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# Quality assessment of chevon nuggets incorporated with green coffee extract

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**Abstract**
The objective was to investigate the effect of green coffee extract (GCE) on frozen chevon nugget quality. Thiobarbituric acid reactive substance (TBARS) and free fatty acid % (FFA) of treatment sample containing green coffee extract were significantly lower than controls ($P<0.05$) during storage at -18±2 $^{o}$C. The GCE treated chevon nuggets recorded significantly ($P<0.05$) superior score of sensory attributes than control. Green coffee extract could be recommended for shelf life extension and maintaining the physico-chemical and sensorial quality during the storage.

**Keywords:** Green coffee extract, free fatty acid and, TBA

## Introduction
Meat and meat products are essential components of the diet because it contains proteins, vitamins and minerals. In addition, meat is excellent diet source of iron, zinc, selenium, copper and vitamin B (Mulvihill, 2004; Biesalski, 2005) [12, 2]. Goat meat is considered as healthier meat because it is low in fat, saturated fatty acids and higher in unsaturated fatty acids, viz., linoleic and oleic acid (Dawkins *et al*., 1999) [5]. In recent years, special attention has been paid to a number of medicinal plants that could be used as potential sources of antioxidants for muscle food preservation and nutritional quality improvement (Contini *et al.*, 2014) [3]. Many herbs, spices, and their extracts have been added in variety of foods to improve their sensory characteristics and extend shelf-life.
Gomez-Ruiz *et al.* (2008) [7] observed that coffees with the highest amount of brown pigments (dark coffee) showed the highest peroxyl radical scavenging activity. These coffees also protect human low-density lipoprotein (LDL) against oxidation, although green coffee extracts showed more protection. Dziki *et al.* (2015) [6] reported that partial replacement of wheat flour in bread with up to 3% ground green coffee bean (GCB) powder gives satisfactory overall consumer acceptability and possessed higher antiradical activity than control samples.

## Materials and methods
### Meat and other ingredients
Deboned meat was purchased from a local market and cut into small pieces before mincing. Green coffee, refined salt, refined wheat flour and spice mix materials were purchased from the Jaipur local market. The fine pastes of onion, garlic, and ginger, in the ratio 3:1:1, were used to make the chevon nuggets. Reputable businesses like Sigma, Mark, SRL, and Hi-media, among others, provided the chemicals and media required for the product analysis. Lab prepared chevon nuggets were stored at temperature of –18±2 °C. Samples were taken at 15 day intervals for physico-chemical and sensory property examination. The analysis was kept going for 15, 30, 45, and 60 days while being stored frozen.

### Analytical Procedure
### Extract preparation
The dried grape seed was sieved after being ground in a grinder and air-dried for two hours at 50 °C in a hot air oven. An ether extraction assembly and 70% ethanol were used to obtain the extracts. In a rotary vacuum evaporator, the extract was collected and concentrated until semi-solid consistency was reached (Labconco corporation, USA). The semisolid material was air dried to produce solid bulk. In order to make 5 percent stock solutions (0.5g of dry extract/10ml), powdered components were reconstituted with the same extraction solvent and

stored at 4 °C for future use.

**Physico-chemical Parameters**

The method used by Witte *et al*. (1970) [18] to determine the TBARS value was used, and Koniecko's estimation for the FFA percent value was used (1979).

**Sensory Evaluation**

The sensory attributes viz. appearance, flavor, texture and overall acceptability of treatment and control were evaluated by using 9 point hedonic scale (Wichchukita and O'Mahonyc, 2014).

**Statistical Analysis**

Data hence obtained through the experiments were analyzed as per Snedecor and Cochran (1994) using Statistical Software Packages (SPSS 16.0).

**Results and discussion**

**Physico-chemical properties**

**TBA value**

Consistent increases in TBA values for treatment and control were seen during the storage period. During the storage period, the mean TBARS values were below the minimum threshold value of 1-2 mg malonaldehyde/kg meat (Watts, 1962, Kowale *et al.*, 2008) [16, 9]. At the conclusion of storage period treatments T (0.54±0.01 mg malonaldehyde/kg) have significantly lower TBA value than the control (0.60±0.01 mg malonaldehyde/kg) (Table 1). The TBARS value increased, which showed that secondary lipid oxidation products were formed. The current study found that introducing GCE to chevon nuggets helped to prevent the development of malonaldehyde.

This was in agreement with the findings of McCarthy *et al*. (2001) [10], Das *et al*. (2008) [4], Sayagao-Ayerdi *et al*. (2009), Alabdulkarim *et al*. (2012) [1], Teruel *et al*. (2015) [15], Nath *et al*. (2016) [13] and Meena *et al*. (2021) [11] who also discovered a similar increase in TBARS values during frozen storage of various meat products.

