

Physico-Chemical and Microbial Profile of Fresh Rabbit Meat

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ABSTRACT

Present study was conducted to assess certain physico-chemical and microbial quality of rabbit meat sold at retail shops. Rabbit meat samples were collected in sterile LDPE; brought to laboratory for further evaluation. The pH of fresh rabbit meat was 5.60 ± 0.01 and the TBARS value ranged between 0.11 to 0.24 with mean value of 0.18 ± 0.01 mg malonaldehyde/kg. The tyrosine values were ranged between 18.09 and 21.12 with mean value of 19.60 ± 0.42 mg/kg. The Extract release volume value of fresh rabbit meat sample was 21.90 ± 0.15 ml. The standard plate count of fresh rabbit meat was in the range of 4.52 to 4.69 log cfu/gm with a mean value of 4.60 ± 0.02 log cfu/gm. *E. coli* count of fresh rabbit meat was observed to be between 2.10 and 2.18 log cfu/gm with an average of 2.14 ± 0.04 log cfu/gm. The moisture content of fresh rabbit meat samples varied from 71.50 to 72.83 % with mean value of 72.16 ± 0.42 %. The protein content of fresh rabbit meat ranged from 19.03 to 21.40 % with mean value of 20.21 ± 0.06 % while the fat content was found to be in the range of 6.40 to 6.63 % with an average of 6.50 ± 0.02 %.

Keywords : Rabbit meat, Physico-chemical and microbial quality

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INTRODUCTION

In India, interest towards broiler rabbit farming is increasing nowadays. Rabbit occupies a place which is mid-way between ruminants and monogastric animals. The ability to convert forages in to meat efficiently is of special significance of rabbit as there is abundant vegetation available in our country. There are no religious taboos for the consumption of rabbit meat among non- vegetarian group. The slaughter age of rabbit is 12-15 weeks, which gives 2 kg slaughtered weight. Most important is that rabbit meat is lean as compared to other meat like mutton, chevon, beef and pork and is a boon for patients ailing from hypertension and heart diseases. Rabbit meat is white, fine grained delightly flavored and nutritious which contains important fatty acids viz., myristic, palmitic, cis n-7 palmitoleic, oleic, linoleic and arachidonic acids (Ramirez *et al.* 2005).

Chicken and mutton have occupied a major part of Indian diet since prolonged period of time because of their acceptability by all the communities. Short cycle production animals like rabbit can be a better alternative for conventional food animals. Intensive commercial rabbit rearing has acquired greater interest in developing country like India, where consumer prefers meat with high palatability, desirable meat: bone ratio, high biological value, low cholesterol, calories and sodium.

MATERIALS AND METHODS

Collection of meat samples

Rabbit meat was collected from 3-4 months age male rabbit dressed at local meat shops of Parbhani, Maharashtra. Care

was taken to avoid contamination of meat during dressing as well as collection of samples. Dressed carcass was then transferred to sterilized polyethylene pouches kept in ice packs and transported to the laboratory within one hour of slaughter.

Design of experiment

Three replications and three samples in each experiment were carried out. The results were drawn after five observations.

Analysis of fresh meat samples

Fresh meat samples from thigh and breast were analyzed to assess its quality on the basis of physico-chemical characteristics and microbial profile.

Physico-chemical properties

pH: The pH was determined by the method of AOAC (1995). Ten gm ground sample was added in 50 ml distilled water and fine suspension was prepared. The pH was then measured using digital pH meter (Model: LI 120, ELICO Pvt. Ltd., Hyderabad).

Tyrosine value: Twenty gm of meat sample was blended with 50 ml precooled 20 % Trichloro acetic acid (TCA) for 2 min. The extract was obtained by filtering the content through Whatman filter paper No. 42. TCA extract (2.5 ml) was diluted with equal amount of distilled water. To this, 10 ml of 0.5 N freshly prepared NaOH solution was added. The mixture was kept for 10 min. followed by addition of Folin and Ciocalteus reagent (1:2 diluted with distilled water). After mixing, it was kept in dark for 30 min. at room temperature and absorbance (OD) was measured at 730 nm using Systronic Spectrophotometer.

