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Quality and acceptability of emulsion and restructured meat rolls from turkey *(Meleagris gallopavo*) meat

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Abstract
A study was conducted to assess the quality and acceptability of emulsion and restructured meat rolls from turkey meat. Significantly (P<0.05) higher pH, product yield, moisture retention, water holding capacity, drip loss and moisture values were values observed in emulsion turkey meat rolls as compared to restructured turkey meat rolls. However, product shrinkage value was significantly (P<0.05) higher in restructured turkey meat rolls then emulsion turkey meat rolls. No significant differences were noticed in protein and fat contents of turkey meat emulsion and restructured turkey meat rolls. Sensory attributes scores for appearance and colour, flavour, juiciness, texture, binding and overall acceptability scores were significantly (P<0.05) higher in emulsion turkey meat rolls as compared to restructured turkey meat rolls. Turkey meat rolls prepared with emulsion had better physico – chemical characteristics and highly acceptable then restructured turkey meat rolls.

Keywords: Acceptability, batter, emulsion, meat, quality, rolls, turkey

Introduction
Turkey (*Meleagris gallopavo*) meat has tremendous commercial viability because of its low fat and cholesterol content in comparison to red meat and other poultry meat (Anna Anandh, 2018) [1]. Consumption of turkey meat is gaining popular among people because of its desirable sensory attributes like taste and texture, its moderate levels of total lipids, lesser saturated fatty acids and cholesterol. (Kumar *et al.*, 2011; Reddy *et al.*, 2018) [2, 3]. Heavier size of turkey carcass make its effective retail sale is a difficult task. Hence, attempts should be made for obtaining better returns by the way of adopting suitable methods for profitable disposal of heavier size turkey carcasses. Development of further processed products from the turkey meat would be the most profitable way of utilization turkey meat from heavier size turkey carcasses which could enhance the consumer acceptability. The mincing of meat has profound effect on the quality attributes of the meat products because meat homogenate or fine chopped meat contains high levels of extracted myofibrillar proteins that will act as effective binder for water, fat and meat particles in cooked meat products (Singh *et al.*, 2014) [4]. Meat emulsion is commonly referred to as a 'meat batter' having powerful binding properties in a meat system (Singh *et al.*, 2015) [5]. Restructuring technology can be used to produce value added products from low quality raw materials of meat industry, which are good sources of protein but are often underutilized. In this perspective, a study was undertaken to develop and evaluate the acceptability of turkey meat rolls by using turkey meat emulsion and restructuring of turkey meat.

Materials and Methods
Turkey meat
Beltsville Small White turkeys of about 26 weeks of age were purchased from Instructional Livestock Farm, Veterinary College and Research Institute, Orathanadu, Thanjavur, Tamil Nadu. The birds were slaughtered following standard procedure, dressed hygienically and manually deboned. The deboned turkey meat was cut into small chunks and frozen for 1 - 2 hr to ensure easy mincing. The turkey meat chunks were used for preparation of emulsion and restructured turkey meat batter.

Product formulation and treatments
The turkey meat roll formulation consisted of 100% turkey meat emulsion / restructured turkey meat batter, sodium tri-poly phosphate (0.5%), salt (2.0%), refined vegetable oil (5.0%), refined wheat flour (4.0%), condiments mix (6.0% - onion, garlic and ginger in the ratio of 3:2:1), spice mix (3.5%) and ice flakes (10.0%).

Preparation of turkey meat emulsion
The turkey meat was manually cut into hen meat chunks and then minced through mincer (Mado, Germany) using 5 mm plate. For emulsion preparation salt was added to the minced turkey meat. The materials were chopped for about 2 min with a Bowl chopper (Scharffen, Germany). After addition of ice flakes it was chopped again for 1–2 min. Refined vegetable oil was added slowly and chopping was continued till the oil was completely dispersed in the batter and chopping further continued for 2 min. Subsequently, spice, condiments mix and ice flakes were added and the contents were mixed well for 3 min. At the final step, refined wheat flour was added and the contents were mixed well for 3 min to get a homogenous mixture to give a fine viscous emulsion.

Preparation restructured turkey meat batter
The turkey meat was manually cut into meat chunks and then coarse ground in a meat mincer (Mado, Germany) with a kidney plate (0.95 cm diameter). The minced meat was placed in a mixer with salt, sodium tri-polyphosphate and mixed at a speed of 200 rpm for 2 min. Subsequently, refined vegetable oil spices, condiments mix, ice flakes, refined wheat flour were added and the contents were mixed well for 3 min to get a homogenous mixture.