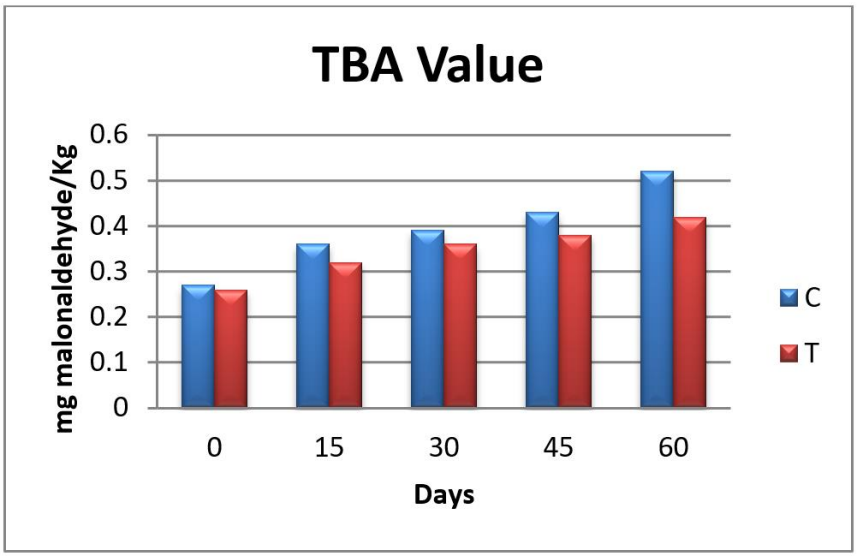
**Free fatty acid value**

The FFA values of the treatment was lower than the control throughout the storage period. At the end of storage period treatment T (0.26±0.00 % oleic acid) have significantly lower FFA value than the control (0.29±0.00 % oleic acid) (Table 1). Das *et al*. (2008) [4] discovered a comparable increase in FFA values during frozen storage in goat meat nuggets and reported that lipase activity causes an increase in FFA values in meat products during storage. Meena *et al*. (2021) [11] also reported increase in FFA values during frozen storage in chevon nuggets.

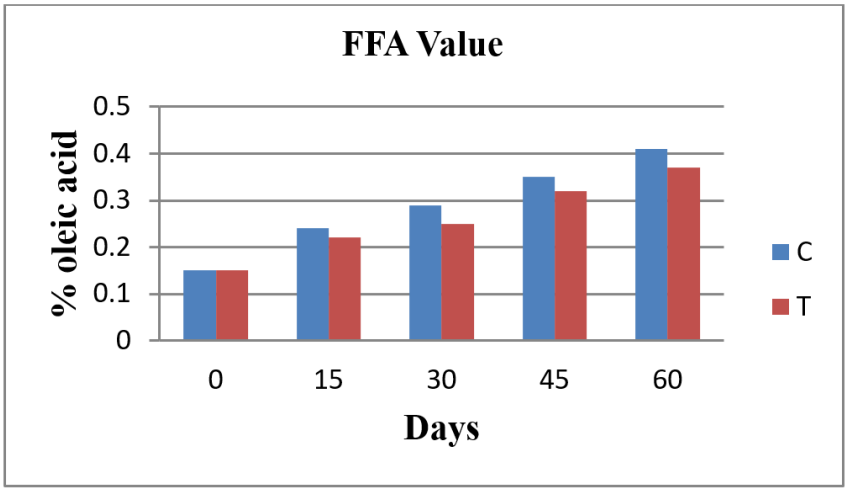
**Table 1:** Effect of green coffee extracts incorporation on physico-chemical properties of chevon nuggets during frozen storage (Mean±SE)

| Days/Group | 0 | 15 | 30 | 45 | 60 | Treatment Mean±SE |
|---|---|---|---|---|---|---|
| **TBARS** | | | | | | |
| C | $0.28\pm0.02^{g}$ | $0.46\pm0.01^{f}$ | $0.60\pm0.02^{d}$ | $0.75\pm0.03^{bc}$ | $0.94\pm0.06^{a}$ | $0.60\pm0.01^{A}$ |
| T | $0.28\pm0.01^{g}$ | $0.44\pm0.02^{f}$ | $0.50\pm0.04^{e}$ | $0.69\pm0.03^{c}$ | $0.81\pm0.01^{b}$ | $0.54\pm0.01^{B}$ |
| Days Mean±SE | $0.28\pm0.00^{T}$ | $0.45\pm0.00^{S}$ | $0.55\pm0.00^{R}$ | $0.72\pm0.00^{Q}$ | $0.87\pm0.00^{P}$ | |
| **Free fatty acid value** | | | | | | |
| C | $0.15\pm0.01^{f}$ | $0.24\pm0.02^{e}$ | $0.29\pm0.01^{d}$ | $0.35\pm0.01^{c}$ | $0.41\pm0.01^{a}$ | $0.29\pm0.00^{A}$ |
| T | $0.15\pm0.01^{f}$ | $0.22\pm0.01^{e}$ | $0.25\pm0.02^{e}$ | $0.32\pm0.02^{c}$ | $0.37\pm0.02^{b}$ | $0.26\pm0.00^{B}$ |
| Days Mean±SE | $0.15\pm0.01^{T}$ | $0.23\pm0.01^{S}$ | $0.27\pm0.01^{R}$ | $0.33\pm0.01^{Q}$ | $0.39\pm0.01^{P}$ | |

