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ASSESSMENT OF QUALITY OF THE BEEF SAMPLES INTENDED FOR FEEDING OF CARNIVORES IN S.V ZOOLOGICAL PARK, TIRUPATI, ANDHRA PRADESH, INDIA

INDUMATHI.J[1] & S.P.ARUN[2]

[1]Department of Livestock Products, Technology, College of Veterinary Science,

Sri Venkateswara Veterinary University, Tiruapti, Andhra Pradesh, India

[2]Veterinary Assistant Surgeon, Sri Venkateswara Zoological Park, Tirupati, Andhra Pradesh, India

ABSTRACT

The study was undertaken to evaluate the quality of randomly collected beef samples (n=50) intended for feeding to the carnivores from S.V Zoological Park, Tirupati, Andhra Pradesh, India and were examined in terms of physical chemistry and microbiological parameters. Results revealed that, the mean values observed for all the physical, chemical parameters like WHC, pH, 2-TBARS, ERV, and FFA were within the normal level, even though some samples had got some slight variation. The slight variation in values in some samples might be due to contamination during handling. As per results obtained in bacterial counts, this study revealed that some of the beef samples were often contaminated with microorganisms. It was found that the microbiological quality of some of the beef samples was inadequate. This might be due to contamination due to either improper handling or delay in transportation of beef from production point to the Zoo.

KEYWORDS: Beef, quality, zoo, Evaluation and Feeding

INTRODUCTION

Meat is the most perishable of all the foods since it contains sufficient nutrients that are essential for the growth and multiplication of microorganisms. Hence utmost precautions must be taken to safeguard it right from bleeding of slaughtered animals till it reaches the consumers (Magnus, 1981). Age and sex of the animal have a major influence on the quality of meat that is produced from animals (Rao et al., 2009). Food security is a complex issue, where foods if animal origin, such as meat, meat products, fish and fishery products are generally regarded as high risk commodity with respect of pathogenic microbes, natural toxins and other possible contaminants and adulterants (Yousuf et al., 2008). Although the muscles of healthy animal do not contain microorganisms, meat, tissues get contaminated during various stages of slaughter and transportation (Ercolini et al., 2006). Meat is unfit for consumption when it is spoiled. A great diversity of microbes inhabits fresh meat generally, but very few may become dominant depending on pH, composition, textures, storage temperature and transportation means of raw meat (Ercolini et al., 2006). When the microbial loads increased to as high as 109 cfu/cm $^{-2}$ the meat becomes putrid (Dainty et al., 1985; Jay, 2000). The food and agricultural organization (FAO) of the United Nations and the world health organizations (WHO) stated that meat contaminated with microbes is perhaps the most widespread reason and an important cause of health problems among animals and humans. Among meats, beef is highly perishable because of its high water content and preponderance of nutrients such as high molecular proteins, low molecular substances such as glucose, free amino acids, peptides, peptides and very minute amount of glycogen (koutsoumanis et al., 2006; Jay, 2000). The quality of beef depends on other factors

such as pre slaughter handing, care and state of animal age, sex, and hygiene precautions to be taken in the slaughterhouse and meat pH (Anon, 2011). Beef is one of the widely consumed protein sources in the world. Furthermore, modern consumers are increasingly concerned about the production of safe meat with no undesirable effects on their health (Andersen et al., 2005). Several biochemical processes and products may affect beef eating quality that is related to animal welfare, especially during transportation, handling, loading, off-loading, pre slaughter period, slaughtering process and meat handling after slaughter and its effects on meat. The present study was designed to assess the quality of the beef samples intended for feeding of carnivores in the S.V. Zoological Park, Tirupati, Andhra Pradesh, India based on the physic chemical changes and microbiological quality.

MATERIALS AND METHODS

Sample collection

Beef samples (n=50) intended for feeding of different carnivores in the S.V. Zoological park, Tirupati, Andhra Pradesh, India were collected in screw-capped test tubes containing 10 ml of sterile maintenance medium (0.85% NaCl and 0.1% put-on) (Bell, 1997). The tube was transported to a lab by ice packs and processed for further analysis within four hours to study the physical chemical changes and microbiological parameters.

Physico-Chemical parameters analysis

The water-holding capacity (WHC) of the beef samples was determined by the procedure of Weirbicki et al. 1962. Extract release volume (ERV) of the beef samples was determined by the procedure of Jay & canto 1964. Free fatty acid **(**FFA) of the beef samples was determined by the procedure of Modi et al., 2004. 2-Thiobarbituric acid reactive substance value (2-TBARS) of beef samples was determined by the aqueous extraction procedure (Pikul et al., 1989.) PH of the samples was analyzed by immersing a glass-calomel electrode directly into the sample using a pH meter (Cyberscan 1000, Eutech Instru- ments, Singapore).