Preparation of emulsion and restructured turkey meat rolls
Emulsion / restructured turkey meat batter was stuffed in to cellulose casing of 100 mm diameter (Viskase, USA), using a Hydraulic Stuffer (Dadaux, France). Stuffed meat rolls were kept in refrigerator (4 ± 2 ºC) for 1 hr to ensure proper setting. The raw rolls were cooked in pre heated water to an internal temperature of 82 ± 2 ºC and maintained at this temperature for about 10 min. The internal temperature was recorded using probe thermometer. After cooking, the cooked turkey meat rolls were allowed to cool down, packaged in low-density polyethylene pouches (LDPE) and chilled in refrigerator for 12 hr. Then the cooked turkey meat rolls were sliced using meat slicer and were analyzed for various physico – chemical characteristics and sensory quality attributes.

Physico – chemical analysis
pH
The pH of the cooked sample was determined by homogenizing 10 gm of sample with 50 ml distilled water with the help tissue homogenizer for 1 min. The pH of the suspension was recorded by immersing the combined glass electrode of digital pH meter.

Product yield
The weight of emulsion and restructured turkey meat rolls were recorded before and after cooking and the product yield was calculated (product yield = weight of cooked roll / weight of raw roll × 100) and expressed as percentage.

Diameter shrinkage
The diameter of cooked emulsion and restructured turkey meat rolls were measured before and after cooking with a digital vernier caliper at 3 random locations. Reduction in diameter shrinkage was expressed in percentage as described by Eyas *et al.* (2007) [6].

Moisture retention
Moisture (%) of the cooked sample was used to calculate moisture retention (%) which represent the amount of moisture retained in the cooked per 100 gm of the raw sample. The value was calculated by using the formula: Moisture retention (%) = (% cooking yield ×% moisture in cooked product) / 100 and as described by El-Magoli *et al.* (1996) [7].

Water holding capacity
Water holding capacity (%) was calculated by mixing 20 gm of sample with 30 ml of 0.6 M NaOH in centrifuge tube and was stirred for 1 min. The tube was then kept at refrigerated temperature (4 ± 1 °C) for 15 min, stirred again and centrifuged at 500 rpm for 10 min. The supernatant was measured and amount of water retained by samples was expressed as water holding capacity in percentage as described by Wardlaw *et al.* (1973) [8].

Drip loss
Drip loss was determined by reweighing blotted slices of cooked emulsion and restructured turkey meat rolls following one week storage at 4±1 ºC (drip loss = weight loss / initial weight × 100).

Proximate composition
The moisture, protein and fat contents of emulsion and restructured turkey meat rolls were determined by using hot air oven, Kjeldahl's assembly and Soxhlet ether extraction apparatus respectively (AOAC 1995) [9].

Sensory evaluation
Slices of cooked emulsion and restructured turkey meat rolls were served to an experienced panel consisting of faculty and students to determine sensory characteristics on 9 - point descriptive scale as suggested by Keeton (1983) [10] where in 1 is extremely undesirable and 9 is extremely desirable.

Statistical analysis
The data generated from four trials were analyzed by following standard procedures (Snedecor and Cochran, 1989) [11] for analysis of variance and Duncan's multiple range test for comparing the means and to determine the effect of treatment ($P<0.05$).

Results and Discussion
Physico–chemical characteristics
The results of physico- chemical characteristics of emulsion and restructured turkey meat rolls are presented in Table 1. The mean pH of turkey meat emulsion rolls were significantly ($P<0.05$) higher as compared to the restructured turkey meat rolls. This is in agreement with the results of Sen and Karim (2003) [12] in restructured mutton steaks. The pH of the product was higher as the meat chunk size decreased. It may be attributed to protein denaturation during cooking. In general, pH changes in food with protein substances are due to thermal denaturation of proteins (Shin *et al.*, 2017) [13].

