Available online at http://www.ijims.com

ISSN: 2348 – 0343

Effect of Freeze Thaw Cycles Abuse and Refrigerated Thawing on Microbial Quality of Chevon

Anita Katekhaye

Department of Livestock Products Technology, Nagpur Veterinary College, Nagpur, India

Abstract

Present study was conducted to evaluate the effect of three freeze thaw cycles and refrigeration temperature thawing on microbial quality of chevon. The muscle comprising of *Semitendinosus, Semimembranosus* and *Bicep femoris* from chevon carcass were collected from local retailer of Nagpur city in insulated ice box. For freeze thaw cycle study, samples were distributed, weighed, packaged, labeled and transferred to deep freeze (-18 ±2˚C). The frozen chevon samples were thawed at every 5th day by refrigeration method of thawing at (4±1˚C) temperature.The exposed freeze thaw cycles chevon evaluated for microbial quality like Total Plate Count, Psychrophilic Count and *E coli* count. Freeze thawed chevon was prone to microbial growth as evident from significant increase in total plate count (TPC). However, coliform count decreased after 3rd freeze thaw cycle while psychrophilic count increased significantly. Thus, it could be concluded that chevon exposed to freeze thaw cycle could be acceptable up to 3rd freeze thaw cycle.

Key words - Freeze thaw cycle, Total Plate Count, *Bicep Femoris*

Introduction

Goat meat is consumed in all the segments of the Indian society; hence it serves as main source of red meat in the country. Chevon is nutritionally dense and heart friendly red meat. The plus points of chevon is lean type and easily digestible. The value of chevon in human nutrition cannot be overemphasized in developing countries because it is complimentary nutritional source without any religious taboos (Casey, 1992). It has been documented that nutritionally chevon is comparatively as better as mutton and it is the best protein source for poor people (Gaili and Ali, 1985). These facts emphasize the necessity of making chevon available in good condition till it reaches the consumer.

In shops, home, restaurant or in meat industry, meat or meat products may reasonably be expected to undergo multiple freeze thaw cycles which cause damage to cell membrane and organelles as well as muscle structure due to repeated melting and reformation of ice crystals. It has been also indicated that number of freeze thaw cycles accelerates the deterioration of meat color, progressive increase in thawing loss, cooking loss and decrease in pH as solute gets concentrated due to fluid loss (Jeong *et al*, 2011, Boonsumerej *et al*, 2007, Leygonie *et al*, 2012). The net effect of these changes is detrimental to retail display of the products. The storage

life of frozen meat is mainly influenced by packaging, storage temperature, relative humidity, degree of processing, chopping or grinding and variation in products themselves. The proper approach of freezing and thawing is of utmost importance because freezing do not make food sterile but it has been documented that pathogenic microorganisms could grow at low temperature (Arthey, 1993).

Neither freezing nor thawing appears to decrease the number of viable microbes present in meat. During freezing, however, microbial spoilage is effectively terminated as the microbes become dormant. Unfortunately, they regain their activity during thawing (Londahl and Nilaaon, 1993). As such, the industry is constantly in search of measures to mitigate the quality changes with multiple freezing-thawing during storage.

Material and Methods

Sample collection and processing of fresh chevon

The fresh chevon thigh muscles especially Bicep femoris, Semitendinosus and Semimembranosus samples were collected from retailer of Nagpur city. The separable fat, connective tissue and tendons were removed from fresh chevon and were cut into size of approximately 2.5×2.5×2.5 cm cubes.

Freezing and thawing condition of chevon

The fresh chevon packed into LDPE bags were transferred to the deep freeze (Blue star, Model no.CHF500) at a temperature of 18±2°C. After five days of frozen storage the samples were thawed at Refrigeration temperature (4±1°C) and again subjected to refreezing for next cycle up to five days. Likewise the study was continued up to three freeze thaw cycle.

Microbial Quality Analysis

Total viable count, psychrophilic count, Total coliform count and Salmonella count were determined by following the standard method of APHA, (1984).

Results

In present study Total Plate Count (Table 1) has increased significantly ($P<0.05$) after every freeze thaw cycle. It was observed that there was significant increase ($P<0.05$) in TPC from 0 day ($4.91 cfu_{10}/g$) to 3rd freeze thaw cycle ($5.12 \log_{10} cfu/g$). The psychrophilic count increased non-significantly ($P>0.05$) up to 2nd freeze thaw cycle of chevon. Thereafter, the count increased significantly ($P<0.05$) in 3rd freeze thaw cycle.

