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Cost economics of chevon nuggets incorporated with green coffee and grape seed extracts

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Abstract

The present study was intended to standardize processing protocol of chevon nuggets with the incorporation of skim milk, flaxseed powder and with different antioxidants and to evaluate cost of production of final developed product. Three treatments were prepared with the incorporation of green coffee extract (T1), grape seed extract (T2) and their 1:1 combination (T3) in products by replacing of meat (1%) from formulation to evaluate economics of chevon nuggets. All treatment and control group were steam cooked for 34 min to make the product. In the cost economics, cost of formulation was found highest for group T1. The break-even point was estimated as Rs 705081.93 for control while Rs 793336.67, Rs 762783.95 and Rs 777760.37 for T1, T2 and T3 respectively. The cost benefit ratio was found highest for control and lowest for T1. The estimated details of economics of the developed product concluded that a viable enterprises can be established by keeping rate Rs 398 for control and Rs 423, Rs 411, Rs 416 for green coffee, grape seed, their 1:1 combination incorporated products respectively.

Keywords: Break-even point, cost benefit ration, flaxseed powder, grape seed, green coffee

Introduction

Diet and nutrition play important role in the promotion and maintenance of health throughout life. Chevon is a rich source of nutrients and micronutrients that are needed for good health throughout life. The percentage of saturated fat in goat meat is lower than chicken, beef, pork or lamb (Banskalieva *et al.*, 2000) [4]. Chevon is red meat that is almost universally acceptable and free from cultural, traditional, social and economic conditions (Xazela *et al.*, 2011) [13]. Economic pressure to minimize cost, maximize product utilization through value addition provides incentive for processing goat meat into consumer oriented convenience meat products (Agnihotri, 2000) [1]. Development of processed meat products involves the incorporation of non-meat ingredients or additives for enhancing the quality attributes, sensory profile and shelf life. Lipid oxidation and auto-oxidation are major causes of quality deterioration and reduced shelf life of meat products. This may produce changes in meat quality parameters such as colour, flavour, odour, texture and nutritional value (Fernandez, Perej-Alvarez and Fernandez-Lopez, 1997) [8]. The rate of oxidative deterioration or lipid oxidation can be reduced through various means like curing, vacuum packaging, modified atmosphere packaging and most importantly adding synthetic or natural antioxidants. Antioxidants can inhibit the oxidation process through breaking the oxidative free radical chain reaction, decomposing peroxides, deactivating singlet oxygen, chelating metal ions, absorbing ultraviolet radiation and scavenge oxygen (Shah *et al.*, 2014) [11]. Although synthetic antioxidants such as butylated hydroxytoluene (BHT) and butylated hydroxy anisole (BHA) have been used extensively, recent studies have implicated them to have toxic effects (Shahidi *et al.*, 1992) [12]. Due to the potential toxicological effects of synthetic antioxidants, the use of alternative natural additives has become widespread due to consumer demands. These findings together with consumer interest in natural food additives have reinforced the need for effective antioxidants from natural sources as an alternative to prevent deterioration of meat products during processing and storage. Herbs, spices, fruits and vegetables and their powders, oils and extracts were found to be a good source of natural antioxidants and antimicrobials to extend food quality and stability. There are a number of studies on the use of natural antioxidants in meat products and it appears that these antioxidants have been extracted from different plant parts such as leaves, roots, stems, fruits and seeds (Rather *et al.*, 2016) [10]. The extracts of rosemary, grape seed, ginger, cinnamon, garlic, pomegranate, broccoli, onion, myrtle, mint, nettle and green tea have

been widely studied for their antioxidant potential (Banerjee *et al.*, 2012) [3]. The antioxidant effect of Echinacea, Mysore thorn, mango seed, cranberry and strawberry, citrus peel, coffee, olive leaf, oregano, adzuki bean and carob fruits extracts were also investigated in broiler meat, beef patties, bologna type-mortodella, rabbit meat, raw chicken drumettes, pork patties, pork sausages (Falowo *et al.*, 2014) [7]. Grape seeds polyphenols extract was effective in terms of lowering TBARS in raw beef sausage (El Zainy *et al.*, 2016) [6]. Rababah *et al.* (2011) [9] found that green tea extract, commercial grape seed extract and TBHQ significantly decreased lipid oxidation of the goat meats. Grape seed extract, pine bark extract, oleoresin rosemary and synthetic antioxidants (BHA/BHT) delayed the formation of TBARS by 92%, 94%, 92% and 75%, respectively (Ahn *et al.*, 2007) [2]. Carpenter *et al.* (2007) [5] found that grape seed and bearberry extract decreased lipid oxidation in raw and cooked pork patties.

