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Giriraja Spent Hen Meat Patties Prepared by Using Food Processor

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ABSTRACT

Processing of meat from spent hen to different value added products by comminution and emulsion formation opens the avenues for its economic utilization. By using cheaper equipment like food processor we can produce meat products economically for small scale business. Among the emulsion based products, chicken patties are one of the most acceptable value added comminuted meat products. Hence, the present study was proposed to standardize procedure and the recipe to prepare patties using food processor. The standardization of procedure for the preparation of patties using food processor different running time (2, 3 and 4 minutes) was carried out. The recipe of patties was standardized using different levels of meat (65, 70 and 75%) and oil (7, 10 and 13%). The patties prepared with food processor by 3 minutes running time had significantly ($P<0.05$) higher emulsion stability. The patties prepared with 70 and 75% meat had significantly ($P<0.05$) better physico-chemical and sensory qualities. The patties prepared with 7 and 10% oil showed significantly ($P<0.05$) better physico-chemical qualities and desired sensory scores. Hence, 3 minutes running time, 70% meat and 7% oil were selected for the preparation of spent hen patties using food processor.

Keywords: *Spent hen meat patties, Food processor, Physico-chemical quality, Sensory quality*

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INTRODUCTION

Meat from chicken constitutes a high-quality protein source, densely packed with essential macro and micronutrients. Within a span of 25 years, the egg production has gone up to 70 billion from few millions, leading to production of more number of spent hens (DADF, 2016). Spent hen meat is tough, less juicy and poor in functional properties, because of high collagen content and cross linkages (Mandal et al., 1996). Spent hen meat is not much liked by the consumers when compared to normal broiler meat. Moreover, egg production decreases with age and directly affects the cost of rearing hen (Acostajic, 2017). So the disposal of spent hen is of great concern among the poultry farmers as it fetches very low price. But spent hen meat has nutritional values same as commercial broiler meat (Chueachuaychoo et al., 2011). Use of such meat in the development of snack food will therefore open up the avenues for not only its economic utilization but a readily accessible animal protein source with high acceptability which can improve the profitability of poultry industry.

The process of comminuting was proved to alter the relatively tough and less juicy meat into a product with desirable sensory characteristics. Emulsion based products are very popular among meat consumers and many products are developed using this emulsion technology. Among the emulsion-based products, chicken patties are one of the most acceptable value added comminuted meat products which occupies a predominant position due to its characteristic flavor and texture. Meat patties are prepared from minced or chopped meat, mixed with some binders, vegetable oil and spices. The mixed batter is moulded into suitable shapes having about 10-20 mm height (Padda et al., 1985). Patties are used as filling for burger roll or sandwich. Some people prefer to consume it separately with tomato sauce or chutney. Being a more preferred processed meat item, patties have good market value.

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In the present era, rapid urbanization, industrialization, expansion in domestic food processing units have resulted in proliferation of fast food parlors and entry of few giant fast food chains (Kentucky Fried Chicken, Mc Donald, Pizza Hut, Wimpy etc.) where product cost is high due to their brand name. So there is a need to produce value added ready to eat meat products at a cheaper price. Normally meat emulsion/batter is prepared in bowl chopper for medium to large scale production of emulsion type meat products. As such bowl choppers are not suitable for small scale (household) production of emulsion /batter based meat products. Food processor is compatible, portable and economical for a producer to prepare comminuted meat products in small scale. It is smaller in capacity (1.5 - 2 kg) and cheaper in price (INR 4000) than bowl chopper (10 – 60 kg capacity; INR 5- 20 lakhs price). It can grind, chop and make emulsion using chunked deboned meat and prior use of minced meat is not required on contrary to the bowl chopper. Hence, this study was to explore the possibility of using food processor for making meat patties in small scale and to our knowledge there is no such report available in the literature.

MATERIALS AND METHODS

Chicken meat: Giriraja spent hens of about 60 weeks of age were procured from the Instructional Livestock Farm Complex, Rajiv Gandhi Institute of Veterinary Education and Research (RIVER) and birds were slaughtered following standard hygienic method in the Department of Livestock Products Technology (LPT), RIVER, Puducherry. All the carcasses were deboned manually. Deboned meat was packed in LDPE bags and stored in freezer (Blue star) at -18±10C to prepare patties.

Preparation of spent hen meat patties using food processor

Standardization of running time for emulsion formation using food processor: A total of one kg batter with 70% meat was prepared using food processor. First proteins were extracted by running the machine after adding curing ingredients and chilled

water. Then oil was added and the machine was run at different running time (2, 3 and 4 minutes) to know about the best running time for emulsion formation using food processor. The suitable running time was selected based on emulsion stability.

Standardization of meat level for emulsion formation using food processor: Three combinations of emulsions were prepared, with 65, 70 and 75% meat by keeping all other ingredients same. The best meat level was selected based on the physico-chemical characteristics like cooking yield of patties, pH of emulsion, pH of patties and sensory characteristics.

