casing of 14-18mm with a hand sausage

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stuffed machine (Make: Gardener's). In case of experimental sample, fresh ginger and good quality garlic were ground to fine paste and added at 3 percent level. The standard procedure was followed similar to that of control sample. The developed sausages were linked, tied and packed separately in polythene packs and stored under frozen conditions (2-4°C).

The acceptability of the developed sausages was evaluated through sensory evaluation of the cooked sausages. Shelf-life studies were also conducted at frozen storage for a period of 60 days with 15 days intervals. The corresponding samples were cooked to an external temperature of 80°c for 5 minutes, fried in a shallow pan and served hot to five-member semi-trained panel of habitual meat consumers. The scoring for sensory characteristics viz., taste, aroma, tenderness, colour and overall acceptability were done on a five-point hedonic scale. The data was analysed and subjected to appropriate statistical analysis as per the methods described by Snedecor and Cochran, 1994.

Results and Discussion

The current research carried out was intended towards the development of chicken sausages using spent hen meat. The product development was focussed on two varieties of chicken sausages as one sample (control chicken sausage) without addition of ginger garlic paste and the other experimental chicken sausage sample with the incorporation of ginger garlic paste at three percent level. Both the control and experimental samples were evaluated for their acceptability levels through sensory evaluation at various storage periods viz 0^{th} day, 15 days, 30days, 45 days and 60days. The results thus obtained were interpreted and discussed in detail for each sensory characteristic along with statistical inferences.

Variety of food products enter the food markets which may be flourished only when they able to catch the consumer acceptability. The sensory quality of the food products is the critical quality consideration influencing the overall quality of any product. The term quality in this regard corresponds to the essential sensory characteristics like appearance, flavour, aroma and texture. Sensory analysis is the description and the scientific measurement of the sensory attributes of the product perceived by the senses: sight, sound, smell, taste and touch. The unique cooked meat flavour basically derives from thermally induced reactions principally the Maillard reaction and the degradation of the lipids. Both reactions involve complex reaction pathways accounting for wide range of volatile compounds. Heterocyclic compounds especially those containing sulphur are flavour compounds released in the Maillard reaction providing savoury, meaty, roast and boiled flavour. These may react with other compounds like aldehydes and other carbonyls formed during Maillard intermediates which give rise to Maillard intermediates which give rise to additional aroma (Mottram, 1998). The flavour of the food includes both taste and odour.

Taste allows the gustatory system in humans to differentiate safe and harmful food. The enzymes present in the saliva initiate to dissolve the food into base chemicals which are washed over papillae and detected

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by the taste buds. Better the taste, better the profits and mobilizes good marketability. Compromising the taste not only decreases the success rate of the product but also exerts greater pressure on marketing the product. The present study made an effort to evaluate the taste perception of the developed chicken sausages and the data gathered is presented in Table 1.

Table 1: Mean sensory scores on taste of the control and experimental chicken sausage samples

S. No.	Storage Period (Days)	Control	Experimental	t-Values Control Vs Experimental
1	0	2.20±0.40	2.40±0.49	1.00^{NS}
2	15	2.00±0.00	2.20±0.40	1.00 ^{NS}
3	30	1.60±0.49	2.20±0.40	2.44^{NS}
4	45	1.40±0.49	1.80±0.40	1.63^{NS}
5	60	1.00±0.00	1.20±0.40	1.00^{NS}

*^{NS}: Not significant; **: Significant at 0.01 level; *: Significant at 0.05 level*

The mean sensory scores on taste during different storage periods well demonstrated the higher mean scores for the fresh samples of both control and experimental chicken sausages. However, the chicken sausages incorporated with ginger garlic paste rated relatively better throughout the study period. The characteristic spicy taste arrived with the blend of the ginger garlic paste probably enhanced the levels of taste in the experimental sample. Though the differences were not significant statistically, the improvement in the taste was clearly observed with the addition of ginger garlic paste at three percent level.

Aroma is the most important contributor affecting the sensory quality of the food product. The primary reactions attributed to the arouse of aroma in cooked meat typically based on the aroma compounds released on oxidation of lipids, degradation of thiamine, the Strecker reaction and the Maillard reaction. Generally, it is assumed that the lipid oxidation mechanism when meat is cooked creates pleasant aroma unlike in the raw meat (Resconi *et al.*, 2013). The mean sensory scores on aroma on different storage periods of control and experimental chick sausages were tabulated in the Table 2.

Table 2: Mean sensory scores on aroma of the control and experimental chicken sausage samples

S. No.	Storage Period (Days)	Control	Experimental	t-Values Control Vs Experimental
1	0	2.20±0.40	2.80±0.40	1.50^{NS}
2	15	2.20±0.40	2.60±0.49	1.63 ^{NS}
3	30	1.80±0.40	2.20±0.40	1.63 ^{NS}
4	45	1.60±0.49	2.20±0.40	2.44*
5	60	1.20±0.40	1.60±0.49	1.00^{NS}

*NS: Not significant; **: significant at 0.01 level; *: significant at 0.05 level*

The initial mean panel scores on aroma revealed pleasant aromatic flavour in both the control and experimental chicken sausages. Usually flavour precursors develop from protein, fat and sugars present in meat as they are volatile in nature and flavour compounds are released during cooking on temperature, time and cooking method. The aromatic compounds being volatile in nature lead to gradual loss with the

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progressive storage period which resulted in slightly lower mean aroma scores in both the samples with the progressive storage. The interesting fact to be noted that the ginger garlic paste incorporated chicken sausages could effectively retained better aroma than the control sample. The differences between control and experimental samples were not statistically significant except at 45 days of storage period as marked by significant difference at five percent level. The findings thus indicated that incorporation of ginger garlic paste played a crucial role in retention of aroma relatively well indicating the positive aromatic effect of ginger garlic paste.