Material and method

Frozen chevon was partially thawed overnight, cut into small cubes and double minced with meat mincer. Meat emulsion was prepared in a bowl chopper (Hakimi, India). Pre-weighed quantity of minced chevon, salt, sodium tripolyphosphate and sodium nitrite were added and chopped for about 2-3 minutes. It was chopped again for 2 minutes after the addition of ice flakes. Animal fat was slowly incorporated while chopping till it was completely dispersed in the batter. Refined wheat flour, condiment paste, dry spice mix, and other ingredients viz: skim milk powder, flaxseed powder, sugar, green coffee and grape seed extracts were added. Chopping was continued till uniform dispersion of all the ingredients and desired consistency of the emulsion was achieved. Weighed quantity of emulsion was taken and filled in stainless steel mould. Mould was covered with lid and tied with thread and steam cooked for 34 minutes. Core temperature of cooked blocks was recorded by using probe thermometer that should reach to 73°C. Chevon meat block obtained was sliced and cut into pieces to get nuggets.

Formulas used for estimation of economics of the products

Cost of production for 100 Kg chevon nuggets = Cost of formulation + cost of overhead production

Cost of overhead production= Daily depreciation cost + Rent of building + Labour cost+ Cost of electricity + Maintenance cost + Water charge + Cost of packaging

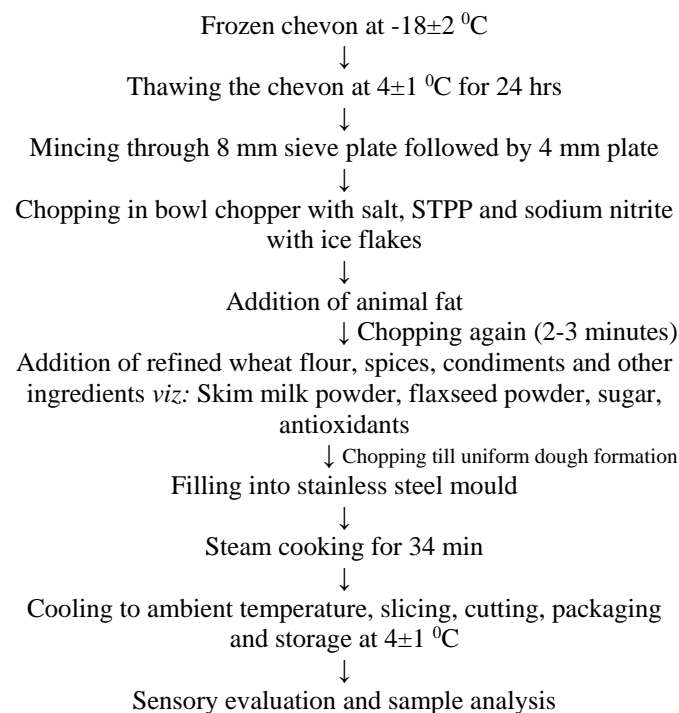
Cost for 1 kg chevon nuggets = (Production cost of 100 Kg formulation/% cooking yield)

Income = total sale price - total cost of production

Break-Even point = Fixed cost × Total sales/Total sales - Variable cost

Cost-benefit ratio= Total profit/Total cost of production
Net profit/day = Total profit- amount of loan payment/day

Flow diagram for preparation of chevon nuggets



Result and discussion

The total cost of formulation for spice mix. was calculated Rs 400 /kg are mentioned in the Table 1. The equipment cost required during this work is cited in the Table 2 and their annual depreciation was calculated as Rs 27,750 /Annum on the basis of 10% annual rate of depreciation.

