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Quality and acceptability of chicken meat cutlets incorporated with chicken meat emulsion

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Chicken meat cutlets with 25, 50 and 75 per cent levels of chicken meat emulsion were prepared and their quality evaluated. Chicken meat cutlets prepared with 100 per cent minced chicken meat were used as control. Significant ($P<0.05$) increase was observed in chicken meat emulsion incorporated chicken meat cutlets for breading pickup, product yield and moisture retention. pH, diameter shrinkage and water holding capacity values were differed significant ($P< 0.05$) from control and the values non significantly increased with increasing level of chicken meat emulsion in the chicken meat cutlet formulation. Moisture, protein and fat content values between control and chicken meat emulsion incorporated chicken meat cutlets did not differed significantly between them. Sensory evaluation scores for appearance and colour, flavour, texture, juiciness, binding and overall acceptability were highest for 50 per cent chicken meat emulsion incorporated chicken meat cutlets followed by 75 per cent and 25 per cent chicken meat emulsion incorporated chicken meat cutlets. Thus, it can be concluded that 50 per cent chicken meat emulsion can be effectively used for preparation of chicken meat cutlets of an acceptable quality without affecting quality and acceptability.

Key Words : Chicken, Meat, Emulsion, Cutlets, Quality, Acceptability

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INTRODUCTION

The demand for ready to eat and or ready to cook chicken meat products are gradually increasing because of their convenience. Cutlets are simple and a cost effective means of converting meat into value added convenience products. Meat cutlets are flat croquettes of minced meat and other ingredients like flours, pulses, shredded potato, condiments and spices and are often coated with bread crumbs (Bhat *et al.,* 2015). Meat homogenate / fine chopped meat are prepared by mixing or chopping with salt and phosphate. Fine chopped meat contains high levels of extracted myofibrillar proteins that will act as effective binder of water, fat and meat particles. Increasing the amount of fine chopped meat (12-18% level) decreased the tensile strength of the product. Hence, it may be postulated that only a certain amount of extracted myofibrillar protein is needed to produce a cohesive bond between meat pieces and any additional extracted proteins had no additional effect (Trout and Schmidt, 1984). McGowan (1970) found that the amount of homogenate needed in chicken rolls to produce a satisfactory bind was 12-15 per cent, while Terlizzi *et al*. (1980) found that 15-20 per cent homogenate gave maximum binding strength in a restructured ham rolls. It appears that when muscle fibres and extracted proteins form an intermediate continum between adjacent meat

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surfaces, maximum binding occurs (Trout and Schmidt, 1984). The works of Huffman (1980) and Terlizzi *et al*. (1980) support this concept. They found that thin slices of muscle added to restructured meat products combined with the extracted meat proteins to form a strong cohesive bound. Hence, a study was undertaken to develop and evaluate the acceptability of chicken meat cutlets incorporated with different levels of chicken meat emulsion.

METHODOLOGY

Chicken meat:

Deboned broiler chicken meat was purchased from the local chicken meat stall. It was cut into small chunks and frozen for 1-2 h to ensure easy mincing. The chicken meat chunks were minced through the meat mincer by using a kidney plate (0.95 cm diameter). The minced chicken meat was used in the preparation of chicken meat cutlets.

Chicken meat emulsion:

Chicken meat emulsion was prepared using a bowl chopper with the boneless broiler chicken meat (77.5%), refined sunflower oil (10%) ice fakes (10%), salt (2%) and sodium tri polyphosphates (0.5%). The salt level used in the standardized formulation of the chicken meat cutlets was changed accordingly to compensate for salt added along with emulsion.

Product formulation:

The basic control chicken meat cutlet consisted of 100 per cent minced chicken meat. The minced chicken meat replaced at 25, 50 and 75 per cent of the raw chicken meat emulsion in the basic control formulation. Each formulation also contained 2.0 per cent salt, 1.5 per cent spice mix (aniseed – 10, black pepper – 10, caraway seed – 10, capsicum – 8, cardamam – 5, cinnamon – 4, clove – 1, coriander – 20, cumin seed – 22, turmeric 10 in percentage / weight), 3.0 per cent refined vegetable oil, 3.5 per cent refined wheat flour, 10 per cent chopped condiments mix (onion, garlic and ginger in the ratio of 10:2:1) and 10 per cent cooked shredded potato. Other ingredients were used in the cutlet preparation are whole liquid egg for coating, breadcrumb powder for enrobing and vegetable oil for deep fat frying as required (Table A).

