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Development and Cost Economics of *Bhujia* Incorporated with Spent Hen Meat Powder

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A B S T R A C T

A study was undertaken to standardize processing protocol of traditional *bhujia* by incorporation with spent hen meat powder and to evaluate the economics of developed product. Four treatment combinations i.e. Treatment A (0% meat powder), Treatment B (10% meat powder), Treatment C (15% meat powder) and Treatment D (20% meat powder) were prepared to evaluate economics of the *bhujias*. In the cost economics, the total production cost of treatments (per 100kg) were calculated on the basis of overhead production cost and formulation cost of *bhujia* mix powder which was found to be Rs. 17,595.00, Rs. 26,085.00, Rs. 30,330.00 and Rs. 34,575.00 for Treatment A, B, C and D respectively. The cost of formulation for 100 kg *bhujia* mix powder was found highest for the Treatment D followed by Treatment C, B and A. Per day expenditure for processing of 100 kg *bhujia* mix powder was found to be highest in Treatment D followed by Treatment C, Treatment B and Treatment A. Maximum total net profit was found for Treatment D followed by Treatment C, Treatment B and Treatment A. Break-even point were estimated as Rs.1,95,006.00, Rs. 1,94,993.00, Rs. 1,95,012.00 and Rs.1,95,002.00 for Treatment A, B, C and D respectively. The cost benefit ratio was estimated around 30% for all the treatments. Estimating the details of economics of the developed products, it can be concluded that a viable enterprise can be established by keeping MRP per kg of *bhujia* as Rs. 190, Rs. 261, Rs. 283 and Rs. 304 for Treatment A, Treatment B, Treatment C and Treatment D respectively.

Introduction

Poultry industry has emerged as an organized, scientific and one of the fastest growing sector of livestock economy. Total poultry population in India is estimated to be 729.21 million which accounts for nearly 45% of the total production of meat (BAHS, 2014). India ranks fifth in chicken meat and third in egg in the world with production figures of 2.19 MT of chicken meat and 63 billion eggs (DAHD & F, 2012). Due to cost competitiveness, nutritional quality, universal availability and absence of religious taboos, chicken meat occupies an important component of non-vegetarian diet in India.

Poultry industry in India is comprised of 24 crores of layers (Kotaiah, 2018) with annual population growth rate of 8% (Desikan and

Megarajan, 2014). 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). Development of value added meat products from spent hen meat has better prospect in view of their lower cost and suitability for processing (Kondaiah and Panda, 1992). Utilization of nutritious, easily available and economically viable spent hen meat in traditional snack formulation can overcome the problem of improper utilization of spent hens and will also improve nutritional value of the snacks.

In India *Bhujia* is one of the popular snacks taken at tea time in average households. *Bhujia* is gram flour based, deep fried, shelf stable, ready to eat salted snack and incorporation of meat powder in its formulation will not only upgrade the nutritional value but will also improve the taste and flavour of the product. It is prepared by deep fat frying process and thus can be stored at ambient temperature for longer period. Young generation is highly cherished by non vegetarian snacks due to its convenient nature and overwhelming taste and flavor. 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. However, 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, development of safe and shelf stable products is the priority of food industry to curtail the high energy cost involved in food preservation and for consumer safety. Also high fat containing meat products is having the problem of off odor and oxidation which can be overcome by the addition of natural antioxidants in the form of spices and condiments. Natural antioxidants extracted from herbs and spices exhibit various degree of efficiency when used in different food application (Bowser *et al.,* 2014). *Bhujia* being a shelf stable product can be formulated with spent hen meat powder incorporating different spices and ingredients to improve its nutritional properties, shelf stability and to increase its popularity.

Thus, the present study was undertaken to develop and literal economization of preparation cost of *bhujia* incorporated with spent hen meat powder.

Materials and Methods

Spent hens of commercial breed were obtained from Regional Poultry Breeding Farm, Kyrdemkulai, Ri Bhoi District, Meghalaya, India. Following ante-mortem examination, spent hens were slaughtered, dressed and deboned manually maintaining hygienic conditions in the laboratory of AICRP on PHET, Department of LPT, C. V. Sc., AAU, Khanapara, Assam, India. Post-mortem examination of the spent hens was also performed to detect any kind of abnormalities. All separable fat, fascia and connective tissue were trimmed off and meat was minced twice through 6 mm sieve in a meat mincer, packed in low density polyethylene (150 µm thickness) bags, and frozen at -18±2°C till further use. Refined salt (Tata Chemicals Ltd., Mumbai), refined oil, gram flour, potato starch powder, rice flour, chat mashala, hing (asafoetida) etc. procured from local market of Guwahati. Red chilli powder, black pepper powder, garlic powder and cardamom powder was prepared in the laboratory. Spent hen meat powder was prepared as depicted in figure 1.