Table 1: Spice mix used in preparation of chevon nuggets

| S. No. | Ingredients | Per cent in mix |
|--------|----------------------------|-----------------|
| 1 | Aniseed (Soanf) | 10 |
| 2 | Black pepper (Kalimirch) | 10 |
| 3 | Capsicum (Mirch powder) | 9 |
| 4 | Caraway seed (Ajwaen) | 11 |
| 5 | Cardamom (Bada Elaichi) | 5 |
| 6 | Cinnamon (Dal Chini) | 5 |
| 7 | Cloves (Laung) | 3 |
| 8 | Coriander powder (Dhaniya) | 13 |
| 9 | Cumin seed (Jeera) | 15 |
| 10 | Turmeric (Haldi) | 05 |
| 11 | Nutmeg (Jaiphal) | 1 |
| 12 | Dried ginger | 13 |
| | Total | 100 |

Table 2: Fixed expenditure for chevon nuggets

| Equipments | Price (in rupee) |
|-------------------------|------------------|
| Meat mincer | 60,000 |
| Steam cooker | 8,000 |
| Refrigerator (2) | 50,000 |
| Deep freezer | 40000 |
| Bowl chopper | 100000 |
| Balance | 1500 |
| Furniture | 6,000 |
| Grinder | 4000 |
| Packaging machine | 3000 |
| Miscellaneous | 5000 |
| Total fixed expenditure | Rs 2,77,500 |

The overhead production cost of 100 kg product was mentioned in Table 3 which includes daily depreciation cost,

rent on building per day, labour cost, electricity cost, maintenance cost, water charge and packaging cost.

Table 3: The overhead production cost of 100 kg chevon nuggets

| Sl. No. | Ingredients | Per cent in mix |
|---------|--------------------------------------------------------|---------------------------------------------------------------------------------|
| 1 | Annual depreciation Daily depreciation cost per day | @ 10% = Rs 27,750 /Annum @ 25 working day = Rs 77.08 /day |
| 2 | Rent of building Money paid for rent per day | Rs 3500 /month @ Rs 25 working days /month = Rs 140 /day |
| 3 | Labour cost:- Trained labour Untrained labour | @ Rs 300 (2) = Rs 600 /day @ Rs 250 (3) = Rs 750 /day Total= Rs 1350 /day |
| 4 | Cost of electricity | Rs 45 unit @ 8.00/Unit= Rs 360 /day |
| 5 | Maintenance | Rs 100 /day |
| 6 | Water charge (approx) | Rs 30 /day |
| 7 | Cost of packaging | @ Rs 1.25/Package= Rs 500 /day |

The formulation cost for 100 kg product was calculated of all the product groups presented in Table 4. It was found that the cost of production of 100 kg product for control group Rs 32,070. Cost of production for antioxidant treated group, i.e. for T1, T2 and T3 were Rs 34,570, Rs 33,770 and Rs 34,170 respectively.

Table 4: Formulation cost for 100 kg chevon nuggets

| Ingredients | (in rupees) | | | |
|-------------------------------|-------------|---------------------|---------------------|---------------------|
| | C (Rs) | T ₁ (Rs) | T ₂ (Rs) | T ₃ (Rs) |
| Meat | 26,400 | 26,000 | 26,000 | 26,000 |
| Fat (8%) | 1600 | 1600 | 1600 | 1600 |
| Ice (10%) | 20 | 20 | 20 | 20 |
| Salt (1.2%) | 19.2 | 19.2 | 19.2 | 19.2 |
| Sodium Nitrite (.02%) | 4 | 4 | 4 | 4 |
| STPP (0.5%) | 350 | 350 | 350 | 350 |
| Condiment (3.5%) | 140 | 140 | 140 | 140 |
| Sugar (0.5%) | 20 | 20 | 20 | 20 |
| Skim Milk Powder (2%) | 600 | 600 | 600 | 600 |
| Maida (3.5%) | 105 | 105 | 105 | 105 |
| Flaxseed powder (3%) | 2100 | 2100 | 2100 | 2100 |
| Grape Seed (1%) | - | - | 2100 | - |
| Green Coffee (1%) | - | 2900 | - | - |
| Grape seed +green coffee(1:1) | - | - | - | 2500 |
| Spice Mix (1.78%) | 712 | 712 | 712 | 712 |
| Total | 32,070 | 34,570 | 33,770 | 34,170 |

Per day expenditure cost for 100 kg product was calculated for all the treated and control group are presented in Table 5. It was estimated that per day expenditure cost for the control group was Rs 34,627.08 and antioxidant treated groups, i.e. for T1, T2 and T3 were Rs 37,127.08, Rs 36,327.08 and Rs 36,727.08 respectively.