Product preparation:

The broiler chicken meat was manually cut into hen meat chunks and then coarse ground in a meat mincer with a kidney plate (0.95 cm diameter). The ground broiler chicken meat and raw chicken meat emulsion was then mixed with salt (50 % of the total salt used) in a blender at medium speed for 2 min. After addition of vegetable oil it was blended again until a tacky exudate was formed. Condiments were fried along with salt (remaining 50 % of the salt used) and spice mix. The fried condiments, cooked shredded potato and binders were blended in a blender for 2 min. About 50 g of blended batter was moulded into oval shaped cutlets using an aluminium mould and were kept chilled until further battering and breading. Whole liquid egg was whipped in a wide mouthed container, chilled and the cutlets were dipped until a uniform coating was formed. The battered cutlets were rolled over the breadcrumb powder until a uniform coating of breading material was formed on the surface. Cutlets were deep fat fried in refined vegetable oil until a golden brown colour developed on the surface and a product core temperature of 80±2°C was attained. The cutlets were aerobically packed in LDPE bags and were

Table A: Formulation of chicken meat cutlets incorporated with different levels of chicken meat emulsion

Ingredients	Level of raw chicken meat emulsion (%)			
	0	25	50	75
Chicken meat	70	52.5	35.0	17.5
Chicken meat emulsion	-	17.5	35.0	52.5
Common salt	2.5	2.5	2.5	2.5
Spice mix	1.5	1.5	1.5	1.5
Vegetable oil	3.0	3.0	3.0	3.0
Refined wheat flour	3.5	3.5	3.5	3.5
Condiments mix (onion, garlic and ginger in the ratio of 10:2:1)	10.0	10.0	10.0	10.0
Cooked shredded potato	10.0	10.0	10.0	10.0

used for analysis of various physico–chemical characteristics and sensory parameters.

Physico – chemical analysis:

The pH was determined by using a digital pH meter (Century Instruments Ltd., Mumbai, India). according to the procedure explained by Trout *et al.* (1992) by dipping the combined glass electrode of a digital pH meter in the slurry of cutlets with distilled water. Percentage of breading pickup was calculated (Hsia *et al.*, 1992) using the following formula:

$$\text{Breading pickup} = \frac{\text{Weight of cutlets after breading} - \text{Weight before breading}}{\text{Weight of cutlets before breading}} \times 100$$

Shrinkage of the products was calculated using the formula given by El-Magoli *et al.* (1996) with suitable modification, *i.e.*, the diameter of the fried cutlets was represented by the average length and breadth of the oval shaped cutlets. Product yield was expressed as a percentage after recording the weights of raw and fried cutlets. Moisture (%) of the cooked sample was used to calculate moisture retention (%) which represent the amount of moisture retained in the cooked per 100 g of the raw sample. The value was calculated by using the formula:

$$\text{Moisture retention (\%)} = \frac{\text{\% cooking yield x \% moisture in cooked product}}{100}$$

And as described by El-Magoli *et al.* (1996). Water holding capacity (%) was calculated by mixing 20 g of meat batter 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 WHC in percentage. Moisture (Oven drying), protein (Kjeldahal) and fat (Soxhlet ether extract) contents of the products were determined as per AOAC (1995).

Sensory evaluation:

The control and chicken meat emulsion incorporated cutlets were served to an experienced panel. The sensory attributes appearance, flavour, juiciness, texture, binding and overall acceptability was evaluated on descriptive scale as suggested by Keeton (1983). The sensory score of 9 was extremely desirable, whereas a score of 1 was extremely undesirable.

Statistical analysis:

The experiment was repeated 4 times. The data generated from each experiment were analyzed statistically by following standard procedures (Snedecor and Cochran, 1989) for comparing the means and to determine the effect of treatments.

