Original Research

Development and Evaluation of Cost of Production of Instant Chicken Soup Mix Incorporated with Spent Hen Meat Shred

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Abstract

A study was undertaken to develop an 'instant chicken soup mix' incorporated with spent hen meat shred and to evaluate its cost of production. Four treatment soup mix combinations containing 0%, 20%, 25% and 30% meat shred were prepared and cost of production was evaluated. Cost of formulation was found to be highest for Treatment D followed by C, B and A. Net profit was found to be highest for Treatment D followed by C, B and A. Estimating the details of economics of the developed products, it can be concluded that a viable enterprise can be established by keeping the cost per kg as Rs. 273, Rs. 455, Rs. 500 and Rs. 546 for Treatment A, B, C and D respectively.

Key words: Cost Economics, Cost Benefit Ratio, Instant Soup Mix, Soup, Spent Hen Meat Powder

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Introduction

Soup is probably one of the oldest foods of human being, since it must have developed about the time when boiling was established as very fast form of cookery. Chicken soup is simple to prepare, relatively cheap, nutritious, easily digestible and highly cherished by young generation. For instance, it is regarded as the most ubiquitous medicinal soup in the world. Chicken soup might have anti-inflammatory activity, namely, the inhibition of neutrophil migration (Barbara *et al.*, 2000) and could hypothetically lead to temporary ease from symptoms of illness (Rennard *et al.*, 2000). Normally soups are consumed before meals to stimulate the appetite and flow of digestive juices in stomach. Chicken soup is often referred as "Jewish penicillin", "bohbymycetin" and "bobamycin" (Caroline and Schwartz, 1975; Saketkhoo *et al.*, 1978).

Convenience food sector is one of the largest growing segments of food industry throughout the world. Dry soup mixes are well recognized convenience food item in the world food markets. Instant soup mixes are

preferred by consumers because of their convenience in preparation, shelf stability and excellent appetizing property. Soup market in India was reported to be in the range of INR 100-125 crores in 2010 (Juse, 2012). The category of ready-to-cook soup mixes formed 25 percent of the instant food segments (Juse, 2012). The major brands in ready to cook soup mixes in Indian market are Knorr (Hindustan Uniliver), Maggi (Nestle), Ching's secret (Capital Foods), Bambino (Bambino Agro), Sil (Scandin Food), Campbell's (Weikfield Products) etc. Apart from good storage stability, nutritional and therapeutic properties, the increasing health consciousness amongst the population has led to increased popularity of instant soup mix all over the world.

The layer bird population of India was around 247 million in 2010 (Juse, 2012). Effective utilization of layer birds after the end of their productive life is one of the urgent requirements of the poultry industry as 30 percent of the poultry slaughtered are spent hens (Juse, 2012). Spent hen meat is a by-product of egg industry obtained from old and culled chicken, after productive and reproductive phase of life; which has high fat and cholesterol content, low tenderness, less juiciness and poor functional characteristics resulting in low acceptability and lower remunerative prices as compared to broiler meat (Saini, 2016). However its nutritional quality is similar to broiler meat (Chueachuaychoo *et al*., 2011). Improved deboning techniques and modern methods of meat processing could enhance the quality and value of meat from spent hens leading to greater demands and better financial returns (Kondaiah and Panda, 1992). Since spent layers are very cheap source of meat it can be used successfully in the formulation of many value added meat products (Kim and Ahn 1997). Thus, the present study was undertaken to develop and evaluate cost of production of instant soup mix incorporated with spent hen meat shred.

Materials and Methods

Raw Materials

Spent hens of commercial layer birds were obtained from Regional Poultry Breeding Farm, Kyrdemkulai, Ri Bhoi District, Meghalaya, India. Following ante-mortem examination, spent hens were slaughtered under humane and hygienic conditions, in the Department of Livestock Products Technology, College of Veterinary Science, Khanapara, Guwahati. The dressed carcasses were deboned manually following proper hygienic conditions. All visible fat, fascia and connective tissue were separated and trimmed off and the meat was minced through 6 mm plate in a meat mincer and packed in low density polyethylene (150µm thickness) bags and then kept at -18±2°C till further use. Refined salt (Tata Chemicals Ltd., Mumbai), corn flour (Amrut International), potato starch (Aksher Chem) and Mono sodium glutamate were procured from local market of Guwahati. Green chili and vegetable (bean, pea and carrot) were chopped after proper washing. Black pepper, onion and garlic were grinded in mixer grinder after peeling and washing. Drying was done in the solar dryer at 60°C until the water activity was reported below 0.3.

