



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(8): 1380-1382
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www.thepharmajournal.com
Received: 09-05-2023
Accepted: 16-07-2023

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Assessment of shelf-life under refrigerated conditions (4+1 °C) of patties from goat by-product: Rumen meat

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Abstract

The study was conducted to evaluate the shelf-life of patties prepared from goat rumen meat. Three types of samples were prepared. Sample one was from 100% rumen meat (T1), another sample was from 100% goat meat (T2) and third sample was from combination of both rumen meat and goat meat (50:50). Analysis of the samples were done for estimation of pH, TBA and TPC under refrigerated condition (4+1 °C). Although pH, TBA value and Total Plate Count was found to be numerically higher for total rumen meat patties for one week of storage under refrigerated condition (4+1 °C) than other two formulations but were within the limit of acceptability of products. Hence the goat by-product i.e rumen meat can be efficiently utilize for preparation of meat patties.

Keywords: Goat meat, Patties, Rumen meat, Shelf-life

Introduction

In developing countries, goat meat is a major source of non-vegetarian protein (Qushim *et al.*, 2016) [9]. In comparison, to other red meat, goat meat is a better alternative due to low saturated fatty acid and cholesterol (Anaeto, *et al.*, 2010) [1]. As commercialization in meat industry increases day by day, proper utilization of slaughter house by-products is essential to reduce the cost of waste management and its impact on environment (Brazil *et al.*, 2014) [4]. Animal by-products are valuable materials but due to lack of management and industrial mind slaughterhouses of most of the developing countries cannot utilize those materials (Md. Abdulla *et al.*, 2021) [11]. Edible by-products from goat had been found to be a good source of niacin, cobalamin, pyridoxine, folacin etc. (Vanathi *et al.*, 2020) [2]. Limited studies are reported on utilization of rumen meat of goat for value added product preparation. Rumen meat or tripe is one of the most important edible offal of goat but due to lack of technology, it is mostly under utilized or thrown away in our country. However, it contains high nutritional value although with some higher levels of fat. It is a good source of high quality protein, rich in B vitamins and minerals, including calcium, iron, magnesium, phosphorus, zinc, manganese and selenium. Rumen meat or tripe from the pastoral regions of Kenya can be utilized as human food and pet food (Karibe, *et al.*, 2018) [7]. But although being highly nutritious, the product development from rumen meat is still challenge due to lack of much study on its shelf-life. So, the present investigation was conducted to utilize the highly nutritious goat rumen meat for patties preparation and to determine its shelf-life under refrigerated conditions (4+1 °C).

Materials and Methods

Rumen meat and goat meat were purchased from local market of Kolkata (W.B.) and were properly cleaned and washed with potable water in the dept. of LPT, WBUAFS, Kolkata. Rumen meat has a typical off odour due to reminiscent of ingesta. Therefore, it should be properly treated to reduce or eliminate such off odour prior to its further processing for product preparation. After proper mincing three types of patties sample were prepared as per standard method. Type one patties sample was prepared from total (100%) rumen meat T1 with adding other ingredients. Type two patties sample was prepared from total (100%) goat meat with adding other ingredients T2 and third patties sample was prepared with combination of (50:50:: rumen meat: goat meat) T3. All three types of prepared patties samples were packaged separately under aerobic condition and kept under refrigerated condition (4+1 °C) for one week and the parameters for their shelf life were assessed on alternate day up to 7th day.

The pH of sample was determined by following the procedure of Jay (1964) [10]. Meat sample weighing 25 gm was blended with 100 ml. distilled water for one minute in a mechanical blender. From total homogenate 50ml. aliquor portion was immediately used for determination of pH using digital pH meter (EUTECH Instruments) after standardizing the instrument with two standard buffers. Thiobarbituric acid (TBA) value is a measure of oxidatative rancidity in food and is expressed as mg malonaldehyde/1000g of sample. The method of Tarladgis *et al.* (1960) was followed for estimation of TBA value. For microbiological analysis during storage period, Total Plate Count was calculated as per standard method of APHA (1984).