Standardization of added oil level for emulsion formation using food processor: Three combinations of emulsions were prepared by using 7, 10 and 13% oil in the recipe and keeping all other ingredients same. The best oil level was selected based on the physico-chemical characteristics like cooking yield of patties, pH of emulsion, pH of patties and sensory characteristics.

Physico-chemical analyses: The cooking yield (%) of patties was calculated by adopting the procedure laid down by Murphy et al. (1975). The pH of emulsion and patties was determined by following AOAC (1995) using combined glass electrode of the pH meter. Emulsion stability was determined following the method described by Townsend et al(1975).

Sensory Evaluation: A 10 member semi-trained panel recorded their preference on 8 point hedonic scale (8=extremely desirable, 1=extremely undesirable) (Keeton, 1983) for the attributes viz. appearance, flavor, texture, juiciness and overall palatability. Plain water was provided to each panelist to rinse the mouth in between the samples.

Statistical Analysis: Each experiment was replicated thrice and each parameter was analyzed in duplicate. The data were analyzed using SPSS version 16.0 (SPSS, Chicago, U.S.A). One way analysis of variance (ANOVA) was used to analyze the effect of different levels of oil, meat on patties for physico-chemical quality and sensory attributes. The level of significance was tested using the least significant difference (LSD) test (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSIONS

Effect of running time of the food processor on the quality of emulsion: The emulsion stability with 2, 3 and 4 minutes running time for emulsion formation in food processor were 87.19 ± 0.04, 89.06±0.07 and 86.26±0.07%, respectively. This revealed that there was a significant increase (P<0.05) in emulsion stability from 2 minutes to 3 minutes running time due to increase in fat emulsification, however, further increase of time (4 minutes) resulted in significant decrease (P<0.05) in emulsion stability. Mandal et al (1996) prepared spent hen meat balls by mixing minced meat and fat for two minutes in a Hobart mixer with desirable quality. Since the emulsion stability was significantly (P<0.05) higher for 3 minutes running time compared to 2 and 4 minutes time, it was selected for emulsion formation using food processor.

Effect of different levels of meat on physico-chemical quality of patties: The cooking yield, emulsion stability (table-1) of spent hen meat patties prepared with different levelsof meat ranged between 83.71 to 85.91% and 93.78 to 95.22%, respectively. Patties prepared with 70 and 75% meat levels had significantly (P<0.05) higher cooking yield and emulsion stability than 65% meat in the formulation and there was no significant difference between the patties containing 70 and 75% meat. This might be due to higher protein content in 70 and 75% meat to form stable emulsion. The pH of emulsion and patties prepared with different levels meat ranged between6.10 to 6.11 and 6.23 to 6.24, respectively (table-2). There was no significant (P>0.05) difference in pH of emulsion and patties prepared with 70 and 75% meat. Emulsion and patties prepared with 65% meat had significantly (P<0.05) higher pH than products containing 70 and 75% meat. Mandal et al. (1996) prepared spent hen meat balls by mixing minced meat (71%) and fat in a Hobart mixer with pH of 6.0 - 6.14 and cooking yield of 83.0 - 88.0%. All most similar results on cooking yield, pH and emulsion stability of chicken meat patties with different extenders prepared by hand mixing has been reported by Gawdaman et al. (2009).

Table 1: Effect of different levels of Giriraja spent hen meat on the physico-chemical properties of patties (Mean ± SE)

	Level of Giriraja spent hen meat		
Parameters	**65%**	**70%**	**75%**
Cooking yield (%)	83.71±0.10^{a}	85.62±0.16^{b}	85.91±0.28^{b}
pH of emulsion	6.11±0.00^{b}	6.10±0.00^{a}	6.10±0.00^{a}
pH of patties	6.24±0.00^{b}	6.23±0.00^{a}	6.23±0.00^{a}
Emulsion stability (%)	93.78±0.07^{a}	95.22±0.19^{b}	95.22±0.15^{b}

Means with different superscripts in the same row differ significantly (P<0.05)

Table 2: Effect of different levels of Giriraja spent hen meat on the sensory quality of patties (Mean ± SE)

	Level of Giriraja spent hen meat		
Parameters	**65%**	**70%**	**75%**
Appearance	7.52±0.11^{a}	7.90±0.30^{b}	7.95±0.21^{b}
Flavor	7.29±0.12^{a}	7.86±0.07^{b}	7.76±0.09^{b}
Texture	7.52±0.13	7.67±0.10	7.76±0.09
Juiciness	7.14±0.10^{a}	7.81±0.08^{b}	7.76±0.09^{b}
Acceptability	7.14±0.10^{a}	7.81±0.08^{b}	7.81±0.08^{b}

Means with different superscripts in the same row differ significantly (P<0.05)

