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Cost economics of chevon patties incorporated with fenugreek and jamun seed extracts

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Abstract
The present study was intended to standardize processing protocol of chevon patties with the incorporation of egg albumin, skim milk powder and with different antioxidants and to evaluate cost of production of final developed product. Three treatments were prepared with the incorporation of jamun seed extract (T1), fenugreek seed extract (T2) and their 1:1 combination (T3) in products by replacing of meat (1%) from formulation to evaluate economics of chevon patties. All treatment and control group were oven 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 239413.75for control while Rs 238713.75, Rs 239093.75 and Rs 238903.75 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 viable enterprises can be established by keeping rate Rs 437 for control and Rs 443, Rs 439, Rs 438 for jamun seed, fenugreek seed, their 1:1 combination incorporated products respectively.

Keywords: Break-even point, cost benefit ration, egg albumin, jamun seed, fenugreek

Introduction
Chevon is a type of red meat which often viewed as potential competitor to beef and sheep meat. Its attributes meet the present-day consumer demands i.e. leaner, nutritious and heart healthy meat products (Gadiyaram and Kannan, 2004; Webb *et al*., 2005) [5, 13]. Chevon is almost universally acceptable and free from culture, tradition, social and economic conditions (Webb *et al*., 2005; Xazela *et al*., 2011) [13, 14]. According to Kadim and Mahgoub (2003) [7], chevon and its product are considered as high-quality meat products on sensory basis by the trained panellists. Some of the comminuted products developed from chevon i.e. kabab, nuggets, sausages, low fat chevon loaves, chevon patties etc. Among them, because of their convenience and versatility, the patties are emerging as one of the main entries in the meat based food market. Patty one of the popular comminuted meat products have higher degree of preference among the consumers due to its typical characteristics such as flavour and pronounced chew ability (Keeton, 1983; Berry and Leddy, 1984) [8, 6]. Meat products typically spoil due to one of the two major causes, microbial growth or chemical deterioration during storage. The most common form of chemical deterioration in meat is oxidative rancidity, ranging from extensive flavour changes, colour losses and structural damage to proteins to a more subtle ‘‘loss of freshness’’ that discourages repeat purchases by consumers. 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) [12]. In industrial processing, mainly synthetic antioxidants such as butylated hydroxyl anisole (BHA) and butylated hydroxyl toluene (BHT) are used to prolong the storage stability of meat products. However, increasing concerns over the safety of synthetic food additives have resulted in a trend towards ‘‘natural products’’. As a result, the industry faces a challenge to find effective antioxidants from natural sources to prevent deterioration in meat and meat products during processing and storage. Natural antioxidants extracted from herbs and spices exhibit various degrees of efficacy when used in different food applications (Bowser *et al.*, 2014) [3].

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) [11]. Phyto-chemicals particularly from, oregano, grape seed, fenugreek, sage, green tea, pine bark, jamun seed, pomegranate, nettle, broccoli, mint, ginger, clove cinnamon and thyme etc. are being used as dietary antioxidants in different livestock products.

The seed and leaf extract of *Syzygium cumini* effective in terms of showing significant source of natural antioxidants (Nair *et al.,* 2013). Haroon *et al*. (2015) [10, 6] found that aqueous and ethyl extracts of *Syzygium cumini* possess considerable antioxidant and radical scavenging properties. Fenugreek seed extract was effective in terms of lowering TBARS in poultry meat and meat products and could be successfully added to meat to function as antioxidant (Devatkal *et al.,* 2012) [4]. According to Manasour *et al.* (2000) [9] additions of freeze-dried extracts from fenugreek seeds (at 500 ppm) to beef patties were found to be effective in retarding rancid odor, TBA, and color change. Biswas *et al.* (2003) [2] founded that the addition of antioxidants simultaneously in both batter mix and the meat mix have some beneficial effect on TBA values, microbial qualities and few sensory parameters which significantly increased the quality and shelf life of precooked pork patties.

Material and Method

Frozen chevon was partially thawed overnight, cut into small cubes and double minced with meat mincer. Patty mixture was prepared in a meat mixer. Pre-weighed quantity of minced chevon, salt, sodium tripolyphosphate and sodium nitrite were added in meat mixer and mixed for about 2-3 minutes. Egg albumin, condiment paste, dry spice mix, and other ingredients viz: skim milk powder, jamun and fenugreek seed extracts were added. Mixing was continued till uniform dispersion of all the ingredients and desired consistency of the mixture was achieved. Weighed quantity of emulsion was taken, patties moulded in shape and cooked in hot air oven at 180°C for 30 minutes. Core temperature of cooked patties was recorded by using probe thermometer that should reach to 80°C.