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Thiobarbituric acid value: TBA value of meat was estimated by the extraction method of Witte *et al.* (1970). Two gm of sample was blended for 2 min. in a blender with 10 ml chilled 20% Trichloro acetic acid (TCA). The resulting slurry was allowed to stand for 10 min. and then filtered through Whatman No. 42. Three ml of the clear filtrate was pipetted in a test tube. Three ml TBA reagent (1 mg/ml in distilled water) was added to the tubes and mixed well. The tubes were then stoppered and placed in a boiling water bath for 35 min. and cooled. The optical density (OD) was read at 532 nm using Spectrophotometer. Blank was prepared using 3 ml of distilled water instead of filtrate.

Extract release volume (ERV): ERV was estimated according to the procedure described by Strange *et al.* (1977). Twenty-five gm of minced meat after blending with 100 ml distilled water was transferred into a funnel fitted Whatman filter paper No. 1. The volume of filtrate collected in first 15 min. was recorded as ERV of the respective sample.

Proximate composition: Compositional parameters viz., moisture, fat and protein content of Rabbit meat were determined using standard procedure described in AOAC(1995).

Moisture: Minced meat was oven dried at $100 \pm 2^\circ\text{C}$ to constant weight and loss in water was recorded as moisture content.

Moisture free sample was powdered and subjected to extraction using petroleum ether (60-80°C) by Soxhlet method and ether extract free of ether was weighed as intra muscular

Protein: Total nitrogen content of the minced meat was determined by Kjeldahl method in which nitrogen was converted to ammonia and assayed by titration. Protein content was obtained by multiplying nitrogen content with 6.25.

Microbiological assay: Microbiological analysis was done as per the standard method of APHA (1984).

Preparation of serial dilution: Ten gm of aseptically excised meat sample was homogenized to a fine slurry in a sterile pestle and mortar by adding 90 ml sterile 0.1% peptone water. Tenfold dilutions were prepared from each slurry by using 0.1% peptone water as diluents.

Standard plate count (SPC): One ml of appropriate dilution was transferred in a sterilized petridish to which about 15-20 ml of pre sterilized melted plate count agar was poured. Plates were allowed to set, incubated at 37°C temperature for 48 hrs and colonies were counted. The average count was multiplied by a dilution factor and expressed as log cfu/gm of sample.

E. coli count: One ml of appropriate dilution was transferred in a sterilized petri dish. About 15-20 ml pre-sterilized melted

Eosine methylene blue (EMB) agar was pour plated. Plates were allowed to set, incubated at 37°C for 48 hrs and colonies were counted and expressed as log cfu/gm of sample.

Salmonella count

Pre-enrichment: Buffered peptone water was used for pre-enrichment. Meat samples were incubated using 1:10 buffered peptone water (25 gm peptone in 225 ml buffer) for 16-20 hrs at 37°C

Enrichment: Sufficient inoculum (1:10) was transferred to Salmonella enrichment Broth (SEB) and incubated for 18-24 hrs at 42°C .

Selective plating: One ml of appropriate dilution was transferred in a sterilized Petri dish. About 15-20 ml of pre-sterilized melted Salmonella Shigella agar (SS) was pour plated. Plates were allowed to set and incubated at 37°C for 48 hrs and the colonies were counted.

RESULTS AND DISCUSSION

Physico-chemical and microbiological quality of fresh rabbit meat:

Physico-chemical properties

The data pertaining to physico-chemical properties of fresh rabbit meat are presented in table 1

pH: The pH of fresh rabbit meat was found between 5.51 and 5.69 with an average value of 5.60 ± 0.01 (Table 1).

