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HERBAL EXTRACT EFFECT ON CHICKEN MEAT POWDER ENRICHED SHELF STABLE FRIED CHICKEN SNACKS

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ABSTRACT:

The present study was conducted to standardization procedure for preparation of chicken meat powder (CMP) based on drying and water activity pattern of cooked meat at 60^{0}C, 70^{0}C and 80^{0}C up to 9 hours. Three different levels (20%, 30% and 40%) of CMP were incorporated into the gram flour. Four different groups were made; control (without herbal extract), Rosemary leaves extract (T_1), betel leaves extract (T_2) and their 1:1 combination (T_3) and examined for cooking yield and pH in the product. Drying of cooked meat at 80^{o}C for 9 hrs was found to be optimum time and temperature for the CMP preparation. Sensory analysis indicated that 30% level of CMP was found favourable for product incorporation. Herbal extract incorporation has no significant ($p>0.05$) effect on cooking yield, total cholesterol and pH of the product. Therefore it can be concluded that nutritionally enriched ready to eat shelf-stable meat product can be prepared by incorporation of CMP in gram flour and herbal extract has no effect on cooking yield and pH of the product.

KEYWORDS: *Chicken meat powder, pH, Fried chicken snacks, Drying, rosemary, Betel.*

INTRODUCTION:

Indian cooking and lifestyle have undergone tremendous changes in the last decades. In the newly emerging era of fast and convenience foods, ready to eat foods are becoming increasingly popular, in view of kitchen convenience as well as for meeting the exigency of offering hospitality to guests. Now the time is to provide better food processing and its marketing infrastructure for Indian industries to serve good quality and safe new processed food. Usually cereal based snacks deficient in essential amino acids such as threonine, lysine and tryptophan (Jean *et al*., 1996), but the incorporation of animal origin protein such as fish, pork, beef, chicken etc, significantly enhances its nutritive value especially concerning amino acids, flavour and taste (Singh *et al*., 2015). In the food matrix, meat based snack foods are convenient, easy to carry, highly crispy, attractive, nutritionally sound, shelf-stable (Singh *et al.,* 2013). A verity of meat snacks exist in global markets such as Jerky, Popped pork rind, Kilishi, Meat biscuit, Meat cookies, Meat noodles, Meat chips and Meat stick.

The perishability of meat products has been regarded as a very serious problem, particularly in tropical countries like India, where the 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.

Reduction of water activity probably is the most important single factor for shelf-stability in most dried meat products. Preparation of meat powder is an efficient way to cope up with the problem of perishability because most microorganisms do not exhibit growth below 0.91 water activity. There are several reports on the development of shelf-stable intermediate moisture (IM) products having reduced water activity (Kanatt, 2006). Chicken meat powder has been used in developing chicken soup mix, chicken enriched noodles and *Idli* mix to improve the nutritional quality of the products (Deswal, 2003; Kumar, 2009 and Bishnoi *et al.,* 2015). Likewise, fried chicken snacks are the deep fried, gram floor based, chicken powder incorporated shelf stable meat product.

Now a day's plants are the liberal source to provide man with valuable bioactive substances (Tayel and El-Tras, 2012) which act as natural antioxidants and could be a good alternative to synthetic antioxidants thus different plant products are being evaluated as natural antioxidants to protect and enhance the overall quality of meat and meat products. Among natural antioxidant sources, rosemary (*Rosmarinus officinalis* L.) and betel (*Piper betel* L.) is highly potent plant material that is high in phenolic content. Therefore, the present study has been undertaken to develop chicken meat powder incorporated self stable meat product.

MATERIAL AND METHOD:

Standardization procedure for preparation of chicken meat powder (CMP)

Frozen lean spent hen meat cubes were ground through an 8 mm plate, followed by a 4 mm plate in meat mincer (Nova Pvt. Ltd.). After mincing, meat was boiled in a pressure cooker at 120°C for 15 min. The minced and pressure cooked chicken meat was dried in a hot air oven and examine water activity at a temperature of 60°C, 70°C and 80°C for 9 hrs, each and the best chicken meat powder was selected for incorporation in fried chicken snacks.