OBSERVATIONS AND ASSESSMENT

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Physico – chemical characteristics of chicken meat cutlzets with different levels of chicken meat emulsion:

Results of physico – chemical parameters of chicken meat cutlets incorporated different levels of chicken meat emulsion are presented in Table 1. The pH values of

Table 1: Effect of added chicken meat emulsion on physico - chemical characteristics of chicken meat cutlets

Physico – chemical charaterisctics (n = 4)	Levels of chicken meat emulsion (%)			
	0	25	50	75
pH	6.14 ± 0.12^{a}	6.32 ± 0.15^{b}	6.36 ± 0.14^{b}	6.40 ± 0.14^{b}
Breading pick up (%)	11.12 ± 0.10^{a}	12.63 ± 0.15^{b}	13.72 ± 0.14^{c}	14.86 ± 0.12^{d}
Product yield (%)	91.02 ± 0.18^{a}	95.17 ± 0.14^{b}	97.10 + 0.15^{c}	99.12± 0.12^{d}
Diameter shrinkage (%)	3.22+ 0.10^{a}	2.48 ± 0.12^{b}	2.52 ± 0.10^{b}	2.58 ± 0.10^{b}
Moisture retention (%)	57.70 ± 0.12^{a}	58.32 ± 0.14^{b}	59.90 ± 0.12^{c}	62.28 ± 0.10^{d}
WHC (%)	38.24 ± 0.10^{a}	39.52 ± 0.12^{b}	39.75 ± 0.13^{b}	39.87 ± 0.11^{b}
Moisture (%)	60.10 ± 0.12	61.28 ± 0.10	61.68 ± 0.12	61.90 ± 0.10
Protein (%)	22.05 ± 0.17	22.12 ± 0.15	22.18 ± 0.12	22.20 ± 0.15
Fat (%)	10.10. ± 0.15	10.42 ± 0.12	10.67 ± 0.14	10.82 ± 0.16

Number of observations: = 4 Means bearing same superscripts row-wise do not differ significantly (P<0.05)

chicken meat cutlets increased with increasing levels of chicken meat emulsion. The pH value of chicken meat emulsion incorporated cutlets were significantly (P<0.05) higher as compared to control. However, no significant difference was observed between chicken meat emulsion incorporated chicken meat cutlets. Tsai *et al*. (1998) also observed similar pH changes in restructured beef. It might be due to higher protein contents of raw chicken meat emulsion incorporated cutlets and protein denaturation during cooking. The present results are in agreement with reports of Sofos *et al*. (1979) and Buchanan (1986). The product yield of chicken meat cutlet increased with increasing levels of chicken meat emulsion. The product yield of 75 per cent chicken meat emulsion incorporated chicken meat cutlets was significantly (P<0.05) higher as compared to other chicken meat emulsion incorporated cutlets and control. Among chicken meat emulsion cutlets, significant difference (P<0.05) were observed between 25, 50 and 75 per cent chicken meat emulsion incorporated chicken meat cutlets. Low product yield of control cutlet might be due to low water holding capacity, binding properties and low levels of extraction of proteins (Kondaiah *et al*., 1992). Minced skeletal meat increased protein availability which results in greater solubilization of muscle proteins during emulsification process and thus leads to increased product yield in chicken meat emulsion incorporated chicken meat cutlets as compared to control. Beuschel *et al*. (1992) also reported increased product yield in emulsion incorporated meat product might be due to improved water binding. The mean diameter shrinkage values were significantly (P< 0.05) lower for 75 per cent chicken meat emulsion incorporated chicken meat cutlets as compared to control. However, no significant difference was found among 25, 50 and 75 per cent chicken meat emulsion incorporated chicken meat cutlets. The level of extraction of myofibrillar proteins for binding was lower in control chicken meat cutlets which results in expulsion of water and higher shrinkage. The results observed in our present study are comparable with those reported by Chen and Trout (1991).