Four combinations of *bhujia* (Table 1) were prepared as described in the protocol (Figure 2) and then aerobic packaging was done with low density polyethylene (150 µm thickness) for storage.

Formulas used in the estimation of the economics of product

Assuming that, 100 kg *bhujia* mix powder will be handled per day and working days/month is 25 days.

Cost of production for 100 Kg formulation = 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 of 1 kg *bhujia* =

$$\frac{\text{Production cost of 100 Kg formulation}}{100\ (1+ \%\text{Water absorption during dough preparation}) \times \%\text{Cooking yield}}$$

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 to be Rs. 313/kg is presented in Table 2. The total cost of production for chicken powder was calculated to be Rs. 929 (Table 3). The equipment cost required during this work is Rs. 45,000 **(**Table 4) and their annual depreciation was calculated to be Rs. 4,500/annum on the basis of 10% annual rate of depreciation **(**Table 5). The overhead production cost of 100 kg product was mentioned in Table 5 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. 2,165/day.

The formulation cost for 100 kg *bhujia* mix powder were Rs. 15,430.00, Rs. 23,920.00, Rs. 28,165.00 and Rs. 32,410.00 in Treatment A, Treatment B, Treatment C and Treatment D respectively (Table-6). In every working day, 100 kg *bhujia* mix powders was processed and hence per day expenditure cost for processing of 100 kg bhujia mix powder was calculated as Rs. 17,595.00, Rs. 26,085.00, Rs. 30,330.00 and Rs. 34,575.00 in Treatment A, Treatment B, Treatment C and Treatment D respectively (Table 7).

Water absorption during dough preparation was measured as 43%, 49%, 52% and 55% in Treatment A, Treatment B, Treatment C and Treatment D respectively (Table 8). Yield of final product was found to be 84.04%, 87.36%, 91.64% and 95.37% of weight of dough in Treatment A, Treatment B, Treatment C and Treatment D respectively (Table 8). Total sale/day was calculated to be Rs. 22,873.29, Rs. 33,910.85, Rs. 39,428.28 and Rs. 44,947.37 in Treatment A, Treatment B, Treatment C and Treatment D respectively (Table 8). Daily profit was calculated to be Rs. 5,278.17, Rs. 7,825.58, Rs. 9,098.62 and Rs. 10,372.81 in Treatment A, Treatment B, Treatment C and Treatment D respectively (Table-8).

The total project cost was calculated by summation of the fixed cost and variable cost in Table 9 as Rs. 62,595.00, Rs. 71,085.00, Rs. 75,330.00 and Rs. 79,575.00 for Treatment A, Treatment B, Treatment C and Treatment D respectively (Table 9).

Table.1 Formulation of *bhujia* (in percentage)

S. No.	Ingredients	Treatment A	Treatment B	Treatment C	Treatment D
1	Gram flour	60	50	45	40
2	Spent hen meat powder	0	10	15	20
3	Potato starch powder	20	20	20	20
4	Rice flour	10	10	10	10
5	Red chili powder	1	1	1	1
6	Black pepper powder	1	1	1	1
7	Garlic powder	1	1	1	1
8	Chat masala	2	2	2	2
9	Cardamom powder	0.25	0.25	0.25	0.25
10	Asafoetida (*Hing*)	0.25	0.25	0.25	0.25
11	Salt	2	2	2	2
12	Refined Oil	2.5	2.5	2.5	2.5
Total		100	100	100	100

Table.2 Cost of formulation of spice mix used in *bhujia*

S.No.	Name of Ingredients	Quantity (gm)	Rate per Kg (Rs.)	Approx. cost (Rs.)
1	Garlic Powder	100	300	30
2	Red chili Powder	100	150	15
3	Chat Mashala	200	500	100
4	Cardamom Powder	25	1,200	30
5	Black Papper powder	100	800	80
6	Asafoetida (Hing)	25	1,000	25
7	Salt	200	15	3
8	Oil	250	120	30
Total		1,000		313

Table.3 Cost of production for chicken powder

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

Table.4 Fixed expenditure (Equipments) cost for *bhujia*

S.No.	Equipments	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	*Bhujia* making machine	1000
9	Miscellaneous	500
Total fixed expenditure		Rs. 45,000

Table.5 Overhead production cost of 100 kg *bhujia*

S.No.	Item	Cost
1	Annual depreciation Daily depreciation cost	@ 10% =Rs. 4500/ annum @ 25 working day/month = Rs. 15/day
2	Rent of building Rent per day	2000 /month @ 25 working day/month = Rs.80/day
3	Labour cost Trained labour (2 nos.) Untrained labour (1 nos.)	 @Rs. 300X2 =Rs. 600 @Rs. 250X1 =Rs. 250
4	Electricity cost	@ Rs 6/unit Approx. used 25 unit =Rs.150
5	Maintenance cost	Rs. 50
6	Water charge	Rs. 20
7	Cost of packaging (1000 packet @ Rs.1/packet)	Rs. 1000
Total		Rs. 2165/day