Formulas used for estimation of economics of the products

Cost of production for 100 Kg ground chevon patties = 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 ground chevon patties = (Production cost of 100 Kg formulation/% cooking yield)

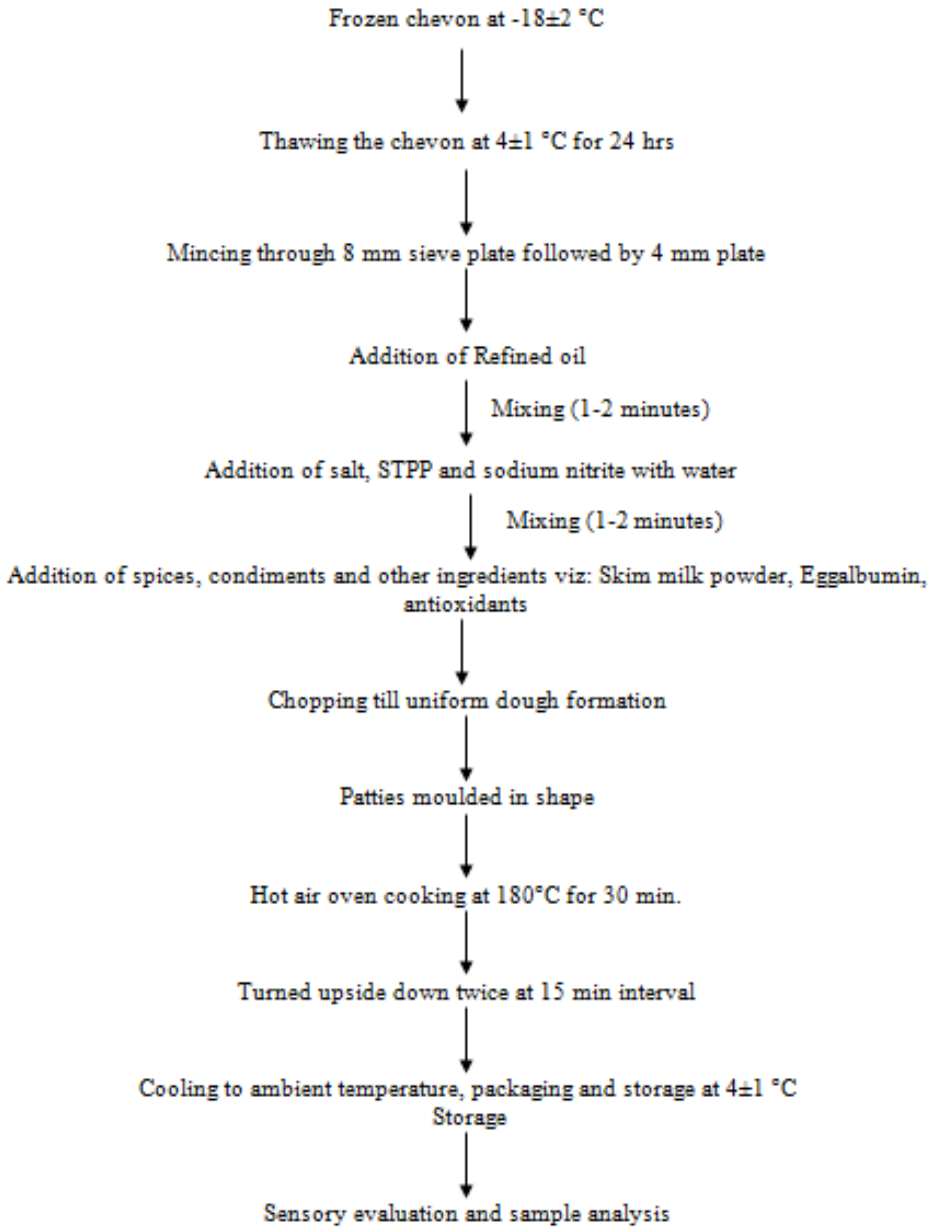
Income = total sale price - total cost of production

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 ground chevon patties



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 deprecation was calculated as Rs. 27450/Annum on the basis of 10% annual rate of depreciation. 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.

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. 32,530. Cost of production for antioxidant treated group, i.e. for T1, T2 and T3 were Rs. 33,230Rs. 32,850 and Rs. 33,040 respectively. 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. 35086.25and antioxidant treated groups, i.e. for T1, T2 and T3 were Rs. 35786.25, Rs. 35406.25 and Rs. 35596.25 respectively. Total profit and income from sale of product was calculated of all the product groups presented in Table 6 and it was around Rs. 16100/day, Rs. 15500/day, Rs. 15900 and 16000 for control, T1, T2 and T3 groups respectively.

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, 09, 586.25, Rs. 3,10, 286.25, Rs. 3, 09, 906.25 and Rs. 3, 10, 096.25 for control, T1, T2 and T3 groups respectively.

The break-even point for control and antioxidant extracts incorporated product was calculated in Table 9 and it was estimated around Rs. 239413.75 for control, Rs. 238713.75, Rs. 239093.75 and Rs. 238903.75 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 fish patties incorporated with peel extract was Rs. 443 for T1, Rs. 439 for T2, Rs. 438 for T3 and Rs. 437 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.

