Periodic Research

Standardization and Optimization of the basic formulation and processing conditions for the preparation of chevon, mutton & chicken patties substituted with rabbit meat

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Abstract

The present study was undertaken to utilize and popularize the rabbit meat quality nutritionally by substituting it in other popular products e.g. chevon, mutton and chicken patties. Different patties were optimized based on sensory evaluation for using 9 % vegetable oil and 4%refined wheat flour. The chicken patties were optimized to be cooked at internal temperature of 78± 2^0 C whereas chevon and mutton patties at 80± 2^0 C.

Keyword: Chevon, Chicken, Mutton, Patties, Rabbit meat, Quality attributes.

Introduction

The nutritive value of Rabbit meat has an increasing importance among the factors determining meat quality and consumer acceptability. Indeed, meat is a major source of proteins and essential amino-acids; it is a source of group B vitamins, minerals, and other bioactive compounds. However, meat is also a major source of saturated fatty acids and cholesterol and its consumption could be related to cardiovascular diseases, hypertension, obesity and diabetes (Valsta *et al*., 2005). Therefore, different strategies can be effectively used to increase or reduce bioactive compounds in order to produce functional meat and meat products (Jiménez-Colmenero *et al*., 2006). Rabbit meat, as it has been previously discussed, is a lean meat rich in proteins of high biological values, with highly unsaturated lipids, low cholesterol content, and noticeable quantities of linolenic fatty acid (C18:3 ω3). Also, it displays a low content of sodium and a high content of phosphorus, and can be a good source of B vitamins (Hernandez and Gondret, 2006). Most research conducted in recent years on rabbit meat quality has focused on incorporating bioactive compounds in meat for the benefit of human health. Moreover, rabbit meat consumption could become a good way to provide these bioactive compounds to human consumers, since manipulation of rabbit's diet is very effective in increasing the levels of ω3 PUFA (Hernández *et al*., 2007; Nuchi *et al*., 2007), CLA (Corino *et al*. 2002 and 2003), or Vitamin E (Castellini *et al*., 1999). In addition, both selenium and iron are also responsive to dietary supplementation (Lynch and Kerry, 2000). Incorporation of chevon in mixed-meat sausages may result in a low-fat product with superior water-holding, nutritional and textural properties (Gadiyaram, 2004).

Material and Methods

Mutton and Rabbit meat: Mutton meat is obtained of (Black bengal) and rabbit meat is obtained of (New Zealand White) breeds. Lean meat was cut into smaller chunks and minced in a Sirman mincer (MOD-TC 32 R10 U.P. INOX, Marsango, Italy) with 6mm plate. The common salt, vegetable oil, refined wheat flour (maida), nitrite, sodium tripolyphosphate, spice mixture and condiment mixture were added to weighed meat according to formulation. Meat emulsion for patties was prepared in Sirman Bowl Chopper [MOD C 15 2.8G 4.0 HP, Marsango, Italy]. Minced meat was blended with salt, sodium tripolyphosphate and sodium nitrite for 1.5 minute. Water in the form of crushed ice was added and blending continued for 1 minute. This was followed by addition of refined vegetable oil and blended for another 1 to 2 minutes. This was followed by addition of spice mixture, condiments and other ingredients and again mixed for 1.5 to 2 minutes to get the desired emulsion. Adequate care was taken to keep

the end point temperature below 18^0C by preparing the emulsion in cool hours of morning, by addition of meat and other ingredients in chilled/partially thawed form and by addition of crushed ice or ice water. Formulation of patties is presented in table 1.

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Table-1: Formulation of patties from meat of mutton, mutton and chicken.

INGREDIENTS	PERCENT (W/W)
Lean meat	68.7
Added water	10.0
Vegetable oil	8.0
Condiment mixture	5.0
Refined wheat flour	4.0
Spice mixture	2.0
Table salt	1.5
Monosodium Glutamate	0.5
Sodium Tripolyphosphate	0.3
Sodium nitrite	120 ppm

Moulding of patties : Patties were moulded with circular ring on steel plates in case of oven roasting. The circular ring of 10 mm diameter and of length sufficient to fit in the hot air oven was used for oven roasting purpose. Holding the circular ring in one hand, an accurately weighed quantity (60 g) of meat mix/emulsion, in the form of a ball, was taken in the other hand, roughly made circular with hand and then accurately circular with the ring. With the help of moistened palm and fingers, it was gently spread evenly and moulded into a circular shaped patty. The height and diameter of the patty was determined by Vernier Calliper.