Table 5: Per day expenditure for 100 kg chevon nuggets

| Groups | C (Rs) | T ₁ (Rs) | T ₂ (Rs) | T ₃ (Rs) |
|-------------------------------------------------|-----------|---------------------|---------------------|---------------------|
| Rent | 140 | 140 | 140 | 140 |
| Depreciation | 77.08 | 77.08 | 77.08 | 77.08 |
| Labour charge | 1350 | 1350 | 1350 | 1350 |
| Electricity | 360 | 360 | 360 | 360 |
| Maintenance | 100 | 100 | 100 | 100 |
| Water charge | 30 | 30 | 30 | 30 |
| Packaging | 500 | 500 | 500 | 500 |
| Total cost of production for 100 kg formulation | 34,627.08 | 37,127.08 | 36,327.08 | 36,727.08 |
| Rate for 1 Kg formulation | 398 | 423 | 411 | 416 |

Profit @ 35% = Rs 148

MRP on the product = Rs 571

Total profit and income from sale of product was calculated of all the product groups presented in Table 6 and it was around Rs 17300/day, Rs 14800/day, Rs 16000 and 15500 for control, T1, T2 and T3 groups respectively.

Table 6: Income and total profit from control and herbal extract incorporated chevon nuggets

| Groups | C (Rs) | T ₁ (Rs) | T ₂ (Rs) | T ₃ (Rs) |
|------------------|--------|---------------------|---------------------|---------------------|
| Income/Kg | 173 | 148 | 160 | 155 |
| Income/100 Kg | 17300 | 14800 | 16000 | 15500 |
| Total profit/day | 17300 | 14800 | 16000 | 15500 |

The total project cost of the product was calculated by summation of the fixed cost and variable cost in Table 7 and was it calculated as Rs 3,12,127.08, Rs 3,14,627.08, Rs 3,13,827.08 and Rs 3,14,227.08 for control, T1, T2 and T3 groups respectively.

Table 7: Calculation of variable cost and total project cost for control and herbal extract incorporated chevon nuggets

| Groups | Fixed cost (Rs) | Variable cost (Rs) | Total project cost (Rs) |
|----------------|-----------------|--------------------|-------------------------|
| C | 277500 | 34,627.08 | 3,12,127.08 |
| T ₁ | 277500 | 37,127.08 | 3,14,627.08 |
| T ₂ | 277500 | 36,327.08 | 3,13,827.08 |
| T ₃ | 277500 | 36,727.08 | 3,14,227.08 |

Total project cost = Rs 400000

Loan amount = Rs 340000

Margin money = Rs 60,000

Amount of interest @ 12% /annum = Rs 40,800

Amount of loan payment/month = 3400 (for 12 months month only)

Amount of loan payment/day = Rs 136

The break-even point for control and antioxidant extracts incorporated product was calculated in Table 9 and it was estimated around Rs 705081.93 for control, Rs 793336.67, Rs 762783.95 and Rs 777760.37 for T1, T2 and T3 groups respectively. The maximum cost benefit ratio was found for control and T2 groups due to lowest formulation cost. The overall cost for the production of 1 kg of chevon nuggets incorporated with herbal extract was Rs 423 for T₁, Rs 411 for T₂, Rs 416 for T₃ and Rs 398 for control. It can be suggested from the study that the development and adaptation of the technology by the entrepreneurs as a liveness proposal for profitable speculation and hence has an ample opportunity for the employment generations.

Table 9: Calculation of break even point and cost benefit ratio for control and herbal extracts incorporated chevon nuggets

| Group | Break Even Point | Cost benefit ratio |
|----------------|---------------------------------------------------------|--------------------------------|
| C | $277500 \times 57,100 / 57,100 - 34,627.08 = 705081.93$ | $17300 / 39800 = 0.434$ or 44% |
| T ₁ | $277500 \times 57,100 / 57,100 - 37,127.08 = 793336.67$ | $14800 / 42300 = 0.349$ or 35% |
| T ₂ | $277500 \times 57,100 / 57,100 - 36,327.08 = 762783.95$ | $16000 / 41100 = 0.389$ or 39% |
| T ₃ | $277500 \times 57,100 / 57,100 - 36,727.08 = 777760.37$ | $15500 / 41600 = 0.372$ or 37% |

The overall cost for the production of 1 kg of chevon nuggets incorporated with herbal extract was Rs 423 for T₁, Rs 411 for T₂, Rs 416 for T₃ and Rs 398 for control.

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