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Solar dryer was fabricated using wood consisting of a tray type drying chamber with heating filament and exhaust fan inside it; panel for collection of heat made up of glass and the interior covered with black paint coated over aluminium sheet, temperature control knob and air ventilation knob. A battery backup system was provided using a solar panel which charges a solar powered battery by converting solar energy through solar powered converter. The average temperature and relative humidity attained during peak hours of sunny days was 67°C and 22±2%. It took around 35 hours to dry the meat shred to attain required moisture level of 6±1%. Dried spent hen meat shred was prepared as given in Fig. 1.

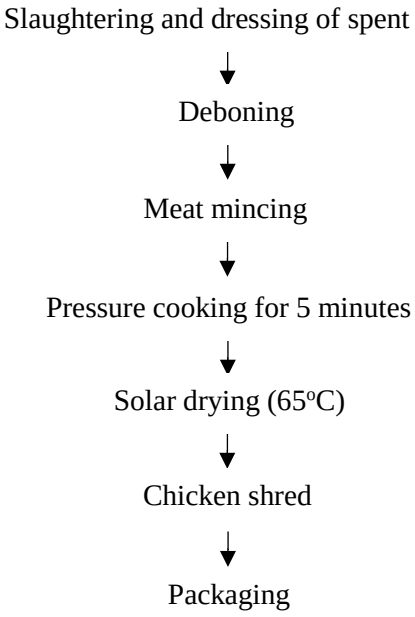

Fig. 1: Flow chart for preparation of spent hen meat shred

In this experiment, formulations for instant chicken soup mix were standardized using different levels of spent hen meat shred, starches, salt and other ingredients as indicated in Table 1. Soup were prepared from instant chicken soup mixes of four formulations namely Treatment-A, B, C and D (Table 1), which fulfilled sensory attributes of consumers.

Preparation of Instant Chicken Soup Mix

Mixing of corn flour, potato starch, spent hen meat shred, salt, black pepper, onion powder, garlic powder, dried green chili, dried vegetable (pea: bean: carrot= 1:1:1) and monosodium glutamate in required proportion was done to obtain the instant chicken soup mix (Table 1). Instant chicken soup mix was then packaged in low density polyethylene (150µm thickness) bags and stored at ambient temperature.

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Table 1: Formulation of instant chicken soup mix (in percentage)

S. No.	Ingredients	Treatment A	Treatment B	Treatment C	Treatment D
1	Corn flour	15	15	15	15
2	Potato starch powder	40	20	15	10
3	Spent hen meat shred	0	20	25	30
4	Dried chopped vegetable	12	12	12	12
5	Salt	20	20	20	20
6	Black pepper powder	3	3	3	3
7	Onion powder	5	5	5	5
8	Garlic powder	3	3	3	3
9	Dried chopped green chili	1.5	1.5	1.5	1.5
10	Mono Sodium Glutamate	0.5	0.5	0.5	0.5
Total		100	100	100	100

Reconstitution of Instant Chicken Soup Mix

The instant chicken soup mix was reconstituted in cold potable water (instant soup mix: water = 1:16), stirred and brought to boil to get ready-to-drink soup.

Sensory Evaluation

Soups prepared from instant chicken soup mix were served at ambient temperature to the semi-trained panelists of 7- member panel. All the samples were evaluated for appearance, colour, flavour, consistency, taste and overall acceptability by using a 7 point hedonic scale.

Formulas Used in the Estimation of the Economics of Product

Assuming that, 10 kg instant chicken soup mix will be prepared in every working day and monthly working day is 25 days.

Cost of production (10 kg/day) = Cost of formulation + Overhead cost

Overhead cost = depreciation cost + Rent of building + Labour cost+ Cost of electricity + Maintenance cost + Water charge + Cost of packaging

Profit = 30% of cost of production
Income = Total sale price - Total cost of production
Break-Even point = Fixed cost × Total sales/ (Total sales - Variable cost)
Benefit cost ratio = Total sale money / Variable cost
Net profit/day = Total profit - Amount of loan payment/day

Results and Discussion

The total cost of production for dried chicken shred was calculated to be Rs. 929/kg (Table 2). The equipment cost was Rs. 45,000 (Table 3) and their annual depreciation was calculated to be Rs. 4,500/annum on the basis of 10% annual rate of depreciation (Table 4).