Similar observations were also reported by Singh *et al.* (2015) [5] in spent hen meat cutlets. The product yield of turkey meat emulsion rolls and restructured turkey meat rolls differ significantly ($P<0.05$). Significantly ($P<0.05$) higher product yield was observed in turkey meat emulsion rolls then restructured turkey meat rolls. The low cooking yield of restructured turkey meat rolls as compared to emulsion turkey meat rolls might be due to its higher particle size and low level of extraction of proteins (Anjaneyulu *et al*., 1990) [14]. Xargayo and Lagares (1992) [15] reported that increased tissue disruption through mincing allows increased protein extractability which results in greater solubilization of muscle proteins. It might be due to an increased product yield in emulsion turkey meat rolls. Higher product yield of emulsion turkey meat rolls as compared to restructured turkey meat rolls might be due to the effect of coarse grinding and fine chopping of meat that could increases the water binding which might be the reason for increased product yield emulsion turkey meat rolls. Eyas *et al*. (2007) [6] and Singh *et al.* (2015) [5] also reported higher product yield in buffalo meat cutlets and spent hen meat cutlets with higher percentage of emulsion in the products. Significantly ($P<0.05$) lower product shrinkage value was observed in emulsion turkey meat rolls then restructured turkey meat rolls. This is in agreement with the results of Singh *et al.* (2015) [5] in spent hen meat cutlets where in they reported lower product shrinkage value in meat emulsion cutlets as compared to control. Eyas *et al.* (2007) [6] also reported that use of emulsion significantly reduced the shrinkage in buffalo meat cutlets.

Table 1: Physico-chemical characteristics of emulsion and restructured turkey meat rolls

Physico-chemical parameters*	Turkey meat emulsion rolls	Restructured turkey meat rolls
pH	6.43 ± 0.15^a	6.28 ± 0.17^b
Product yield (%)	93.09 ± 0.13^a	90.41 ± 0.14^b
Product shrinkage (%)	1.60 ± 0.22^a	3.27 ± 0.20^b
Moisture retention (%)	61.05 ± 0.10^a	56.35 ± 0.12^b
Water Holding Capacity (%)	46.69 ± 0.14^a	40.97 ± 0.13^b
Drip loss (%)	3.82 ± 0.10^a	1.20 ± 0.12^b
Moisture (%)	65.58 ± 0.15^a	62.32 ± 0.17^b
Protein (%)	20.96 ± 0.16	20.18 ± 0.18
Fat (%)	10.97 ± 0.15	10.44 ± 0.13

*Number of observations = 4.
Means bearing same superscripts (lowercase letters) row-wise do not differ significantly ($P<0.05$).

Moisture retention and water holding capacity values were significantly ($P<0.05$) higher for turkey meat emulsion rolls as compared to restructured turkey meat rolls. The present findings are in agreement with the findings of Beuschel *et al*. (1992) [16] who reported that increases water binding capacity due to increased level of mincing. In meat systems high pH favour water binding ability and emulsion stability (Young *et al.*, 2005) [17]. The mean drip loss of restructured turkey meat rolls were significantly ($P<0.05$) lower as compared to the emulsion turkey meat rolls. Drip loss is a cytoplasmic fluid oozing out from meat particles. The steaks restructured from smaller meat pieces generally have higher purge compared with those restructured from relatively larger meat pieces. This might be due to more cellular disruption in the smaller meat pieces and consequently more cytoplasmic fluid purging upon thawing (Raharjo *et al*., 1995) [18]. Moisture content of turkey meat emulsion rolls and restructured turkey meat rolls differ significantly ($P<0.05$). No significant differences were observed in protein and fat contents of emulsion and restructured turkey meat rolls. Eyas *et al.* 2007; Singh *et al.*, 2015) [6, 5] also reported that incorporation of meat emulsion significantly increased the moisture content of buffalo meat cutlets and spent hen meat cutlets as compared to control.

Sensory characteristics

The results of sensory attributes of emulsion and restructured turkey meat rolls are presented in Table 2. The sensory attributes scores for appearance and colour, flavour, juiciness, texture, binding and overall acceptability were significantly ($P<0.05$) higher for emulsion turkey meat rolls as compared to restructured turkey meat rolls. The rolls prepared by emulsion were assessed as highly acceptable, whereas the rolls prepared by restructuring moderately to very acceptable. The lower sensory scores for restructured turkey meat rolls as compared to emulsion turkey meat rolls are due to lower physico – chemical, textural and binding properties. It is documented that emulsion improves the cohesion of particles therefore higher texture and binding scores than control products without emulsion (Corriera and Mittal, 1991; Singh *et al.*, 2015) [19, 5]. Incorporation of meat emulsion significantly improved overall palatability of cooked meat products (Eyas *et al.* 2007; Singh *et al.*, 2015) [6, 5].

Table 2: Sensory characteristics of emulsion and restructured turkey meat rolls

Sensory attributes***	Turkey meat emulsion rolls	Restructured turkey meat rolls
Appearance	8.5± 0.10^a	8.0± 0.12^b
Flavour	8.0± 0.10^a	7.5± 0.10^b
Juiciness	8.5± 0.10^a	7.5± 0.12^b
Texture	8.5± 0.10^a	7.0± 0.10^b
Binding	8.5± 0.12^a	7.0± 0.10^b
Overall acceptability	8.4± 0.11^a	7.4± 0.11^b

***Number of observations = 32.
Sensory attributes were evaluated on a 9-point descriptive scale (wherein, 1 = extremely undesirable; 9 = extremely desirable).
Means bearing same superscripts (lowercase letters) row-wise do not differ significantly ($P<0.05$).