Cooking of patties: Steel plates with raw circular patties on them were placed longitudinally on the shelf of a perforated oven tray in a convection oven (Yorco sales Pvt. Ltd. India, Model-YS1-431, S. No. 02B2843). The moulded raw patties were smeared with vegetable oil and cooked in a preheated hot air oven at 180**±**2^0C for a total time of about 16 minutes in case of rabbit meat substituted mutton patties and mutton patties and 12 minutes in case of rabbit meat patties. The internal temperature of patties was monitored by a thermometer and cooked to an internal temperature of 80±2^0C for mutton 78±2^0C for rabbit meat patties. The patties were removed from the plates, cooled to room temperature and weighed. Pooled sample of each treatment was assigned for analysis.

Sensory Evaluation: A semi-trained experienced sensory panel consisting of scientists and post graduate students of the Faculty of Veterinary Sciences and Animal Husbandry evaluated the sensory attributes viz: appearance, flavour, juiciness, texture and the overall acceptability of fresh and stored samples using 8 point descriptive scale (Seman et al., 1987) where 8 denoted extremely desirable and 1 denoted extremely poor. Panelists were seated in a room free of noise and odours and suitably illuminated. Coded samples for sensory evaluation were prepared by cutting patties into small (approx. 4 cm long) pieces and served warm to panelists. Refrigerated stored samples were warmed in a preheated oven, cut into pieces and then presented to panelists. Water was provided for oral rinsing between the samples.

Statistical Analysis: Means and standard errors were calculated for different parameters. Factorial design of experiment was fallowed. Analysis of variance was performed as per Snedecor and Cochran (1980). In significant effects, least significant differences were calculated at appropriate level of significance for a pair wise comparison of treatment means.

Result and Discussion

Optimization of the basic formulation and processing conditions for the preparation of meat patties.

A series of experiments were conducted to standardize the formulation and processing of *patties* from chevon, mutton and chicken meat with substitution of rabbit meat. The results are presented through analyzed tables. The mean values for various sensory parameters are presented in Tables 2-4.

Standardization of level of added refined vegetable oil, refined wheat flour and time-temperature combination.

The sensory score at 8% refined vegetable oil level was significantly lower ($p<0.05$) than 10% level whereas at 9% level of added fat, the overall acceptability scores were significantly higher ($p<0.05$) than both 8% and 10%. Texture, juiciness and overall acceptability scores showed significantly higher ($p<0.05$)of 4% than both 2% and 6 % level of incorporation of refined wheat flour (Table-3). Overall acceptability was significantly higher ($p<0.05$) for *Patties* of chevon and mutton cooked at 82±2^0C when compared to 80±2^0C and 84±2^0C. However, *Patties* of chicken cooked to a temperature of 78±2^0C were having best score to those cooked to 74±2^0C as well as to those cooked to 82±2^0C for all sensory attributes. (Table-4). Higher level of fat has been reported to fade the colour affecting appearance. Fat content of meat and meat products have been found to be related with perceived juiciness, flavour, texture and mouth feel (Pearson and Gillett, 1997). Slight improvement in overall acceptability score may be due to increase in flavour and juiciness scores with increase in added fat level. Hence, incorporation of 9% refined vegetable oil was taken as optimum in the product. Gradual improvement in juiciness of *patties* was in accordance with findings of Wesley *et al.,* (1993), whereas decrease in flavour score with increase of incorporation level was supported by results of Wesley *et al.* (1993). Hence, incorporation of 4% refined wheat flour was taken as optimum in the product. Three internal temperatures i.e. 74±2^0C, 78±2^0C and 82±2^0C for chicken and 76±2^0C, 80±2^0C and 84±2^0C for chevon and mutton patties were used to optimize the cooking temperature. Non-significant change that included improvement in the appearance and flavour score as well as, a marginal improvement in colour might be attributed to leaching out of some fat at higher temperature. The decline in juiciness might be due to decrease in moisture percent of product cooked at higher temperature. An increase in

flavour score with increase of cooking temperature could be attributed to those volatile substances that gave a pronounced meaty flavour at higher temperature and the result was in agreement with findings of Berry (1994) in beef patties and Kumar and Sharma (2005) in chicken patties. Thus on the basis of various physico-chemical and sensory attributes, the cooking temperature of 78 ± 2^0C was taken as optimum for oven roasting method for rabbit substituted chicken patties, 80 ± 2^0C was taken as optimum for oven roasting method for rabbit substituted chevon and mutton patties .

