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Development and Cost Economics of Chicken Powder Incorporated Shelf Stable Fried Snack Prepared from Spent Hen Meat with Rosemary and Betel Leaves Extract

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A B S T R A C T

The purpose of the study was undertaken to standardize processing protocol of fried snack and to evaluate economics of the developed product. Three treatments were prepared with incorporation of rosemary extract (T_1), betel extract (T_2) and their 1:1 combination (T_3) in product by replacing amount (3%) of chicken powder from formulation to evaluate economics of the fried snack. All treatments and control group were deep fried at 190^0C for 45 sec. to make the product. In the cost economics, cost of formulation was found highest for group T_2. Maximum total net profit was found for control followed by T_2, T_4 and T_1. The break-even point was estimated as ₹ 14,31,707.37 for control while ₹ 24,96,454.21, ₹ 16,33,154.67 and 21,88,047.71 for T_1, T_2 and T_3 respectively. The cost benefits ratio was found highest for control and T_3 whereas lowest for T_1. The estimated details of economics of the developed product concluded that a viable enterprise can be established by keeping rate ₹ 261, ₹ 241, ₹ 260 and ₹ 230 for rosemary extract, betel extract, their 1:1 combination incorporated product and control respectively.

Introduction

The poultry industry in India plays a foremost success story. Poultry population in India is around 729.21 million and it contributes 45% of total meat production in India (BAHS, 2014).

Poultry industry, a vibrant and organized sector, play a key role in ensuring quality animal proteins at cheaper rate particularly through spent hen meat in India (FAO, 2006). Spent hen meat is high in fat and cholesterol content, less tender, less juicy and poor in functional characteristics due to increased cross linking in collagen, resulting in lower remunerative prices as compared to broiler meat. By standardizing appropriate and economic technology for processing, such underutilized meat may be converted into value-added meat products that are palatable and economically viable (Kumar *et al.*, 2015).

In India, snacks has been connected with social customs and been developed into culinary art; it is used as an accompaniment to meal, as a snack and croutons in soups (Talukder *et al.,* 2015). In the newly emerging era of fast and convenience foods, ready to eat foods are becoming increasingly popular. Traditional foods, particularly the snack foods are integral parts of food matrix, which have sustained the culinary heritage, cultural identity and shared values of people for many generations. Due to their nutritive and sensory qualities, a broad range of traditional food products from plant origins like bhujia are still consumed today and sold under various geographical indications. Bhujia is gram flour based, deep fried, shelf stable ready to eat salted snack with an opportunity to incorporate meat powder in its formulation.

Diversity of convenience/ready-to-cook/ready-to-serve chicken meat products such as kababs, tikkas, lollipops, fingers, nuggets, patties and sausages exist in the markets. Perishability of meat products has been regarded as a very serious problem, particularly in tropical countries like India, where household refrigeration facility is scanty (Kumar *et al.,* 2015). In the present era, the energy demand for food preservation and improving the safety of preserved foods vis-à-vis convenience, development of shelf stable products is highly desirable. The most common form of deterioration in shelf stable meat products is; oxidative rancidity, it's ranging from extensive flavor changes, color losses and structural damage to proteins leads to ''loss of freshness'' that discourages repeat purchases by consumers. The most efficient and practical way to prevent oxidative of meat products is to incorporate antioxidants into formulations. Antioxidants either synthetic or natural have become an indispensable group of food additives mainly because of their unique properties of enhancing the shelf life of food products without any damage to sensory or nutritional qualities (Nanditha and Prabhasankar, 2008). In industrial processing, mainly synthetic antioxidants such as butylated hydroxylanisole (BHA) and butylated hydroxyltoluene (BHT) are used to prolong the storage stability of meat products. However, increasing concerns over the safety of synthetic food additives has resulted in a trend towards ''natural products''. Natural antioxidants extracted from herbs and spices exhibit various degrees of efficacy when used in different food applications (Bowser *et al.,* 2014). Among natural antioxidant sources, rosemary (*Rosmarinus officinalis* L.) and its extract used as an antioxidant in different chicken meat products like frankfurters (Rinzar *et al.,* 2006) and patties (Naveena *et al.,* 2013). Further, betel (*Piper betel*) and its extract have been used in different food systems; however, reports of its use in meat products are very scanty.

Thus, the present study was undertaken to develop and literal economization of preparation cost of product from spent hen meat incorporated with rosemary and betel leaves extract.