Table 1: Physico-chemical properties of fresh rabbit meat

Parameters	Range	Mean
pH	5.51 – 5.69	5.6 ± 0.01
TBA value (mg malonaldehyde/kg)	0.11 – 0.24	0.18 ± 0.01
Tyrosine Value (mg/100gm)	18.09 – 21.12	19.60 ± 0.42
ERV (ml)	20.70 – 23.10	21.90 ± 0.15

In general pH falls during post-mortem glycolysis while conversion of muscle into meat. In mammalian animals the ultimate pH is around 5.54 to 5.60. Doifode (2007) observed pH of fresh goat meat, which varies between 5.59 to 5.65. Nikerson and Sinsickey (1977) also observed ultimate pH of beef which varies between 5.1 and 6.2. The rate and extent of change in pH is influenced by intrinsic factors such as species, type of muscle and variations between individuals.

TBA value: The Thiobarbituric acid (TBA) value is used as an indicator of food quality and is known to be the most popular test for measuring oxidative deterioration of lipids in muscle foods (Willson *et al.* 1976). The threshold value of TBA is 1-2 mg malonaldehyde/ kg, which is indicative of rancidity in meat (Watts 1962). It is observed from Table 1 that TBA value of fresh rabbit meat sample ranged between 0.11 and 0.24 with mean value of 0.18 ± 0.01 malonaldehyde/kg. Doifode (2007) reported slightly higher values in fresh goat meat. The results

are in conformity with the report of Sen and Sharma (2003) regarding buffalo meat.

Tyrosine value: Tyrosine value is an indicator of proteolysis as it measures tyrosine and tryptophan present in non-protein extract of meat (Strange *et al.* 1977). Estimation of tyrosine value has been used as one of the methods for detecting microbial spoilage in meat and sea-foods (Jay 1996). It is observed from the Table 1 that fresh rabbit meat samples recorded range of tyrosine values between 18.09 and 21.12 with mean value of 19.60 ± 0.42 mg/100 gm. Present findings are in close agreement with Doifode (2007) and Kandeepan and Biswas (2007). Proteolysis might be due breaking down the complex protein structure of meat into simple compounds such as free amino acids by certain bacteria.

Extract release volume: The extract release volume technique has been shown to be useful in determining incipient spoilage in meat as well as in predicting storage life. In general, meat having better sensory profile and low microbial load releases more volume of extract as compared to poor quality meat with higher microbial load, which releases smaller extract volume. Table 1 reveals, ERV value of fresh rabbit meat sample ranged from 20.70 to 23.10 ml with mean value of 21.90 ± 0.15 ml. The findings are in close agreement with the observations of Doifode (2007) for goat meat and Jay and Hollingshed (1990) for buffalo meat.

Proximate composition of fresh rabbit meat: The data with regard to proximate analysis of fresh rabbit meat is presented in Table 2. It is clear from the table that the moisture content of fresh rabbit meat samples varied between 71.50 and 72.83 % with mean value of 72.16 ± 0.42 %. The protein content of fresh rabbit meat ranged between 19.03 and 21.40 % with mean value of 20.21 ± 0.06 % while the fat content was found to be in the range of 6.40 to 6.63 % with an average of 6.50 ± 0.02 %. The result pertaining to moisture, protein and fat content of rabbit meat are almost similar to those reported by Bazar *et al.* (2008) and Pla *et al.* (2004).

Table 2: Proximate composition of fresh rabbit meat

Parameters (%)	Range	Mean
Moisture	71.50 - 72.83	72.16 ± 0.42
Protein	19.03 - 21.40	20.21 ± 0.06
Fat	6.40 - 6.63	6.50 ± 0.02

Microbial quality of fresh rabbit meat : The observations with regard to microbial quality of fresh rabbit meat samples are present in Table 3.

Table 3 : Microbiological quality of fresh rabbit meat (log cfu/gm)

Microbial count	Range	Mean values
SPC	4.52 - 4.69	4.60 ± 0.02
<i>E. coli</i>	2.10 - 2.18	2.14 ± 0.04
<i>Salmonella</i>	-	-

Standard plate count is the most widely used technique to determine the viable bacterial cells in meat and meat products. It is seen from the table that the standard plate count of fresh rabbit meat samples was in the range of 4.52 to 4.69 log cfu/gm with a mean value of 4.60 ± 0.02 log cfu/gm. The total standard plate counts observed in the present investigations are comparable with earlier findings of Doifode (2007) who reported standard plate count in fresh goat meat as 5.59 ± 0.03 log cfu/gm. *E. coli* of fresh rabbit meat samples was observed to be between 2.10 to 2.18 log cfu/gm with an average of 2.14 ± 0.04 log cfu/gm. similar findings were also reported by Rathod *et al.* (2004) for fresh goat meat. It was further revealed that none fresh rabbit meat sample was positive for *Salmonella* species. The results are in agreement with the findings of Biswas *et al.* (2006) and Nortje *et al.* (1990) who also stated that salmonella was not identified in fresh meat samples.