Table.6 Formulation cost for 100 kg *bhujia* mix powder

S.No.	Ingredients	Rate per Kg (Rs.)	A (Rs.)	B (Rs.)	C (Rs.)	D (Rs.)
1	Gram flour @60%, 50%, 45% & 40% respectively	100	6,000	5,000	4,500	4,000
2	Potato Starch@ 20%	40	800	800	800	800
3	Rice Flour @ 10%	50	500	500	500	500
4	Chicken Powder @ 0%, 10%, 15% & 20% respectively	949	0	9,490	14,235	18,980
5	Spice mix@ 10%	313	3,130	3,130	3,130	3,130
6	Frying oil (50 Kg)	100	5,000	5,000	5,000	2,400
Total			15,430	23,920	28,165	32,410

Table.7 Total expenditure for 100 kg *bhujia* mix powder

S.No.	Treatment	A (Rs.)	B (Rs.)	C (Rs.)	D (Rs.)
1	Daily depreciation cost	15	15	15	15
2	Rent per day	80	80	80	80
3	Labour cost	850	850	850	850
4	Electricity cost	150	150	150	150
5	Maintenance cost	50	50	50	50
6	Water charge	20	20	20	20
7	Packaging cost (1000 packet @ Rs.1/packet)	1,000	1,000	1,000	1,000
8	Total cost of 100 Kg *bhujia* mix powder	15,430	23,920	28,165	32,410
Total		17,595	26,085	30,330	34,575

Table.8 Calculation of MRP, sale/day and total profit/day

Treatment	A	B	C	D
Water absorption during dough preparation (%)	43	49	52	55
Yield (%)	84.04	87.36	91.64	95.37
Cost of production for 1 kg *bhujia* (Rs.)	146.41	200.40	217.74	233.89
Profit @30%	43.92	60.12	65.32	70.17
MRP on the product (1 Kg) (Rs.)	190.33	260.52	283.06	304.06
Income/Kg *bhujia* (Rs.)	43.92	60.12	65.32	70.17
Daily production (Kg)	120.177	130.166	139.293	147.824
Total sale money/day (Rs.)	22,873.29	33,910.85	39,428.28	44,947.37
Total profit/day (Rs.)	5,278.17	7,825.58	9,098.62	10,372.81

Table.9 Calculation of variable cost, total project cost and net profit

Treatment	A (Rs.)	B (Rs.)	C (Rs.)	D (Rs.)
Fixed cost	45,000	45,000	45,000	45,000
Variable cost	17,595	26,085	30,330	34,575
Total Project cost	62,595	71,085	75,330	79,575
Loan amount (85%)	53,200	60,400	64,000	67,600
Margin money	9,395	10,685	11,330	11,975
Amount of interest @12% /annum	7,511.4	8,530.2	9,039.6	9549
Amount of loan payment/month	625.95	710.85	753.3	795.75
Amount of loan payment/day	25.038	28.434	30.132	31.83
Net profit/day	5,253.14	7,797.15	9,068.49	10,340.98

Table.10 Calculation of break-even point and cost benefit ratio

Treatment	Break-even point	Cost benefit ratio
A	45000 x 22873.29/(22873.29-17595) =1,95,006	5278.174/17595=0.30 Or 30%
B	45000 x 33910.85/ (33910.85-26085) =1,94,993	7825.58/26085=0.30 Or 30%
C	45000 x 39428.28/ (39428.28-30330) =1,95,012	9098.619/30330=0.30 Or 30%
D	45000 x 44947.37/ (44947.37-34575) =1,95,002	10372.81/34575=0.30 Or 30%