Materials and Methods

Spent hen required for the experiments was obtained from local market and deboning was done manually in the laboratory. After the removal of the separable tissue and fat, meat was packed in colorless polyethylene bags and stored over-night at 4^{o}C in a refrigerator for conditioning and later on frozen at -18±1^{o}C for the subsequent use. Frozen meat was thawed at 4±1^{o}C for 24 hrs before use and cut into small pieces before grinding in a meat grinder.

Gram flour, refined oil, common salt and spices used in product formulation were procured from the local market. After removal of extraneous matter, all the spice ingredients

were dried in an oven at 50ºC for 2-3 hrs. The ingredients were ground in a grinder with a suitable blade and sieved through a fine mesh. The moisture content analyzed every hour until stable moisture content was obtained. Spice mix so obtained was incorporated into product formulations.

Methodology for preparation of product

The deboned frozen lean spent hen meat cubes were ground through 8 mm plate, followed by 4 mm plate in meat mincer (Nova Pvt. Ltd.). After mincing, meat was boiled in pressure cooker at 120°C for 15 min. The minced and pressure cooked chicken meat was dried in hot air oven for preparation of chicken powder at a temperature of 80^{o}C for 9 hrs. The chicken powder, gram flour, spice mix, table salt and 3% level of herbal (rosemary, betel and 1:1 combination of both herbs) extract were incorporated in final mix. Subsequently, the chicken broth was added to make the dough at approx. 40 per cent of the formulation and kept it for 10-15 min for conditioning.

Later on, the dough was filled in the vermicelli maker machine and the product was deep fried for 45 sec at the temperature of 190^{o}C for the preparation of product.

For the storage study herbal treated as well as control product stored up to two months at room temperature for physicochemical, microbiological and sensory evaluation.

Formulas used in the estimation of the economics of product as fallow

Cost of production for 100 Kg product = 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 product = (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

Results and Discussion

The total cost of formulation for spice mix. was calculated ₹ 395.05 /kg are mentioned in the Table 1. The total cost of production for chicken powder was calculated in Table 2. On the basis of the above observations cost of one kg chicken powder was around ₹ 450.30. The equipment cost required during this work is cited in the Table 3 and their annual deprecation was calculated as ₹ 39,250 /Annum on the basis of 10% annual rate of depreciation. The overhead production cost of 100 kg product was mentioned in Table 4 which include daily depreciation cost, rent on building per day, labour cost, electricity cost, maintenance cost, water charge and packaging cost, which was estimated around ₹ 2589.08/day.

The formulation cost for 100 kg product was calculated of all the product groups presented in Table 5. It was found that the cost of production of 100 kg product for control group ₹ 23,614.25. Cost of production for antioxidant treated group, i.e. for T_1, T_2 and T_3 were ₹ 27,835.25, ₹ 24,835.25 and ₹ 27,035.25 respectively. Per day expenditure cost for 100 kg product was calculated for all the treated and control group are presented in Table 6.

Table.1 Cost of formulation of spice mix used in fried snack

S.No.	Name of ingredients	Quantity (gm)	Rate/kg	Approx. cost
1	Aniseed (Soanf)	100	125	12.2
2	Black pepper (Kalimirch)	200	735	147
3	Capsicum (Mirch powder)	80	160	12.8
4	Caraway seed (Ajwaen)	100	195	19.5
5	Cardamom (Bada Elaichi)	50	1360	68
6	Cinnamon (Dal Chini)	50	180	9
7	Cloves (Laung)	30	1050	31.5
8	Coriander powder (Dhaniya)	170	150	25.5
9	Cumin seed (Jeera)	100	210	21
10	Mace (Javitri)	10	1050	10.50
11	Nutmeg (Jaiphal)	10	905	9.05
12	Dried ginger	100	290	29
Total		1000		395.05

Table.2 Cost of production for chicken powder

Heads	Cost
Price of live spent hen	40/kg
Dressing percentage (%)	65
Cost of 1 kg dressed carcass	40×100/65 = 61.53
Average recovery of Deboned meat (%)	55
Cost of 1 kg deboned meat	61.53×100/55 = 111.88/kg
Cost of 100 kg deboned meat	111.88×100 = 11,188/-
Cooking yield of meat powder	26%
Cost of meat powder	11,188/26 = 430.30
Drying charges	20/-
Total Cost of 1 kg meat powder	₹ 450.30