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Table 2: Cost of production for dried chicken shred

Heads	Cost
Price of live spent hen	80/Kg
Dressing Percentage (%)	65
Cost of 1 kg dressed carcass	80 X 100/65 = 123.08
Average recovery of deboned meat (%)	56%
Cost of 1 kg deboned meat	123.08 X 100/56 = 219.79
Cost of 100 Kg deboned meat	21,979
Yield of dried chicken shred	23.66%
Cost of dried chicken shred	21,979/23.66 =929
Cost of drying (solar)	0
Total cost of 1 kg dried chicken shred	929

Table 3: Fixed expenditure (Equipment's cost) for instant soup mix

S. No.	Equipment's	Cost (Rs.)
1	Manual meat mincer	3000
2	Pressure cooker	1500
3	Balance	1500
4	Furniture and utensils	4000
5	Grinder	1500
6	Packaging machine	2000
7	Dryer	30000
8	Miscellaneous	1500
Total fixed expenditure		**Rs. 45,000**

**Every day 10 kg instant soup mix will be prepared.*

Table 4: Overhead production cost of 10 kg instant soup mix

S. No.	Item	Cost
1	Annual depreciation	@ 10% =Rs. 4500/ annum
	Daily depreciation cost	@ 25 working day/month = Rs. 15/day
2	Rent of building	2000 /month
	Rent per day	@ 25 working day/month = Rs.80/day
3	Labour cost	
	Trained labour (1 nos.)	@Rs. 300X1 =Rs. 300
	Untrained labour (1 nos.)	@Rs. 250X1 =Rs. 250
4	Electricity cost	@ Rs 6/unit
		Approx. used 15 unit/ day =Rs.90
5	Maintenance cost	Rs. 50
6	Water charge	Rs. 15
7	Cost of packaging (1000 packet @ Rs.1/packet)	Rs. 1000
Total		**Rs. 1800/day**

The overhead production cost of 10kg product was mentioned in Table 4 which includes daily depreciation cost, rent on building per day, labour cost, electricity cost, maintenance cost, water charge and packaging cost, thus, amounting to a total of Rs. 1,800/day. The formulation cost of 10kg instant soup mix powder

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were Rs. 930.00, Rs. 2,748.00, Rs. 3,203.00 and Rs. 3,657.00 for Treatment A, B, C and D respectively (Table 5).

Table 5: Formulation cost for 10 kg instant soup mix

S. No.	Ingredients	Rate per Kg	A	B	C	D
1	Corn flour @ 15%	40	60	60	60	60
2	Patato Starch @ 40%, 20%, 15% & 10% respectively	40	160	80	60	40
3	Dried chicken shred @ 0%, 20%, 25% & 30% respectively	949	0	1898	2373	2847
4	Dried vegetable (carrot: pea: bean=1:1:1) @ 12%	200	240	240	240	240
5	Salt @ 20%	15	30	30	30	30
6	Black pepper@ 3%	800	240	240	240	240
7	Onion powder@ 5%	150	75	75	75	75
8	Garlic powder@ 3%	300	90	90	90	90
9	Dried chopped chili@ 1.5%	200	30	30	30	30
10	Mono Sodium Glutamate @ 0.5%	100	5	5	5	5
Total			**930**	**2748**	**3203**	**3657**

In every working day, 10kg instant soup mix powder was prepared and hence total expenditure per day was calculated as Rs. 2,730.00, Rs. 4,548.00, Rs. 5,003.00 and Rs. 5,457.00 for Treatment A, B, C and D respectively (Table 6).