Effect of different levels of oil on physico-chemical quality of patties: The cooking yield and emulsion stability (table-3) of the spent hen meat patties prepared with different levels of oil ranged between 83.51 to 85.97%; 93.57 to 95.27%, respectively. The patties prepared with 7 and 10% oil had significantly (P<0.05) higher cooking yield and emulsion stability (%) than 13% oil level and there was no significant difference between patties containing 7 and 10% oil. It is revealed that 7 and 10% oil addition was found to be optimum to make stable emulsion. The pH of emulsion and patties prepared with different levels of oil ranged between 6.11 to 6.12 and 6.23 to 6.25, respectively (table-4). There was no significant (P>0.05) difference in pH of emulsion and patties prepared with 7 and 10% oil. Patties added with13% oil had significantly higher (P<0.05) pH than 7 and 10% oil levels. Mandal et al. (1996) reported that spent hen meat balls containing minced meat (71%) and fat (5%) in a Hobart mixer had a pH of 6.0 – 6.14 and cooking yield of 83.0 – 88.0%.Similar findings were reported by Mohammad et al. (2009) in low fat buffalo meat patties with significantly (P<0.05) higher emulsion stability and cooking yield than high fat buffalo meat patties.

Table 3: Effect of different levels of vegetable oil on physico-chemical properties of Giriraja spent hen meat patties (Mean ± SE)

	Level of oil		
Parameters	**7%**	**10%**	**13%**
Cooking yield (%)	85.47±0.16^{b}	85.97±0.15^{b}	83.51±0.51^{a}
pH of emulsion	6.11±0.00^{a}	6.11±0.00^{a}	6.12±0.11^{b}
pH of patties	6.23±0.00^{a}	6.23±0.00^{a}	6.25±0.00^{b}
Emulsion stability (%)	95±0.13^{b}	95.27±0.19^{b}	93.57±0.22^{a}

Means with different superscripts in the same row differ significantly (P<0.05)

Effect of different levels of oil on sensory quality of patties: The scores for appearance, flavor, texture, juiciness and overall palatability of the spent hen meat patties prepared with different levels of oil (table-4) were desirable with the numerical scores ranging between 7.71 to 7.95; 7.81 to 7.95; 7.76 to 8.00; 7.67 to 8.00 and 7.76 to 8.00, respectively. No significant differences were found in appearance, flavor scores of patties with different levels of oil. The patties prepared with 10 and 13% oil had significantly (p<0.05) higher texture, juiciness and overall acceptability scores than patties prepared with 7% oil level. Mandal et al. (1996) prepared spent hen meat balls by mixing minced meat (71%) and fat (5%) in a Hobart mixer with desirable sensory quality.

Since patties prepared with three levels of oil had desirable sensory scores and there was no significant (P>0.05) difference between 7 and 10% oil level patties in cooking yield, emulsion stability, pH of emulsion and patties, therefore, 7% oil was selected over 10% oil to reduce the fat level in patties. Pathak et al. (2009) reported sensory attributes scores of chicken patties containing 9% vegetable oil using bowl chopper in the range of 6.95 to 7.04. Kumar and Sharma (2005) also reported slightly lower sensory scores for chicken patties formulated with 9% vegetable oil prepared by using bowl chopper than scores recorded in the present study.

Table 4: Effect of different levels of vegetable oil on the sensory quality of Giriraja spent hen meat patties (Mean ± SE)

Parameters	**7% oil**	**10% oil**	**13% oil**
Appearance	7.71±0.10	7.95±0.04	7.81±0.08
Flavor	7.81±0.08	7.95±0.04	7.95±95
Texture	7.76±0.09^{a}	7.95±0.21^{b}	8.00±0.00^{b}
Juiciness	7.67±0.10^{a}	8.00±0.00^{b}	8.00±0.00^{b}
Acceptability	7.76±0.09^{a}	8.00±0.00^{b}	7.95±0.21^{b}

Means with different superscripts in the same row differ significantly (P<0.05)

Standardized recipe and procedure for the preparation of spent hen meat patties using food processor: Based on the results (tables 1 - 4) shown and discussion thereof, the standardized recipe for preparation of spent hen meat patties using food processor has been proposed and is presented in table-5 and the procedure for the same is summarized here. Frozen meat was chopped into small pieces after thawing by keeping in the refrigerator overnight and meat was taken in food processer (Philips HR7627), run at high speed to extract protein for 3 minutes after addition of salt, sugar, phosphate and chilled water. Then vegetable oil was added and the food processor was run at high speed for 3 minutes for emulsion formation and then condiments, spices and binder was added in sequence to the emulsion and the machine was run for 30 seconds for uniform mixing and this final batter was used for the preparation of patties. The patties were cooked in electrical grilling oven at 1600 C for 40 minutes.

Table 5: Standardized recipe to prepare patties

Ingredients	**Quantity (%)**
Meat	70
Maida	3
Oil	7
Wet condiments	3
Dry spice mix	1.6
Salt	1.5
Sugar	0.5
Phosphate	0.4
Ice-water	13
Total	100

CONCLUSION

The recipe and procedure for preparation of good quality spent hen meat patties using food processor was standardized. Based on physico-chemical analysis (cooking yield, pH, and emulsion stability) and sensory evaluation 3 minutes running time, 70% meat and 7% oil were selected for the preparation of spent hen meat patties using food processor.

COMPETING INTERESTS: The authors have no known competing interests either financial or personal between themselves and others that might bias the work.

ETHICS STATEMENT: Not applicable.

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