Table.3 Fixed expenditure (Equipments) cost for fried snack

Equipments	Price (in rupee)
Meat mincer	60,000
Steam cooker	8,000
Freezer (2)	50,000
Oven (3)	2,25,000
Paddle mixer	30,000
Balance	1500
Furniture	6,000
Grinder	4000
Packaging machine	3000
Miscellaneous	5000
Total fixed expenditure	₹ 3,92,500

Table.4 The overhead production cost of 100 kg fried snack

S.No.	Items	Cost (₹)
1	Annual depreciation Daily depreciation cost	@ 10% = ₹ 39,250 /Annum @ 25 working day = ₹ 109.02 /day
2	Rent of building 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	Electricity cost	@ ₹ 8.00/Unit Total used 45 unit = ₹ 360 /day
5	Maintenance cost	₹ 100 /day
6	Water charge (approx)	₹ 30 /day
7	Cost of packaging @ ₹ 1.25/Packet	₹ 500 /day
Total		₹ 2589.08/day

Table.5 Formulation cost for 100 kg fried snack

Ingredients	(in rupees)			
	C (₹)	T_1 (₹)	T_2 (₹)	T_3 (₹)
Meat powder (30%)	13,509	13,509	13,509	13,509
Gram flour (70%)	6300	6030	6030	6030
Rosemary (3%)	-	4500	-	-
Betel (3%)	-	-	1500	-
Rosemary+Betel (1:1)	-	-	-	3700
Vegetable oil (20%)	1800	1800	1800	1800
Spice mix (5%)	1975.25	1975.25	1975.25	1975.25
Table salt (1.5%)	30	30	30	30
Total	23,614.25	27,835.25	24,835.25	27,035.25

Table.6 Per day expenditure for 100 kg fried snack

Groups	C (₹)	T1 (₹)	T2 (₹)	T3 (₹)
Rent	140	140	140	140
Depreciation	109	109	109	109
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	26,203.25	30,424.25	27,424.25	29,624.25
Cost of production for 1 Kg formulation	230	267	241	260

Profit @ 35%= ₹ 94

MRP on the product= ₹ 361

Table.7 Income and total profit from control and rosemary extract (T1), betel extract (T2) and their 1:1 combination (T3) fried snack

Groups	C (₹)	T1 (₹)	T2 (₹)	T3 (₹)
Income/Kg	131	94	120	101
Income/100 Kg	13100	9400	12000	10100
Total profit/day	13100	9400	12000	10100

Table.8 Calculation of variable cost and total project cost for control and rosemary extract (T1), betel extract (T2) and their 1:1 combination (T3) fried snack fried snack