Water activity (aw)

The water activity of cocked meat was measured by the Pawkit water activity meter (Rotrinics model no. L1161).

Standardization of CMP level in fried chicken snacks

Three Different levels (20%:80%, 30%:70% and 40%:60%) of CMP and gram flour were tried. Then, based on sensory characteristics like appearance, flavor, texture and overall acceptability, the best combination was selected for product preparation.

Extract preparation

The rosemary and betel leaves and their 1:1 combination were oven dried at 50°C for 12 hrs followed by grinding and sieving. Pre-weighed powdered leaves were extracted with 70% ethanol for 24 hrs at 40°C. The extract was collected and concentrated under reduced pressure in a rotary vacuum evaporator (Labconco Corporation, USA) until semi solid consistency. The semisolid mass was oven dried at 50°C at overnight to obtain dried extract. The extract was reconstituted with the same solvent as used for extraction to obtain 5% solutions and stored at 4°C.

Formulation of fried chicken snacks

The dough was prepared by mixing gram flour, spice mix, table salt and rosemary, betel leaves extract and their combination in 1:1 ratio was mixed with CMP. Subsequently, chicken broth was added in to mix to make dough at approx. 40 percent of the formulation and kept it for 10-15 min for conditioning. Later on, the dough was filled in the vermicelli maker machine for preparations of product. Afterward deep fried at 190°C temperature for 45 sec. for fried chicken snacks preparation. Herbal extract incorporation could not produce any significant effect in sensory properties of the product, therefore products with highest (3%) level of extract treated group was selected for cooking yield, total cholesterol and pH estimation along with control. For pH analysis control and herbal treated product (T_1, T_2 and T_3) sample of fried chicken snacks stored

at ambient temperature in Aluminium/Polyethylene laminates bag up to 60 days and tested in each 15 days interval.

Processing Protocol of Chicken Meat Powder and Fried chicken snacks

Deboned lean from spent hen

↓

Cut in small cubes

↓

Minced by 8 mm plate followed

By 4 mm plate

↓

Boiled in a pressure cooker (120°C for 15 min)

↓

Cooled and dried in Cabinet drier

↓

Grinding to powder (CMP)

↓

Addition of gram flour, spice mix, seasonings and extract

↓

Addition chicken broth

↓

Dough making

↓

Conditioning for 10-15 min (covered)

↓

Filling in Vermicelli maker

↓

Deep frying

Analytical Procedure

Proximate composition (moisture, protein, fat, ash and crude fiber) in the product was estimated as per AOAC (2000). Cooking yield (%) was calculated by dividing the recorded weights of cooked product before and after cooking respectively, multiplied by 100. The pH of the sample was measured with a digital pH meter equipped with a combined glass electrode (Eutech pH 700,

thermo scientific) as a method described previously (Trout *et al.,* 1992). For statistical analysis the experiments were replicated thrice and obtained data were analyzed using Statistical Software Packages (SPSS 16.0) following the procedure of Snedecor and Cochran (1994).

RESULTS AND DISCUSSION:

(1) Standardization of drying rate for chicken meat powder preparation

The mean drying rate of cooked meat and water activity is presented in fig. 1 and 2. The results indicated that there was an accelerated phase of drying up to 4 hrs, thereafter; it became steady up to 9 hrs. However, the rate of drying was faster at 80^{o}C followed by 70^{o}C and 60^{o}C. In the first hour of drying, meat lost approx. 40%, 34% and 24% moisture at 60^{o}C, 70^{o}C and 80^{o}C, respectively. At the same time, there was a consistent decrease in water activity up to 3rd hr, thereafter; a sharp decline was recorded at 4th hr in all three drying temperatures. However, the rate of decline in water activity was faster at 80^{o}C followed by 70^{o}C and 60^{o}C. At the end of 9 hrs drying, water activity values were 0.31, 0.23 and 0.15 at 60^{o}C, 70^{o}C and 80^{o}C, respectively. Examination of water activity of meat sample was also conducted by the Nayar *et al.,* 2015, Kahre *et al.,* 2014 and Singh *et al.* (2014) in dehydrated goat meat cubes, chicken meat noodles and chicken lollipop respectively. Analysis of the results indicated that drying of cooked meat at 80^{o}C for 9 hrs was found to be optimum time and temperature for the CMP preparation. Sample dried at 75^{o}C was found optimum for CMP preparation (Ilansuriyan *et al.,* 2016).

