



SHORT COMMUNICATION

Production Cost of Mutton Nuggets Developed by Incorporating Flaxseed Flour, Blend of Essential Oils and their Selected Combinations

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ABSTRACT

In the present study, production cost of mutton nuggets formulated with pre-optimized level of flaxseed flour (8%) (T-1), blend of essential oils (0.25%) (T-2) and their selected combination (4% flaxseed flour + 0.25% blend of essential oils) (T-3) were studied in comparison to that of the control. Optimization of levels for flaxseed flour and blend of essential oils was done under different experiments based on sensory attributes and those having sensory status closer to control were selected. It was found that the production cost of 1 kg product was ₹ 428.16, 392.41, 436.01 and 418.16 for control, flaxseed, essential oil (EO) and combination of flaxseed and essential oil incorporated mutton nuggets, respectively. Thus, it was concluded that formulation with 8% flaxseed flour at the cost of lean meat was most economic among the various other combinations.

Keywords: Mutton nuggets, essential oils, cost production, economic cost

Besides the nutritive value and sensory acceptability of meat product, economics is also very important criterion that determines the marketability of any product (Sharma *et al.*, 2013). Now days, direct linkages have been established between food nutrition and human health and consumers are becoming more and more aware and conscious about quality food product. It creates the demand of holistic approach for manufacturers and processors to develop variety of meat products and make the availability of quality protein sources by reducing the cost of formulated products. Processing of mutton to different value added products not only unlocks the avenues for not only its judicious utilization but, in addition to this, it also acts as a readily available animal protein sources for poor. Emphasis over food processing and economic formulation has made it necessary to do the needful work in this direction (Kumar *et al.*, 2014). Reduction in the cost of meat products by its replacement with economic non-meat ingredients has been in practice since long back (Huang *et al.*, 2005; Yilmaz and Daglioglu, 2003).

Processed meats which are minced and cooked are susceptible to accelerated lipid oxidation and it is one of the main factors responsible for loss of quality of meat products besides microbiological deterioration (Rhee, 1989; Singh, 1996). The process of food (fat) oxidation produces a rancid flavour and decreases the sensory scores and nutritive value of the products, thus making them unacceptable to consumers (Belitz *et al.*, 2009).

Thus, in order to improve the quality and shelf life of meat products, use of antioxidants and antimicrobial agents has been tried. Consumers have also rejected synthetic antioxidants because of their carcinogenicity (Kumar *et al.*, 2017; Sharma *et al.*, 2017), leading to notable increase in use of natural additives, especially of plant origin. Application of natural anti-oxidants is believed to be essential to inhibit or delay the lipid oxidation reaction in meat and meat products (Falowo *et al.*, 2014).

Thus, the present study was envisaged to develop mutton nuggets and production cost of flaxseed flour, blend of

essential oils and their combination incorporated mutton nuggets were determined and compared with control.

Mutton was procured from slaughter of adult sheep (irrespective of breed and sex) of age group 1-2 years from experimental abattoir of Division of Livestock Products Technology, Indian Veterinary Research Institute, Izatnagar. All the chemicals used were of analytical grade and obtained from standard firms (Qualigen, Hi-Media, Sdefine etc.). Food grade essential oils were procured from commercial suppliers. Refined salt (Tata Chemicals Ltd., Mumbai), refined wheat flour (maida), onion, garlic, spice mix and flaxseed were purchased from local market of Bareilly.

The frozen mutton was partially thawed at refrigeration temperature (4 ± 1 °C) for about 16-18 hours and cut into small cubes. For the treatment, blend of essential oil (clove oil+ cassia oil+holybasil oil+thyme oil+ajowan oil + beetal oil) were applied on surface of thawed meat cubes and kept for half an hour in a desiccators for complete absorption of oil in meat. Then the meat for control sample and treated samples were double minced with Electrolux meat mincer (Meat Mincer TC12I, China) separately. Pre-weighed quantity of minced mutton, salt, sodium tripolyphosphate,

and other non-meat ingredients were added and chopped for few minutes. Meat emulsion was prepared in a bowl chopper (Seydelmann K20, Ras, Germany). Emulsion was then filled in stainless steel mould. Mould was covered with lid and tied with thread and steam cooked for 40 minutes. Core temperature of cooked blocks was recorded by using probe thermometer that should reach to 72° C. Mutton meat block so obtained was sliced and cut into pieces to get nuggets.