CONCLUSION

Rabbit meat is a good source of animal protein with an average protein content of 20.21 ± 0.06 %. The assessment of physico-chemical characteristics (pH, TBA, tyrosine value and ERV) and microbial quality (standard plate count, *E. coli*) of rabbit meat collected from local meat shops revealed their suitability for consumption.

REFERENCES

- AOAC (1995) Official methods of analysis, 16th Edn. association of official agricultural chemists, Washington, DC
- APHA (1984) Compendium of methods of microbiological examination of foods, 2nd Edn. American Public Health Association
- Bazar G, Kover G, Szendro Z, Romvari R (2008) NIR prediction for protein and intramuscular fat content of rabbit hind leg meat. 9th World Rabbit Congress, Varona, Italy
- Biswas AK, Kondiah N, Anjneyulu ASR, Bhilegaonkar KN, Mendiratta SK, Jana C, Sing H (2006) Microbial profile of export frozen meat trimmings and silver sides. National symposium on prospects and challenges in Indian meat industry, Chennai, pp151
- Doifode VK (2007) Assessment of quality of chevon during frozen storage. M.V.Sc thesis submitted to MAFSU, Nagpur
- Jay JM (1996) Modern Food Microbiology, 5th Edn. Champan and Hall, New York
- Jay JM, Hollingshed AM (1990) Two methods for determining extract release volume (ERV) of fresh and spoiled beef and poultry meats. J Food Sci 55: 1475-1476
- Kandeepan G, Biswas S (2007) Effect of low temperature preservation on quality and shelf life of buffalo meat. Am J Food Technol 2: 126-135

- Nikerson JT, Sinskey AJ (1977) Microbiology of food and food processing. Elsevier Publication, New York. pp 140-141
- Nortje GL, Nel L, Jordaan E, Badenhorst K, Goedhart G, Holzappel WH (1990) The aerobic psychrotrophic population on meat and meat contact surfaces in a meat production system and on meat stored at chilled temperature. *J Appl Bacteriol* 68:335-344
- Pla M, Pascual M, Arino B (2004) Protein, fat and moisture content of retail cuts of rabbit meat evaluated with the NIRS methodology. *World Rabbit Sci* 12: 149-158
- Ramirez JA, Diaz I, Pla M, Gil M, Blasco A, Oliver MA (2005) Fatty acid composition of leg meat and perirenal fat of rabbits selected by growth rate. *Food Chem* 90: 251-256
- Rathod KS, Ambadkar RK, Zanjad PN, Deshmukh VV, Raziuddin M (2004) Microbiological quality of chevon sold in Parbhani city. *J Vet Publ Health* 2(1-2):19-22
- Sen AR, Sharma N (2003) Quality changes in buffalo meat during storage in dry ice pack. *Indian Vet J* 80: 166-168
- Strange ED, Benedict RC, Smith JL, Swift CE (1977) Evaluation of rapid test for monitoring alterations in meat quality during storage. *J Food Protect* 40:843-847
- Watts BM (1962) Meat products. In: Symposium on food lipids and their oxidation. AVI Publishing Co. Inc., Westport, CT. pp: 202
- Wilson RB, Pearson AM, Shortand F (1976) Effect of total lipids and phospholipids on warmed over flavour in red and white muscle from several species as measured by TBA analysis. *J Agri Food Chem* 24:7
- Witte VC, Krause GF, Baileye ME (1970) A new extraction method for determining 2-thiobarbituric acid values of pork and beef during storage. *J Food Sci* 35:582-585