Table 6: Calculation of MRP, sale/day and total profit/day

Groups	A	B	C	D
Overhead production cost	1800	1800	1800	1800
Formulation cost	930	2748	3203	3657
Cost of 10 kg instant soup mix	2730	4548	5003	5457
Cost of 1kg instant soup mix	273	455	500	546
Profit @30%	82	137	150	164
MRP of instant soup mix (1 Kg)	355	592	650	710
Income/Kg	82	137	150	164
Total sale money/day	3550	5920	6500	7100
Total profit/day	820	1370	1500	1640

Production cost of instant soup mix/ kg was calculated as Rs. 273.00, Rs. 455.00, Rs. 500.00 and Rs. 546.00 in Treatment A, B, C and D respectively (Table 6). MRP of instant soup mix (1kg) was calculated as Rs. 355.00, Rs. 592.00, Rs. 650.00 and Rs. 710.00 for Treatment A, B, C and D respectively, considering 30% profit (Table 6). The price of instant soup mix was found to be half the price of readily available chicken soup in market. Total sale/day was calculated to be Rs. 3,550.00, Rs. 5,920.00, Rs. 6,500.00 and Rs. 7,100.00 in Treatment A, B, C and D respectively (Table 6). Daily profit was calculated to be Rs. 820, Rs.

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1370, Rs. 1500 and Rs. 1640 in Treatment A, B, C and D respectively (Table 6). The total project cost was calculated by summation of the fixed cost and variable cost and was found to be Rs. 47,730.00, Rs. 49,548.00, Rs. 50,003.00 and Rs. 50,457.00 for Treatment A, B, C and D respectively (Table 7). The net profit per day was calculated as Rs. 803.76, Rs. 1,353.16, Rs. 1,483.00 and Rs. 1622.84 for Treatment A, B, C and D respectively (Table 7).

Table 7: Calculation of Net profit, Breakeven point and Benefit cost ratio

Groups	A	B	C	D
Fixed cost	45000	45000	45000	45000
Variable cost	2730	4548	5003	5457
Total Project cost	47730	49548	50003	50457
Loan amount (85%)	40600	42100	42500	42900
Margin money	7130	7448	7503	7557
Amount of interest @12% /annum	4872	5052	5100	5148
Amount of loan payment/month	406	421	425	429
Amount of loan payment/day	16.24	16.84	17	17.16
Net profit/day	803.76	1353.16	1483	1622.84
Break-even point	194817	194169	195391	194461
Benefit cost ratio	1.3	1.3	1.3	1.3

The break-even point was calculated to be Rs. 1,94,817.00, Rs. 1,94,169.00, Rs. 1,95,391.00 and Rs. 1,94,461.00 for Treatment A, B, C and D respectively (Table 8). Benefit cost ratio was found to be 1.30 for all four treatments. All the sensory parameters (appearance, colour, flavour, consistency, taste and overall acceptability) of the soup prepared from instant soup mix evaluated by 7-membered semi trained panelist revealed a significantly higher score for treatment C (spent hen meat shred-25%) in comparison to other treatments.

Table 8: Sensory evaluation of soup prepared by instant soup mix (Mean±SE) *

Parameter	A	B	C	D
Appearance	5.86 ± 0.14^{C}	6.20 ± 0.10^{B}	6.49 ± 0.07^{A}	5.77 ± 0.18^{C}
Colour	5.94 ± 0.15^{BC}	6.14 ± 0.10^{AB}	6.31 ± 0.05^{A}	5.80 ± 0.10^{C}
Flavour	5.49 ± 0.06^{C}	5.99 ± 0.08^{B}	6.34 ± 0.06^{A}	5.89 ± 0.16^{B}
Consistency	5.84 ± 0.10^{B}	6.24 ± 0.14^{A}	6.50 ± 0.13^{A}	5.80 ± 0.12^{B}
Taste	5.46 ± 0.08^{C}	5.96 ± 0.04^{B}	6.54 ± 0.05^{A}	6.02 ± 0.09^{B}
Overall acceptability	5.76 ± 0.06^{D}	6.21 ± 0.04^{B}	6.55 ± 0.02^{A}	5.93 ± 0.07^{C}

Conclusion

Based on the above findings, it can be concluded that up to 25% spent hen meat shred (Treatment C) could be incorporated in instant soup mix to enhance its acceptability through which a potential entrepreneur can generate Rs. 1500.00 per day as profit by producing and selling 10kg of instant soup mixes. Moreover, it

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will provide impetus to the food processing industry besides making healthy and nutrient enriched meat products available to the consumers and hence creating ample opportunity for employment generation.

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