While calculating the various costs involved in the production and processing of mutton nuggets, certain assumptions were made such as depreciation rate @10% per annum, present electricity charges @ ₹ 6/KWh and total of 300 annual working days.

The cost of raw materials is presented in Table 1. The essential equipments and accessories required for processing of mutton nuggets and approximate cost of processing and other machineries required for the preparation of 50 kg mutton nuggets was calculated as ₹ 41820 i.e. ₹ 140/day. The cost of electricity incurred for processing of 50 kg of mutton nuggets was calculated as $78.5 \times 6 = ₹ 471/$ day. The labor cost of one skilled person and two unskilled persons would be ₹ 300 per day and ₹ 400

Table 1: Comparative cost of raw materials for preparation of 100 Kg emulsion of control and treatment products

Ingredients	Rate Rs/ kg	Control		T-1		T-2		T-3	
		Qt. (Kg)	₹						
Lean mutton (Deboned)	500	72	36000	64	32000	72	36000	68	34000
Flaxseed (hydrated)	150	—	—	4	600	—	—	2	300
Blend of EOs	3000	—	—	—	—	0.250	750	0.250	750
Ice/ chilled water	2	10	20	14	28	10	20	12	24
Vegetable oil	85	8	680	8	680	8	680	8	680
Spice mix	400	1.5	600	1.5	600	1.5	600	1.5	600
Condiment mix. (Onion: garlic 3:1)	40	3.5	140	3.5	140	3.5	140	3.5	140
Refined wheat flour	20	3.0	60	3.0	60	3.0	60	3.0	60
Salt	20	1.6	32	1.6	32	1.6	32	1.6	32
STPP	700	0.4	280	0.4	280	0.4	280	0.4	280
Nitrite	200	0.015	3	0.015	3	0.015	3	0.015	3
Transportation cost	—	—	100	—	100	—	100	—	100
Total (Rs.)	—	—	37915	—	34523	—	38665	—	36969

T-1=8% hydrated flaxseed flour, T-2=0.25% selected blend of EOs and T-3= 0.25% selected blend of EOs+4% hydrated flaxseed flour

Table 2: Retail cost calculation of mutton nuggets

Parameter	Control	T-1	T-2	T-3
Cost of formulation (₹)	37915	34523	38665	36969
Overhead production cost (₹) (Total expenditure - Cost of formulation)	2756	2756	2756	2756
Total Input (₹)	40671	37279	41421	39725
Pragmatic Product yield (Kg)	95	95	95	95
Actual production cost per Kg product (₹)	428.16	392.41	436.01	418.16
Average gross Profit of the Producer (A gross profit of 12% is considered reasonable for the product) (₹)	51.38	47.09	52.32	50.18
Actual Retail cost of the products per kg (₹)	479.44	439.50	488.33	468.36
Retail cost of Nuggets per 200gm packet. (₹)	95.89	87.90	97.67	93.67
Approx cost per packet of 200gm (₹)	96	88	98	94

T-1=8% hydrated flaxseed flour, T-2=0.25% selected blend of EOs and T-3= 0.25% selected blend of EOs+4% hydrated flaxseed flour

per day respectively amounting to ₹ 700/day. Packaging cost, Premises rent and maintenance cost was calculated as ₹ 500/ day, ₹ 500/day and ₹ 300/day. The total input cost (cost of formulation + overhead production cost) for the production of control, flaxseed, selected blend of EOs and combination of flaxseed and EOs incorporated mutton nuggets from 100 kg meat batter was calculated as 40671, 37279, 41421 and 39725, respectively. The reduction in the cost of flaxseed and combination of flaxseed and EOs might be due to the replacement of lean meat with low cost flaxseed flour.

Considering the product yield (Kg) about 95% of each treatment along with control (Table 2), cost of 1 kg product can be calculated as : Cost of 1 kg product = Total expenditure/product yield. Therefore, the calculated production cost of 1 kg product was ₹ 428.16, 392.41, 436.01 and 418.16 for control, flaxseed, EOs and combination of flaxseed and EOs incorporated mutton nuggets respectively.

CONCLUSION

Results from this study revealed that an acceptable value added mutton product with Indian consumer appeal can be produced in the form of mutton nuggets incorporated with essential oil, flaxseed and their combination. Therefore,

on the basis of production cost, 8% incorporation of flaxseed flour and combination of essential oil (0.25%) and flaxseed flour (4%) can be successfully incorporated in mutton nuggets.

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