Table-3:
Effect of added refined vegetable oil on sensory attributes of cooked chevon, mutton & chicken meat patties substituted with rabbit meat. (Mean ± SE)*

Sensory attributes	Added refined vegetable oil level (%)		
	8	9	10
Appearance	$7.07^{b}\pm0.05$	$7.17^{c}\pm0.10$	$6.92^{a}\pm0.13$
Flavour	$6.72^{a}\pm0.11$	$6.94^{b}\pm0.08$	$7.06^{c}\pm0.13$
Juiciness	$7.05^{c}\pm0.11$	$6.98^{b}\pm0.12$	$6.95^{a}\pm0.08$
Texture	$6.92^{a}\pm0.13$	7.05^{b} ±0.10	$7.07^{b}\pm0.05$
Overall acceptability	$6.93^{a}\pm0.10$	$7.09^{c}\pm0.10$	$7.01^{b}\pm0.08$

*Mean SE with different superscripts in a row differs significantly (P<0.05). Mean values are scores on 8 point descriptive scale where 1- extremely poor and 8- extremely desirable. n = 21 for each treatment

Table-4:
Effect of added refined wheat flour incorporation on sensory attributes of cooked *Patties* substituted with rabbit meat. (Mean ± SE)*

Sensory attributes	Incorporation levels of refined wheat flour (%)		
	2	4	6
Appearance	$6.90^{a}\pm0.12$	$7.02^{b}\pm0.12$	$7.06^{c}\pm0.10$
Flavour	$7.05^{c}\pm0.05$	$6.93^{b}\pm0.09$	$6.73^{a}\pm0.07$
Juiciness	$6.92^{b}\pm0.09$	$6.99^{c}\pm0.08$	$6.87^{a}\pm0.09$
Texture	$6.91^{b}\pm0.14$	$6.95^{c}\pm0.09$	$6.78^{a}\pm0.11$
Overall acceptability	6.92^{b} ±0.10	$6.99^{c}\pm0.14$	$6.83^{a}\pm0.08$

*Mean SE with different superscripts in a row differs significantly (P<0.05). Mean values are scores on 8 point descriptive scale where 1- extremely poor and 8- extremely desirable. n = 21 for each treatment

Table-5:
Effect of internal end point temperature on sensory attributes of cooked Chevon and Mutton *Patties* substituted with rabbit meat. (Mean ± SE)*

Sensory attributes	Internal end point temperature levels (^{0}c)		
	76±2	80±2	84±2
Appearance	6.97^{a}±0.19	7.06^{b} ±0.10	6.96^{a}±0.10
Flavour	6.87^{b} ±0.10	7.05^{c} ±0.11	6.81^{a}±0.11
Juiciness	$7.06^{c}\pm0.08$	6.92^{b}±0.13	6.89^{a} ±0.13
Texture	6.94^{a}±0.10	7.04^{a}±0.09	7.04^{a} ±0.07
Overall acceptability	6.88^{a}±0.13	$7.12^{c}\pm0.13$	6.93^{b}±0.13

*Mean SE with different superscripts in a row differs significantly (P<0.05). Mean values are scores on 8 point descriptive scale where 1- extremely poor and 8- extremely desirable. n = 21 for each treatment

Table-8:
Effect of internal end point temperature on sensory attributes of cooked chicken *Patties* substituted with rabbit meat. (Mean ± SE)*

Sensory attributes	Internal end point temperature levels (^{0}c)		
	74±2	78±2	82±2
Appearance	6.82^{a} ±0.09	6.82^{a} ±0.09	6.96^{b} ±0.10
Flavour	6.87^{b} ±0.10	$6.97^{c}\pm0.10$	6.75^{a} ±0.11
Juiciness	7.13^{c} ±0.10	7.06^{b} ±0.08	6.99^{a} ±0.13
Texture	$7.03^{a}\pm0.11$	$7.08^{b}\pm0.10$	$7.04^{a}\pm0.07$
Overall acceptability	$6.66^{b}\pm0.11$	$6.98^{c}\pm0.13$	$6.92^{b}\pm0.13$

*Mean SE with different superscripts in a row differs significantly (P<0.05). Mean values are scores on 8 point descriptive scale where 1- extremely poor and 8- extremely desirable. n = 21 for each treatment

Conclusions

Incorporation of 9% refined vegetable oil was found to be optimum for the formulation of the meat patties. Incorporation of 4% refined wheat flour was found to be optimum level as binder for the formulation of meat patties. An internal cooking temperature of 80^0C for chevon and mutton patties and 78^0C for chicken patties was found to be optimum for preparation in hot air oven.