CONCLUSION:

The results of this investigation revealed that significant differences exist among ten plus trees based on phonological characters within populations. Further genetic improvement of PTs for fruit and seed characters stands a high chance. 100 fruit weight and oil percent had significant high heritability, however, genetic advance also high in 100 fruit weight followed by oil percent this may indicate additive gene action. Inflorescence length had a high positive significant correlation with 100 fruit weight followed by the number of fruits per inflorescence with fruiting percent in this case both inflorescence length and numbers of fruit are important traits for the future selection would help to the limited objective of high seed production.

(2) Standardization of CMP level in fried chicken snacks

Standardization of CMP level in product is based on sensory parameter (appearance, flavor, texture and overall acceptability) showed in table 1. Results of the study indicate that overall acceptability score of 30% CMP level was found significantly ($P<0.05$) superior as compared to

20% and 40% CPM. Appearance score was no significant (P>0.05) among all groups. CMP with 40% level have highest falvor score followed by 30% and 20%.The texture of 40% CMP observed fairly hard and with 20% CMP was found slightly soggy in texture. So, 30% CMP level was selected for product incorporation. Bishnoi *et al.* (2015) incorporated 20% and 30% CMP in rice idli mix and semolina idli mix respectively.

Scores have been given on 9 points hedonic scale (9-Extremly desirable, 1-Extremely undesirable) n=21, Mean with different superscripts differ significantly (P<0.05)

(3) Proximate composition:

The mean value of moisture and protein content was 2.29±0.29% and 42.86±0.77% respectively and mean value of fat, crude fibre and ash content was 27.34±0.71, 3.64±0.13 and 7.73±0.08 respectively found in the product.

(3) Cooking yield:

Cooking yield and total cholesterol content of the product showed in table 2. Higher cooking yield (114%) of the fried product is might be due to uptake of fat during deep frying. Goswami *et al.* (2014) found (108%) similar higher cooking yield in egg balls and Soni *et al.* (2013) found similar cooking yield in meat ring. Cooking yield of all treatments and control group was found similar therefore herbal extract has no significant effect in product. Talukder *et al*. (2015) and Verma *et al*., (2014) conducted similar work in mutton snacks and chicken meat noodles respectively.

(4) pH

The Result of study revealed that there was no significant (p>0.05) effect of herbal extract incorporation on the products (Table 3). But, throughout the storage period, pH values of all treatments were fairly lower than the control. However, there was an increased trend in pH values with the progression of storage period in all the treatments and control was observed. The pH value for control group starts from 6.16 and reaches up to 6.31 at the end of the storage period. Similarly for T_2 group range of pH value were 6.06 to 6.19. Singh *et al.* (2014) observed the same findings in chicken lollipop during storage period. The mean pH of meat rings was observed to be 6.10, 6.00 and 6.50 respectively in chicken, pork and chevon rings respectively (Soni *et al.,* 2013). Similar trends of pH during storage found in mutton snacks and vacuum packed chicken snacks (Talukder *et al*., 2015 and Singh *et al*., 2011).

CONCLUSION:

After completion of the study it can be concluded that nutritionally enriched shelf stable ready-to-eat meat product can be made by chicken meat powder incorporation in the gram flour. Drying of cooked meat at 80°C for 9 hrs was found to be optimum time and temperature for the chicken meat powder preparation and according to sensory analysis 30% level of chicken meat powder favourable for product development. The herbal extract does not affect the cooking yield and pH of the product.