Microbiological analysis

For microbiological examination, a representative of 1 g restructured chicken chunk sample was withdrawn and homogenized in aseptically using 9 ml 0.1% peptone water (and serial dilutions were made using 0.1% sterile peptone water. The microbial quality of prepared was evaluated by estimating the Total plate count (TPC), Coliform Count (PPC) and Yeast and Mold counts (Y&M) following pour plating technique as per standard procedure of APHA (1984).

Statistical analysis

The data thus obtained was subjected to statistical analysis using SPSS MAC, version 20.0, SPSS Chicago (US).

RESULTS AND DISCUSSIONS

The mean values for physical, chemical and microbiological parameters of minced beef samples (n=50) were given in Table 1. As per the results, observed a wide range (48-74%) in the values of water holding capacity between beef samples and the average fund was 55% for all the samples. These results were in agreement with Jolley et al., (1981), who found very little drip loss in pre-rigor meat when compared to the post rigor meat and the drip losses tend to increase on storage this might be due to protein hydrolysis during storage.

According to the results, a wide range in the pH values was observed between the samples (5.86 - 6.48) and the

overall mean pH value was 6.13 as shown in the table. 1. Fletcher (1995) reported that there was a significant correlation between muscle pH and spoilage of meat. Beef normally reaches its lowest pH value of 5.4 to 5.7 at 18-24 hours after slaughter. After the lowest pH level is reached, the pH starts to rise again slowly but steadily. By the time it reaches a pH of 6.7 beef starts spoilage. The Ideal range pH value of meat was 5.8 to 6.3. The present results observed were almost within the range of normal values. The ERV values observed for the collected samples varied between 19 – 31ml and found that the overall mean was 26 ml as shown in the table 1. These results are in agreement with Leora et al., (1970) who assessed the bacterial Spoilage of Fresh Beef and Jay & Kontou (1964) who found that fresh beef of good organoleptic quality, with a relatively low bacterial number releases large volumes of extract (high ERV), whereas beef in the process of microbial spoilage with a higher bacterial number release less (low ERV) and the normal range of ERV for fresh meat reported was 21-35 ml.

Lipid per oxidation is one of the primary causes of quality deterioration in meat. Among meats, beef is the most susceptible to lipid per oxidation (Byung et al., 2008) and the minimum threshold value i.e., 1-2 mg malonaldehyde/kg meat (Watts, 1962). In the present study, observed a wide range of the 2-TBARS values between the samples (1.79 - 2.59) and found that the overall mean 2-TBARS value was 1.96 mg malonaldehyde/kg as shown in the table. 1. This might be due to auto-oxidation of lipids over a period of storage. Free fatty acid content can be considered as an indicator of lipid oxidation. According to the results, observed a wide range in the FFA values between the samples (0.92 - 2.15) and found that the overall mean FFA value was 1.52 as shown in the table. 1. In the present study the observed values of beef samples for lipid oxidation analysis were within the normal level. These results were in agreement with Byung et al., (2008) and Modi et al., (2006)

In the samples, the values of TPC ranged from 1.98 to 3.26 cfu/g and observed overall mean total plate counts were 2.48 cfu/g. The range of total coliform counts of beef samples obtained between 1.22 - 2.82 cfu/g while the overall mean values observed were 2.36 cfu/g. Psychrophiles and Yeast & moulds were not detected in 65% of the samples and detected only in 35% of the samples and observed mean scores were 1.98cfu/g and 0.54cfu/g respectively. This might be due to the meat is an excellent medium for microorganism growth. The microorganisms normally encountered on meat surface are distributed thoroughly into the meat and start reproducing when the conditions are favourable during storing and packaging, causing loss of product quality and creating potential health hazards (Gökmen and Alişarlı 2003; Başkaya et al. 2004). Similar results were shown by Ayten kimiran erdem et al., (2014) Kozačinski et al., (2006) in chicken Okonko et al. (2010), Roberts et al., 1980 in beef samples.

CONCLUSIONS

Beef samples collected from S.V. Zoological Park for quality evaluation were analysed and found that the beef supplied to the Zoo intended for feeding of carnivores were good in terms of physico chemical parameters but some inadequacy was observed in terms of microbial quality, this might be due to contamination due to either improper handling or delay in transportation from production point to the Zoo.

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Table 1: Mean Values for Physico Chemical and Microbiological Parameters of Beef Samples.

S.No.	Parameter	MEAN±SE
1.	WHC	55.0±0.044
2.	pH	6.13±0.021
3.	ERV	26.0±0.082
4.	2-TBARS	1.96±0.051
5.	FFA	1.52±0.038
6.	Total plate count	2.48±0.034
7.	Coliform count	2.36±0.062
8.	Psychrophilic count	1.98±0.092
9.	Yeast&Mould count	0.54±0.005