Discussion

The results of TPC are in agreement with findings of Nirmal and Benjakul (2010) who recorded increase in microbial count as number of freeze thaw cycles increased in white shrimp. The gradual increase in TPC

might be due to prolonged thawing at refrigeration temperature that has resulted in release of drip loss has provided excellent medium for microbial growth. The results of psychrophilic count are in agreements with findings of Kandeepan ans Biswas (2007) in beef. Vieira et al., (2009) in beef, Nirmal and Benjakul (2010) in shrimp. Thus it could be inferred that during frozen storage, psychrophiles were arrested initially but defrosting favored their growth during 3rd freeze thaw cycle. In the present study it was evident that fresh chevon had a coli count of 2.5±0.03 $\log_{10}$cfu/g which decreased in 3rd freeze thaw cycle significantly ($P<0.05$) indicating that these organisms could not sustain a cyclic freeze thaw exposure. The results corroborated with documented findings as Kandeepan and Biswas (2005) who also observed decreasing trend in coliform count in freezing temperature storage.

Conclusion

Microbiological count with respect to TPC and Psychrophilic count increased as number of freeze thaw cycle increased. However, *E coli* growth poorly affected in freeze thaw cycles.

References

APHA - American Public Health Association (1984). Compendium of Methods of Microbiological Examination of Foods 2nd Edn.

Arthey D (1993). Freezing of vegetables and fruits. Frozen food technology. ed. C. P. Mallette, Blackie Academic & professipnal, Glasgow.

Boonsumrej S, S Chaiwanichsiri, S Tantratian *et al* (2007). Effect of freezing anf thawing on the quality changes of tiger shrimp (Penaeus monodon) frozen by air-blast and cryogenic freezing. J.of Food Eng.80 (1).

Casey NH. (1992). Goat meat in human nutrition. In: Processing of the Vth international conference on Goat. Vol.2, Part II. Indian council of agricultural research, New Delhi, India, Pp.25-40.

Gaili ES. and AE. Ali (1985). Meat from sudan desert sheep and goats:part 2-composition of muscular and fatty tissues. Meat Sci.30(4):229-236.

Jeong JY, GD Kim, HS Yang and ST Joo (2011). Effect of freeze-thaw cycles on physicochemical properties and color stability of beef semimembranosus muscle. Food Res International 44:3222-3228.

Kandeepan G and S Biswas (2005). Effect of low temperature preservation on microbial and sensory quality of buffalo meat. Livestock Res. Rural Development, 17(11):1-9.

Kandeepan G and S Biswas (2007). Effect of domestic refrigeration on keeping quality of buffalo meat. J. of food tech. 5(1):29-35.

Leygonie CT, J Britz and LC Hoffman (2012). Meat quality comparison between fresh and frozen/thawed ostrich M. iliofibularis. Meat Sci.91:364-368.

Londahl G, and T Nilaaon (1993). Storage of frozen foods. In B. Caballero (Ed.), Encyclopaedia of food science and nutrition. (2nd Edition) Oxford:Academic Press. Pp:2732-2735.

Nirmal NP and S Benjakul (2010). Effect of catechin and ferulic acid on melanosis and quality of pacific white shrimp subjected to prior freezethawing during refrigeration storage. Food Control. 21:1263-1271.

Vieira C, M T Diaz, B Martinez *et al* (2009). Effect of frozen storage conditions (temperature and length of storage) on microbiological and sensory quality of rustic crossbreed beef at different states of ageing. Meat sci. 83:398-404.

Table 1: Effect of freeze thaw cycle abuse and refrigerated thawing on microbial quality of chevon (n=6)

Parameters	Freeze Thaw Cycles				
	0 Day	1st Cycle	2nd Cycle	3rd Cycle	CD
Total Plate Count	4.91^{d}±0.8	4.97^{c}±1.4	5.1^{b}±1.5	5.18^{a}±1.3	0.02
Psychrophilic Count	0	2.71^{b}±0.2	2.71^{b}±0.13	2.85^{a}±0.1	0.03
E coli (log10cfu/g)	2.5^{a}±0.03	ND	ND	1.2^{b}±0.01	0.02

Different superscripts in a row indicates significant difference ($P<0.05$)