References

1. AOAC. 1995. Official methods of analysis. 16th edition. Association of official Agricultural Chemists, Washington, DC.
2. APHA 1984. Compendium of methods for the microbiological Examination of foods. 2nd edn. (ed. M.L. Speck). Animal Public Health Association Washington, DC.
3. Berry, B.W. 1994. Fat level, high temperature cooking and degree of doneness affect sensory, chemical and physical properties of beef patties. *Journal of Food Science,* **59**(1): 10-14.
4. Castellini, C., Bosco, A.D. and Bernardini, M. 1999. Effect of dietary vitamin E supplementation on the characteristics of refrigerated and frozen rabbit meat. *Italian Journal of Food Science,* **11**: 151-160.
5. Corino C., Mourot J., Magni S., Pastorelli G., Rosi F. 2002. Influence of dietary conjugated linoleic acid on growth, meat quality, lipogenesis, plasma leptin and physiological variables of lipid metabolism in rabbits. *Journal of Animal Science,* **80**: 1020-1028.
6. Corino C., Filetti F., Gambacorta M., Manchisi A., Magni S., Pastorelli G., Rossi R., Maiorano G. 2003. Influence of dietary conjugated linoleic acids (CLA) and age at slaughtering on meat quality and intramuscular collagen in rabbits. *Meat Science,* **66**: 97-103.
7. Gadiyaram, K.M. and Kannan, G.2004.Comparision of textural properties of low fat, chevon, beef, pork and mix meat sausages. *South African Journal of Animal Science*, **34**:212-214.
8. Hernàndez, P.and Gondret, F. 2006. Rabbit meat quality. In: Maertens, L., Coudert, P. (eds.). *Recent Advances in Rabbit Sciences*; pp. 269-290. Plot-it-bvba Publisher: Marelbeke, Belgium.
9. Hernández P., Cesari V., Pla M. 2007. Effect of the dietary fat on fatty acid composition and oxidative stability of rabbit meat. *In: Proc. 53rd International Congress of Meat Science and Technology,* pp. 367-370. Beijing, China.
10. Jimenez-Colmenero F., Reig M., Toldra F. 2006. New approaches for the develpoment of functional meat products. *In: Nollet L.M.L., Toldrá F. (Eds.). Advanced Technologies for Meat Processing.* CRC Press, Boca Raton, pp. 275-308. FL, USA,
11. Kumar, R. R and Sharma, B. D. 2005. Evaluation of the efficacy of sorghum flour as extender in chicken patties. *Journal of Meat Science*, **3**(1): 17-20.
12. Lynch, P.B.and Kerry J.P. 2000. Utilizing diet to incorporate bioactive compounds and improve the nutritional quality of muscle foods. *In: Decker E., Faustman F., López-Bote C. (Eds). Antioxidants in muscle foods.* Wiley & Sons, Inc. Publication, pp.455-480. New York, USA
13. Nuchi C., Magrinyá N., Tres A., Bou R., Guardiola F., Codony R. 2007. Results on lipid composition and oxidation in animal samples. *htpp://www.ub.es/feedfat* (accessed September 2010).
14. Pearson, A. M. and Gillett, T. A. 1997. Reduced and low-fat meat products. In: *Processed Meats.* 3rd edn. CBS Publishers and Distributors, New Delhi.
15. Seman, D. L., Olson, D. G. and Mandigo, R. W. 1980. Effect of reduction and partial replacement of sodium on bologna characteristics and acceptability. *J. Food Science,* **45:** 1116-1121.
16. Snedecor, G. W. and Cochran, W. G. 1980. In: *Statistical Methods*. 7th Edition. Oxford and IBH Publishing Co., Calcutta.
17. Valsta, L.M., Tapanainen, H. and Männisto, S. 2005. Meat fats in nutrition. *Meat Science,* **70**: 525-530.
18. Wesley, G. M., Reddy, K. S., Prabhakar Rao, Z. and Pillai, K. J. 1993. Effect of binders on organoleptic and physiocemical characteristics of pork patties. *Cheiron*, **22**(3): 93-97.