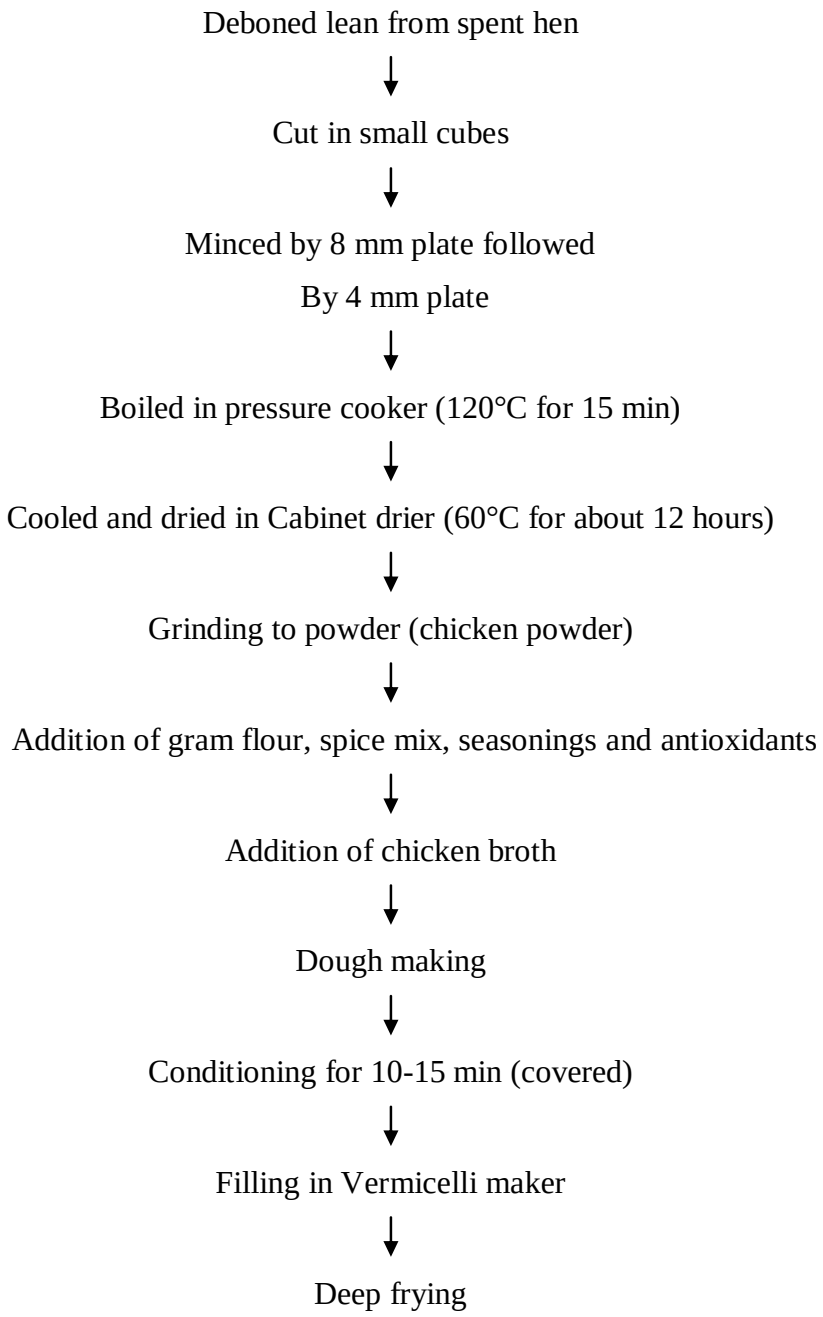
Groups	Fixed cost (₹)	Variable cost (₹)	Total project cost (₹)
C	3,92,500	26,203.25	4,18,703.25
T_1	3,92,500	30,424.25	4,22,924.25
T_2	3,92,500	27,424.25	4,19,924.25
T_3	3,92,500	29,624.25	4,22,124.25

Total project cost = ₹ 500000
Loan amount = ₹ 425000
Margin money= ₹ 75,000
Amount of interest @12% /annum= ₹ 51,000
Amount of loan payment/month= 4,250/12 (for 12 months month only)
Amount of loan payment/day = 4,250/25= ₹ 170

Table.9 Calculation of break-even point and cost benefit ratio for control and herbal extracts incorporated fried snack

Group	Break Even Point	Cost benefit ratio
C	3,92,500×36,100/36,100-26,203.25 = 14,31,707.37	13100/26,203.25=0.499 or 50%
T_1	3,92,500×36,100/36,100-30,424.25 = 24,96,454.21	9400/26700=0.355 or 35%
T_2	3,92,500×36,100/36,100-27,424.25=16,33,154.67	12000/24,100=0.497or 50%
T_3	3,92,500×36,100/36,100-29,624.25=21,88,047.71	10100/26000=0.388 or 39%

Flow diagram for preparation of chicken powder incorporated fried snack



It was estimated that per day expenditure cost for the control group was ₹ 26,203.25 and antioxidant treated groups, i.e. for T_1, T_2 and T_3 were ₹ 30,424.25, ₹ 27,424.25 and ₹ 29,624.25 respectively. Total profit and income from sale of product was calculated of all the product groups presented in Table 7 and it was around ₹ 13,100/day, ₹ 9400/day, ₹ 12,000 and 10,100 from control, T_1, T_2 and T_3 groups respectively. The total project cost of the product was calculated by summation of the fixed cost and variable cost in Table 8 and was it calculated as ₹ 4, 18,703.25, ₹ 4, 22,924.25, ₹ 4, 19,924.25 and ₹ 4, 22,124.25

for control, T_1, T_2 and T_3 groups respectively. The break-even point and cost benefit ratio for control and antioxidant extracts incorporated product was calculated in Table 9 and it was estimated around ₹ 14,31,707.37 for control, ₹ 24,96,454.21, ₹ 16,33,154.67 and ₹ 21,88,047.71 for T_1, T_2 and T_3 groups respectively. The maximum cost benefit ratio was found for control and T_3 groups due to lowest formulation cost.

A viable enterprise can be established in tropical countries such as India by keeping rates ₹ 261, ₹ 241, ₹ 260 and ₹ 230 for rosemary extract, betel extract, their 1:1 combination incorporated product and control respectively. 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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