Moisture retention values were increased with increasing levels chicken meat emulsion in the cutlets. The moisture retention value was significantly (P<0.05) higher for 75 per cent chicken meat emulsion incorporated chicken meat cutlets followed by 50, 25 per cent chicken meat emulsion incorporated chicken meat cutlets and control chicken meat cutlets. Coagulation and thermal shrinkage of coarse ground meat might have contributed to decreased moisture retention value in control chicken meat cutlets as compared to chicken meat emulsion incorporated cutlets. Trout and Schmidt (1984) also demonstrated the ability of meat to absorb water in the raw state, but it was not retained when the meat was cooked. The WHC values of chicken meat cutlets increased with increasing levels of chicken meat emulsion. No significant difference was observed 75, 50 and 25 per cent chicken meat incorporated cutlets and were significantly (P<0.05) differed from control. Cutlets prepared from meat emulsion had high water holding capacity value as compared to those prepared from ground chicken meat. Decreased water holding capacity values in control chicken meat cutlets were primarily due to moisture loss (Raharjo *et al.*, 1995).

Moisture content of chicken meat emulsion incorporated cutlets and control chicken meat cutlets differ significantly (P<0.05). Among chicken meat emulsion cutlets, no significant difference was observed between 25, 50 and 75 per cent chicken meat emulsion incorporated chicken meat cutlets. No significant difference was noticed in protein and fat content control

Table 2 : Effect of added chicken meat emulsion on sensory characteristics of chicken meat cutlets

Sensory characteristics**	Levels of chicken meat emulsion (%)			
	0	25	50	75
Appearance and colour	7.4 ± 0.14^{a}	7.8 ± 0.12^{a}	8.5 ± 0.14^{a}	8.2 ± 0.14^{b}
Flavour	7.0 ± 0.14^{a}	7.2 ± 0.14^{a}	8.2 ± 0.16^{b}	8.0 ± 0.15^{b}
Juiciness	7.0 ± 0.12^{a}	8.0 ± 0.14^{a}	8.5 ± 0.15^{b}	8.0 ± 0.12^{b}
Texture	7.0 ± 0.15^{a}	7.5 ± 0.14^{a}	8.5 ± 0.14^{b}	8.0 ± 0.12^{b}
Binding	7.0 ± 0.12^{a}	7.5 ± 0.14^{a}	8.2 ± 0.12^{b}	8.0 ± 0.12^{b}
Overall acceptability	7.0 ± 0.12^{a}	7.6 ± 0.14^{a}	8.3 ± 0.14^{b}	8.1 ± 0.12^{b}

Number of observations: = 28

Means bearing same superscripts row-wise do not differ significantly (P<0.05).

**Sensory attributes of chicken meat cutlets were evaluated on a 9 – point descriptive scale (wherein 1 = Extremely undesirable; 8 = Extremely desirable)

and chicken meat emulsion incorporated chicken meat cutlets. The protein and fat contents non-significantly increased with increasing levels of chicken meat emulsion in meat cutlet formulation. The addition of chicken meat emulsion in the chicken meat cutlets only slightly affected the composition of the final product.

Sensory characteristics of chicken meat cutlets with different levels of chicken meat emulsion:

Results of sensory evaluation scores of chicken meat cutlets incorporated with chicken meat emulsion are presented in Table 2. Among the chicken meat emulsion incorporated chicken meat cutlets, the sensory scores for appearance and colour, flavour, juiciness, texture, binding and overall palatability were significantly ($P< 0.05$) higher for 50 per cent chicken meat emulsion incorporated chicken meat cutlets followed by 75 per cent and 25 per cent chicken meat emulsion incorporated chicken meat cutlets. Appearance scores were significantly lower for chicken meat cutlets without chicken meat emulsion. It might be due to the crumbly texture (Eyas *et al.*, 2007). Poor binding and cohesiveness of the particles results in crumbling and breakage of the product (Sparado and Keeton, 1996). Textures of the chicken meat cutlets were significantly improved by the incorporation of chicken meat emulsion (Eyas *et al.*, 2007). It is documented that meat emulsion improves the cohesion of particles (Corriera and Mittal, 1991). Incorporation of meat emulsion significantly improved overall palatability of cooked meat products (Anna Anandh and Annal Villi, 2018). Eyas *et al.* (2007) also reported that incorporation of meat emulsion significantly improved overall palatability of buffalo meat cutlets.

Conclusion:

The cutlets prepared by using added chicken meat emulsion were assessed as moderately to highly acceptable, whereas the chicken meat cutlets prepared by without chicken meat emulsion were rated as moderately acceptable. Thus, finding of this study has shown that the 50 per cent chicken meat emulsion can be effectively used for preparation of chicken meat cutlets of an acceptable quality.

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