The tenderness of the meat reflects the quality of meat facilitating easiness when it is chewed or cut. Meat tenderness is a major factor influencing the consumers' acceptance. Collagen is an abundant connective tissue protein which is identified as an essential contributing factor to variation in meat tenderness (Weston and Althen (2002). Cooking converts more complex molecules into simpler compounds subjecting the meat to heat aids to modify the tough sinewy structures in a piece of meat into soft gelatin and collagen. The spent hen meat usually has tough texture which needs to be considered to modify into chewable texture. The process of sausage making is helpful in bringing out the desirable tenderness. The sensory evaluation scores of the panelists on tenderness of the chicken sausages in relation storage period were denoted in Table 3.

Table 3: Mean sensory scores on tenderness of the control and experimental chicken sausage samples

S. No.	Storage Period (Days)	Control	Experimental	t-Values Control Vs Experimental
1	0	3.20±0.40	3.60±0.49	1.63^{NS}
2	15	3.20±0.40	3.40±0.49	0.53^{NS}
3	30	2.60±0.49	2.80±0.40	0.53^{NS}
4	45	1.80±0.40	2.40±0.80	2.44^{*}
5	60	1.40±0.49	1.80±0.40	1.63^{NS}

*NS: Not significant; **: significant at 0.01 level; *: significant at 0.05 level*

The mean tenderness scores from the table expressed the highest mean values in the fresh samples. The mean scores seemed to be lowered on storage probably due to the gradually moisture losses in the stored products. The losses might be at lower rate and hence only slight changes were noticed. There was no significant difference between control and experimental samples on various storage periods except during 45 days storage period which was found to be significant at five percent level. Though ginger garlic paste had no binding property it helped in providing tender texture to the sausages. Adequate cooking of meat is of utmost importance to inactivate microbial pathogens. It is particularly important for ground meat products such as sausages, patties, meat balls where pathogens can be present internally. Consumers are more likely to assess cooking condition by the colour of the meat or juiciness (King and Whyte, 2005). The mean colour scores evaluated by the panel members of the developed chicken sausages were shown in the table 4 on different storage periods.

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Table 4: Mean sensory scores on colour of the control and experimental chicken sausage samples

S. No.	Storage Period (Days)	Control	Experimental	t-Values Control Vs Experimental
1	0	3.20±0.40	3.40±0.49	0.53^{NS}
2	15	3.20±0.40	3.20±0.40	0.00^{NS}
3	30	2.60±0.49	2.80±0.40	1.00^{NS}
4	45	2.20±0.40	2.40±0.49	1.00^{NS}
5	60	1.60±0.80	2.20±0.40	1.17^{NS}

*NS: Not significant; **: significant at 0.01 level; *: significant at 0.05 level*

The data from the table implicated highly acceptable colour scores in the initial chicken sausages. The mean values found to be slightly decreased with the progressive storage periods which might be due to gradual oxidative changes and alterations in the myoglobin pigment. Statistically, no significant differences were observed between control and experimental samples. However, considerably higher mean scores were noticed in the chicken sausages introduced with ginger garlic paste denoting more acceptable scores. The overall acceptability of any product is dependent on the holistic acceptable levels of the essential sensory parameters like flavour, colour and tenderness of the product. Better acceptable sensory scores eventually result in better overall acceptability of the product. The results obtained on the overall acceptability of the developed chicken sausages at different storage periods were denoted in this Table 5.

Table 5: Mean sensory scores on overall acceptability of the control and experimental chicken sausage samples

S. No.	Storage Period (Days)	Control	Experimental	t-Values Control Vs Experimental
1	0	2.70±0.10	3.20±0.24	3.65^{**}
2	15	2.40±0.33	2.85±0.25	3.08^{**}
3	30	2.20±0.29	2.40±0.25	2.13*
4	45	1.75±0.35	2.15±0.37	6.53^{**}
5	60	1.30±0.29	1.60±0.20	1.63^{NS}

*NS: Not significant; **: Significant at 0.01 level; *: Significant at 0.05 level*

The findings well demonstrated that the experimental chicken sausage sample which was incorporated with ginger garlic paste found to be well acceptable even in the overall acceptable levels against the control sample. The trend seemed to be highly significant up to 45 days storage period as evidenced by relatively better overall acceptable mean scores in the ginger garlic paste added to the experimental sample. The results on the other hand represented comparatively lower scores at 60 days storage period of both the samples. However, the mean scores found to be within acceptable range indicating the shelf period of chicken sausages for a period of 60 days.

The current research provided an ample evidence for the optimum utilization of spent hen meat with the successful development of chicken sausages as analysed through sensory evaluation scores of the selected panel members. The interesting fact to be highlighted that incorporation of ginger garlic paste found to be

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highly acceptable not only organoleptically but also effectively enhanced the shelf life. The present research served as the base research towards livestock product technology for further development of several such value-added products from the underutilized by product of spent hen meat.

Conclusion

The availability of chicken sausages is not established to the maximum potential in Indian marketing sector. Efforts towards the development of chicken sausages from the spent hen meat might be one of the better channels to popularise value added meat products at an affordable cost. The current findings proved to be successful and fetch adoptability for new combination of various other ingredients. The research can be extensively planned and focus on achieving nutritional and therapeutic benefits in arriving at food as well as nutritional security.

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