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Table 1: Effect of CMP level on the sensory characteristics of fried chicken snacks (Mean±SE)

Parameter	Gram flour: CMP (80:20)	Gram flour: CMP (70:30)	Gram flour: CMP (60:40)
Appearance	7.50±0.50	7.10±0.28	6.60±0.28
Flavor	6.00±0.86^{b}	7.50±0.50^{a}	7.66±0.28^{a}
Texture	7.50±0.50^{a}	7.80±0.28^{a}	6.30±0.28^{b}
Overall acceptability	6.66±0.25^{b}	7.80±0.28^{a}	6.66±0.28^{b}

Table 2: Cooking yield of fried chicken snacks (Mean±SD)

Group	Cooking yield (%)
C	114±2.55
T_1	114±0.05
T_2	114±2.54
T_3	114±2.83

C=control, T_1= rosemary extract, T_2= betel extract and T_3= 1:1 combination (rosemary+betel)

Table 3: Effect of herbal extracts incorporation on pH of fried chicken snacks (Mean±SE)

Group	Storage Days				
	0	15	30	45	60
C	6.16±0.05	6.16±0.02	6.24±0.03	6.28±0.03	6.31±0.09
T_1	6.08±0.06	6.12±0.12	6.16±0.16	6.23±0.04	6.27±0.02
T_2	6.06±0.04	6.11±0.02	6.16±0.02	6.17±0.02	6.19±0.03
T_3	6.05±0.08	6.06±0.02	6.07±0.03	6.14±0.03	6.17±0.04

C=control, T_1= rosemary extract, T_2= betel extract and T_3= 1:1 combination (rosemary+betel)

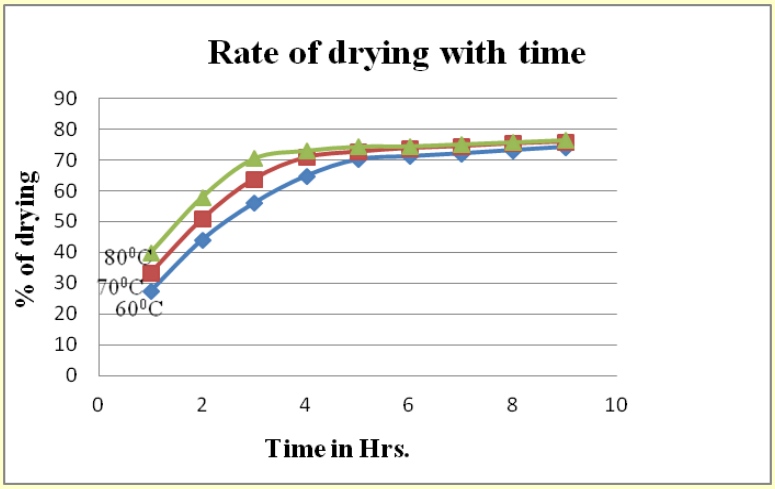

Fig.1: Effect of drying temperature on rate of drying of cooked meat

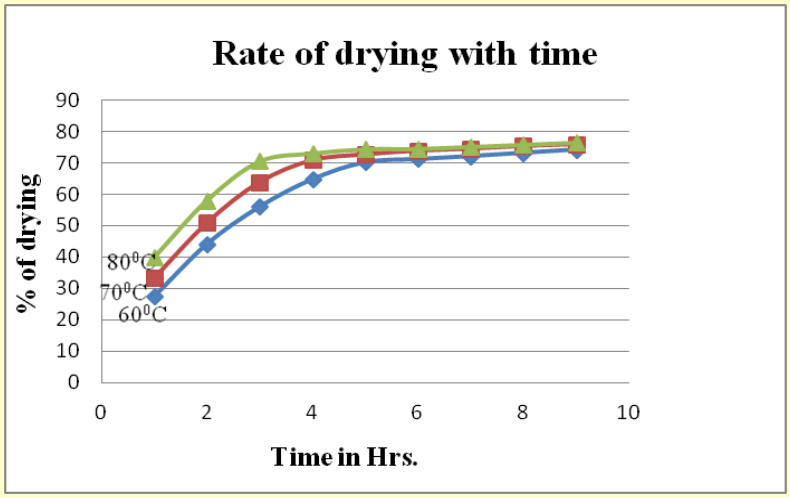

Fig. 2: Effect of drying temperature on water activity of cooked meat