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Table 1: Spice mix used in preparation of ground chevon patties

Sl. No.	Ingredients	Percent in mix
1	Aniseed (Soanf)	10
2	Black pepper (Kalimirch)	20
3	Capsicum (Mirch powder)	8
4	Caraway seed (Ajwaen)	10
5	Cardamom (Bada Elaichi)	5
6	Cinnamon (Dar Chini)	5
7	Cloves (Laung)	3
8	Coriander powder (Dhaniya)	17
9	Cumin seed (Jeera)	10
10	Mace (Javitri)	1
11	Nutmeg (Jaiphal)	1
12	Dried ginger	10
	Total	100

Table 2: Fixed expenditure for ground chevon patties

Equipments	Price (in rupee)
Meat mincer	60,000
Refrigerator	50,000
Deep Freezer	40,000
Oven	75,000
Paddle mixer	30,000
Balance	1500
Furniture	6,000
Grinder	4000
Packaging machine	3000
Miscellaneous	5000
Total fixed expenditure	₹ 2,74,500

Table 3: The overhead production cost of 100 kg ground chevon patties

S. No.	Ingredients	Per cent in mix
1	Annual depreciation Daily depreciation cost per day	@ 10% = ₹ 27450/Annum @ 25 working day = ₹76.25 /day
2	Rent of building Money paid for rent per day	₹ 3500 /month @₹ 25 working days /month = ₹ 140 /day
3	Labour cost:- Trained labour Untrained labour	@ ₹ 300 (2)= ₹ 600 /day @ ₹ 250 (3) = ₹ 750 /day Total= ₹1350 /day
4	Cost of electricity	₹ 45 unit @ 8.00/Unit= ₹ 360 /day
5	Maintenance	₹ 100 /day
6	Water charge (approx)	₹ 30 /day
7	Cost of packaging	@ ₹ 1.25/Packet= ₹ 500 /day

Table 4: Formulation cost for 100 kg ground chevon patties

Ingredients	(in rupees)			
	C (₹)	T_1 (₹)	T_2 (₹)	T_3 (₹)
Meat (76%)	29,600	29,200	29,520	29,360
Egg albumin (1%)	100	100	100	100
Skim milk powder (2%)	600	600	600	600
Jamun seed (1%)	-	1100	-	-
Fenugreek seed (0.20%)	-	-	400	-
Jamun+Fenugreek (0.60%)	-	-	-	750
Vegitable oil (12.8%)	1200	1200	1200	1200
Spice mix (1.5%)	600	600	600	600
Condiments (3%)	120	120	120	120
Table salt (1%)	16	16	16	16
Sodium nitrite (0.02%)	4	4	4	4
STPP (0.4%)	280	280	280	280
Water (5%)	10	10	10	10
Total	32,530	33,230	32,850	33,040

Table 5: Per day expenditure for 100 kg ground chevon patties

Groups	C (₹)	T_1 (₹)	T_2 (₹)	T_3 (₹)
Rent	140	140	140	140
Depreciation	76.25	76.25	76.25	76.25
Labor 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	35086.25	35786.25	35406.25	35596.25
Cost of production for 1 Kg formulation	437	443	439	438

Profit @ 35% = ₹ 155
MRP on the product = ₹ 598

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

Groups	C (₹)	T_1 (₹)	T_2 (₹)	T_3 (₹)
Income/Kg	161	155	159	160
Income/100 Kg	16100	15500	15900	16000
Total profit/day	16100	15500	15900	16000

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

Groups	Fixed cost (₹)	Variable cost (₹)	Total project cost (₹)
C	2,74,500	35086.25	3,09,586.25
T_1	2,74,500	35786.25	3,10,286.25
T_2	2,74,500	35406.25	3,09,906.25
T_3	2,74,500	35596.25	3,10,096.25

Total project cost = ₹ 400000
Loan amount = ₹ 345000
Margin money= ₹ 75,000
Amount of interest @12% /annum= ₹ 41,400
Amount of loan payment/month= 3450 (for 12 months month only)
Amount of loan payment/day = ₹ 138

Table 8: Net profit/day after payment of loan control and herbal extract incorporated ground chevon patties

Group	Total sales/day (₹)	Variable Cost (₹)	Total cost of production/day (₹)	Net profit/day (After payment of loan 138day) (₹)
C	59,800	35086.25	43700	15962
T_1	59,800	35786.25	44300	15362
T_2	59,800	35406.25	43900	15762
T_3	59,800	35596.25	43800	15862

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

Group	Break Even Point	Cost benefit ratio
C	274500×59800/59800-35086.25 = 239413.75	16100/43700=0.368 or 37%
T_1	274500×59800/59800-35786.25 = 238713.75	15500/44300=0.349 or 35%
T_2	274500×59800/59800-35406.25 = 239093.75	15900/43900=0.362or 36%
T_3	274500×59800/59800-35596.25 = 238903.75	16000/43800=0.365 or 36.5%

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