Results and Discussion

The mean values for pH of patties prepared and stored under refrigerated conditions (4+1 °C) are depicted in Table 1. It varied from 5.95 to 6.53 among different treatment groups of one week storage under refrigerated conditions (4+1 °C). The pH of patties exhibited an increasing trend in all the formulations at each interval of storage period of one week study period. The progressive increase in pH of patties upto one week of storage period might be due to accumulation of metabolites of bacterial action on meat and deamination of protein (Bachhil, 1982 and Jay, 1986) [3, 6].

The mean values of TBA value of all treatment groups evaluated at alternate day of one week storage period under refrigerated conditions (4+1 °C) are presented in Table 1. It was observed that TBA value increased at each interval of storage in all formulations, but the overall TBA value showed a significant ($p < 0.01$) increase with the advancement of storage period up to 7th day. The higher TBA value in control formulation than other formulations might be due to higher fat content in control than their respective extended formulations. Reports also indicated that lipid oxidation increases in meat with advancement of storage period (Keller and Kisella, 1973; Wilson *et al.*, 1976) [14]. Watts (1962) [13] also reported that the mean values of TBARS numbers during the storage period were below the minimum threshold value, i.e., 1-2 mg malonaldehyde/kg meat.

The Total Plate Count (TPC) of different treatment groups varied from 2.5 to 3.72 log cfu/g under one week storage period (Table-1). All the formulations differed significantly ($p < 0.01$) from each other and the values also differed significantly ($p < 0.01$) between days of one week storage period. An increase in TPC may be due to multiplication of contaminating bacteria in patties packed in air permeable polyethylene pack and kept under refrigerated storage. The 1st day and 3rd day value of TPC didn't differ significantly ($p < 0.01$) from each other during one week storage period. Apparently, the increase in TPC may be due to multiplication of contaminating bacteria in patties packed in aerobic packaging and kept under refrigerated condition for one week assessment period. The 1st and 3rd day TPC didn't differ significantly and remain same, this might be due to lag phase of microbes in which they tried to adjust in new environment and so there was no multiplication in them during that period. But on 5th and 7th day of storage progressive higher counts in patties samples might be due to multiplication of organisms were noticed as the days advanced. But the increase was within the limit of consumption. Many researchers have also find similar results during the storage of different meat products for one week under refrigerated conditions. Thompson *et al.* (1978) [12] and Deenathayalan (1997) [5]

observed similar results with advancement of storage period under refrigerated condition.

Table 1: pH of patties under refrigerated conditions (4+1 °C)

Days	T1	T2	T3	Mean
1 st day	6.24	6.16	5.95	6.07 ^C
3 rd day	6.25	6.17	5.99	6.10 ^C
5 th day	6.31	6.30	6.29	6.24 ^B
7 th day	6.53	6.49	6.46	6.49 ^A
Mean+ S.E.	6.33 ^{acd}	6.29 ^{acd}	6.18 ^{bcd}	

(N=4)

Table 2: TBA value of patties under refrigerated conditions (4+1 °C)

Days	T1	T2	T3	Mean
1 st day	0.49	0.42	0.42	0.42 ^D
3 rd day	0.48	0.46	0.42	0.45 ^C
5 th day	0.53	0.50	0.55	0.53 ^B
7 th day	0.65	0.59	0.64	0.63 ^A
Mean	0.55 ^{acd}	0.49 ^{bcd}	0.51 ^{bcd}	

(N=4)

Table 3: TPC values of patties under refrigerated conditions (4+1 °C)

Days	T1	T2	T3	Mean
1 st day	3.15	2.67	2.92	2.81 ^C
3 rd day	3.14	2.8	2.92	2.87 ^C
5 th day	3.35	3.25	3.12	3.20 ^B
7 th day	3.72	3.57	3.58	3.61 ^A
Mean	3.34 ^{acd}	3.07 ^{bcd}	3.14 ^{bcd}	

(N=4)

Conclusion

The patties prepared by combination of rumen meat: goat meat in 50:50 ratio has better shelf life under refrigerated conditions over prepared by the individual ones.

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