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

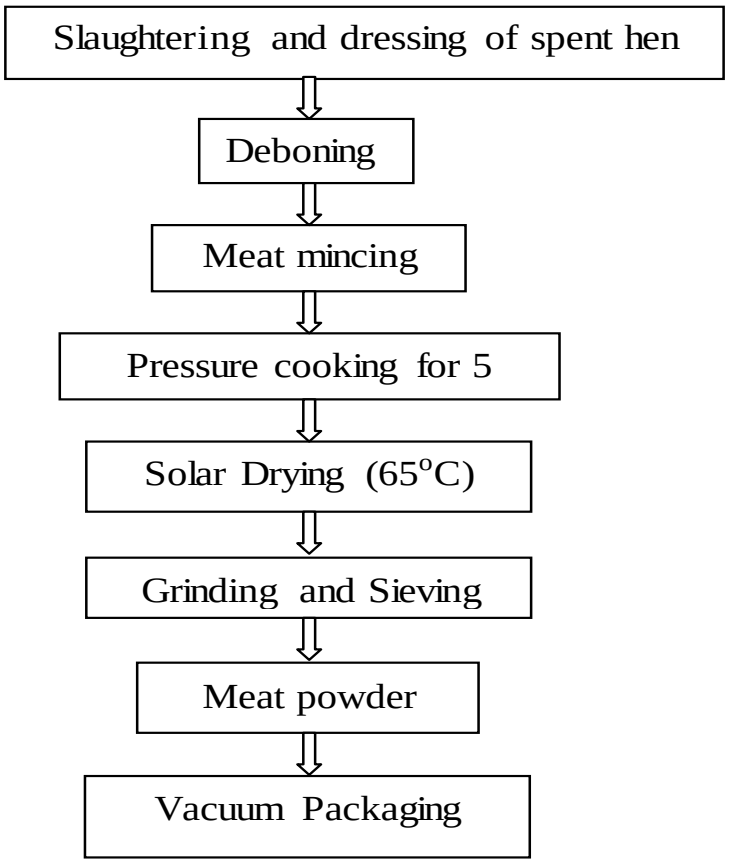
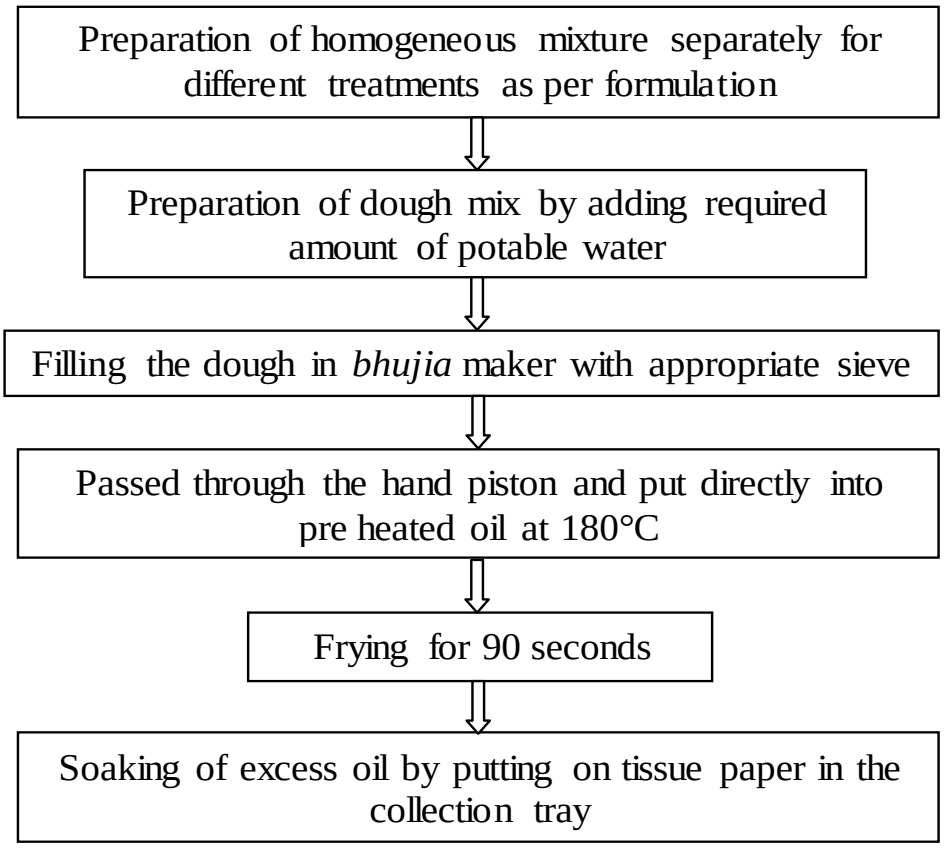


Fig.2 Flow chart for preparation of chicken *bhujia*



The break-even point was calculated to be Rs. 1,95,006.00, Rs. 1,94,993.00, Rs. 1,95,012.00 and Rs. 1,95,002.00 for Treatment A, Treatment B, Treatment C and Treatment D respectively (Table 10). Cost benefit ratio was found to be 30% for all four treatments.

Thus, viable enterprises can be established in tropical countries such as India by keeping MRP (Maximum Retail Price) of *bhujia* as Rs. 190, Rs. 261, Rs. 283 and Rs. 304 per kg for Treatment A, Treatment B, Treatment C and Treatment D respectively (Table 8).

From the above study, it can be suggested that development and adaptation of the technology by the small and medium scale entrepreneurs will be a profitable one which will pave their way into the meat processing business by utilization of undesirable old and culled hens. Moreover, it 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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