For each trait, means with different superscript within each column and each row differed highly significantly ($P<0.01$), significantly ($P<0.05$)
C=control, T= green coffee extract n=6 (for each treatment)




Effect of herbal extracts incorporation on TBA value of chevon nuggets




Effect of herbal extracts incorporation on free fatty acid value of chevon nuggets

**Sensory characteristics**

During frozen storage, GCE had a significant ($P$<0.05) impacton the flavour score of chevon nuggets (Table 2). The flavour score of the chevon nuggets treated with GCE was significantly ($P$<0.05) greater than the control. Additionally, Das *et al*. (2008) [4], Alabdulkarim *et al*. (2012) [1], Nath *et al*. (2016) [13], and Meena *et al*. (2021) [11] observed a decline in flavour scores with storage in various meat products.There were no significant effect of GCE on appearance and texture quality of chevon nuggets. Control samples overall acceptability scores were seen to fall throughout the full storage period. Throughout the storage period, the control product's scores were lower than those of the treated products (Table 2). Several studies, including Das *et al*. (2008) [4], Nath *et al*. (2016) [13], and Meena *et al*. (2021) [11], have noted a decline in the meat products overall acceptability scores during storage for goat meat nuggets, chicken nuggets and chevon nuggets, respectively.

**Table 2:** Effect of green coffee extracts incorporation on Sensory properties of chevon nuggets during frozen storage (Mean±SE)

| Days/Group | 0 | 15 | 30 | 45 | 60 | Treatment Mean±SE |
|---|---|---|---|---|---|---|
| **Appearance** | | | | | | |
| C | 6.80±0.08 | 6.88±0.04 | 6.86±0.13 | 6.93±0.12 | 6.86±0.13 | $6.87±0.05^{A}$ |
| T | 6.95±0.11 | 6.95±0.07 | 6.90±0.10 | 6.88±0.11 | 6.91±0.10 | $6.92±0.05^{A}$ |
| Days Mean±SE | $6.87±0.05^{P}$ | $6.91±0.05^{P}$ | $6.88±0.05^{P}$ | $6.90±0.13^{P}$ | $6.88±0.13^{P}$ | |
| **Flavor** | | | | | | |
| C | $6.80±0.05^{ab}$ | $6.56±0.04^{abc}$ | $6.28±0.03^{bcd}$ | $5.63±0.05^{ef}$ | $5.26±0.06^{f}$ | $6.11±0.02^{B}$ |
| T | $7.11±0.06^{a}$ | $6.88±0.04^{a}$ | $6.56±0.04^{abc}$ | $6.08±0.04^{cde}$ | $5.73±0.04^{def}$ | $6.47±0.02^{A}$ |
| Days Mean±SE | $6.95±0.13^{P}$ | $6.72±0.13^{PQ}$ | $6.42±0.13^{Q}$ | $5.85±0.13^{R}$ | $5.49±0.13^{R}$ | |
| **Texture** | | | | | | |
| C | 7.10±0.13 | 7.01±0.12 | 6.96±0.14 | 6.78±0.21 | 6.41±0.17 | $6.84±.09^{B}$ |
| T | 7.33±0.06 | 7.10±0.21 | 6.98±0.21 | 6.91±0.24 | 6.81±0.32 | $7.03±.09^{AB}$ |
| Days Mean±SE | $7.21±0.09^{P}$ | $7.05±0.09^{P}$ | $6.97±0.09^{PQ}$ | $6.84±0.09^{PQ}$ | $6.61±0.09^{Q}$ | |
| **Overall acceptability** | | | | | | |
| C | $7.08±0.07^{ab}$ | $6.81±0.03^{abc}$ | $6.38±0.03^{bcd}$ | $6.05±0.04^{de}$ | $5.48±0.03^{e}$ | $6.36±0.01^{B}$ |
| T | $7.46±0.03^{a}$ | $7.20±0.03^{a}$ | $6.88±0.04^{abc}$ | $6.28±0.03^{cd}$ | $5.70±0.05^{de}$ | $6.70±0.01^{A}$ |
| Days Mean±SE | $7.27±0.01^{P}$ | $7.00±0.01^{PQ}$ | $6.63±0.01^{QR}$ | $6.16±0.01^{R}$ | $5.59±0.01^{T}$ | |

For each trait, means with different superscript within each column and each row differed highly significantly ($P$<0.01), significantly ($P$<0.05) C=control, T= green coffee extract n=6 (for each treatment)

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