Conclusion

The turkey meat rolls prepared by using emulsion had significantly better physico - chemical characteristics as compared to restructured turkey meat. Emulsion turkey meat rolls had significantly higher sensory characteristics than restructured turkey meat rolls. Therefore, turkey meat can be successfully used for value addition into preparation of comminuted meat products both by emulsion and restructuring techniques with emulsion procedure scoring higher than restructuring procedure. Thus, it can be concluded that good quality turkey meat rolls can be prepared after emulsification of turkey meat.

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References

1. Anna Anandh M. Quality and acceptability of turkey (*Meleagris gallopavo*) meat cutlets. The Asian Journal of Animal Science. 2018; 13:54-58.
2. Kumar S, Anjaneyulu ASR, Majumdar S, Gadekar YP, Patel A, Singh RP. Physico - chemical and functional parameters of Black turkey, Beltsville white turkey and Broiler spent hen meat. Indian Journal of Poultry Science. 2011; 46(3):365-369.
3. Reddy MNK, Kumar MS, Reddy GVB, Krishnaiah N, Reddy NA, Rao K. Quality evaluation of turkey meat sausages incorporated with ground carrot. The Pharma Innovation Journal. 2018; 7(4):773-777.
4. Singh PK, Kumar S, Kumar P, Bhat ZF. Effect of mincing on the quality characteristics of chevon cutlets. Journal of Animal Research. 2014; 4(2):193-200.
5. Singh T, Chatli MK, Malav OP, Kumar P, Metha N. Quality characteristics of spent hen meat cutlets incorporated with meat emulsion as binder. Indian Journal of Poultry Science. 2015; 50(2):175-179.
6. Eyas AM, Anjaneyulu ASR, Sathu T, Thomas R, Kondaiah N. Effect of different binders on the quality of enrobed buffalo meat cutlets and their shelf life at refrigeration storage (4 ± 1 °C). Meat Science. 2007; 75:451-459.
7. El-Magoli SB, Laroia S, Hansen PMT. Flavor and texture characteristics of low fat ground beef patties formulated with whey protein concentrate. Meat Science, 1996; 42:179-193.
8. Wardlaw FB, McCaskill LH, Acton JC. Effect of post-mortem muscle changes of poultry meat loaf properties. Journal Food Science, 1973; 38: 421-424.
9. AOAC. Official methods of Analysis (16th Edn.). Association of Official Analytical Chemists. Washington, DC, 1995.
10. Keeton JC. Effect of fat and Nacl / phosphate levels on the chemical and sensory properties of pork patties. Journal of Food Science. 1983; 48:878-881.
11. Snedecor GW, Cochran WG. Statistical methods. 8th Edn. Oxford and IBH Pub. Co, Calcutta, 1989.
12. Sen AR, Karim SA. Effect of meat particle size on quality attributes of restructured mutton steaks. Journal of Food Science and Technology. 2003; 40:423-425.
13. Shin HB, Kim HY, Chun JY. Quality characteristics of emulsion-type chicken sausages added different level of buckwheat powder. Korean Journal of Poultry Science, 2017; 44:135-141.
14. Anjaneyulu ASR, Sharma N, Kondaiah N. Evaluation of salt, polyphosphates and their blend sat different levels on physico-chemical properties of buffalo meat patties. Meat Science. 1989; 25:293-306.
15. Xargayo M, Lagares J. Computerized massaging of meat. Fleishwirtschaft, 1992; 4: 2.
16. Beuschel BC, Patridge JA, Smith DM. Insolubilized whey protein concentrate and /or chicken salt-soluble protein gel properties. Journal of Food Science. 1992; 57:852-855.
17. Young OA, Zhang SX, Farouk MM, Podmore C. Effects of pH adjustment with phosphates on attributes and functionalities of normal and high pH beef. Meat Science. 2005; 70:133-139.
18. Raharjo S, Dexter DR, Worfel RC, Sofos JN, Solomon MB, Shultz GW. Quality characteristics of restructured beef steaks manufactured by various techniques. Journal of Food Science. 1995; 60:68-71.
19. Corriera LR, Mittal GS. Kinetics of hydration properties of meat emulsions containing various fillers during smoke house cooking. Meat Science. 1991; 29:335-51.