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Quality Assessment of Traditionally Processed Kola, A Deli Meat of Tamil Nadu, India

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A B S T R A C T

In the present study, kola, a comminuted deli meat of Tamil Nadu was traditionally processed and assessed for microbial, sensory and physiochemical qualities. For the standardization of recipe and process, the traditional knowledge on different recipes and processes of kola possessed by the caterers and homemakers were utilized for conducting preliminary experiments that were solely based on sensory trails. Subsequently, the kola prepared using standardized recipe and process was subjected to sensory (colour, flavour, texture, and overall acceptability), microbial (total viable count, staphylococcal count and coliform count) and physio chemical (pH and cooking loss) quality analysis at periodic intervals during refrigerated storage (4±1°C). Data obtained from different analysis were presented and discussed.

Introduction

Vast majority of the population in India and their diverse food habits, cultures, tradition and religions offer great market for meat and meat products. The consumption pattern of meat products is primarily skewed towards traditional ones. In recent years, the demand for quality meat and meat products is constantly increasing in India due to enhanced meat consumption, changing socio-economic status, growing consciousness of consumers about their nutritional contribution, urbanization, women employment etc., In general, the country is endowed with great number of traditional meat products and or preparations due to herinherent ethnic diversity. These products/preparations are chiefly consumed along with the staple food as side dishes and play a significant role in social and religious events as well as considerably contribute to local economy. Some of these are popular at regional and or national level. Traditional meat and chicken based fast food products like meat balls, kebabs, tikka, chicken tandoori (roast),

biryani, curries, pickles, enrobed and battered products are attracting greater consumer response in India. Goshtaba and rista, popular traditional Kashmiri products, are also being processed at fast food corners, restaurants, star hotels, etc., which are liked by many for their unique taste. Similarly, Nihari, a traditional dish of Delhi, is a stew consisting of slow-cooked meat mainly from shank portion of beef or lamb and mutton, goat meat and chicken, along with bone marrow. Several authors have reviewed and/ discussed the status and importance of traditional meat and poultry products at various prestigious conferences (Kondaiah, 1996; Sushil Kumar and Anjaneyulu, 1998; Kesava Rao *et al.*, 1999; Anjaneyulu *et al.*, 2008).

Majority of these products are 'prepare, cook and serve' in nature. Due to the lack of storage stability, these products usually take part only in the menu of catering establishments. Conduct of organized scientific studies for their process standardization and product characterization, subsequent application of novel technological interventions to improve their storage stability, mechanizing their production in large scale, taking steps to popularizing and commercializing such products would not only significantly contribute to cater the ever increasing demand and also employment opportunities.

'Kola urundai' also known as 'Kola' is one of the popular coarse comminuted meat product of Tamil nadu, usually prepared either with gravy for accompanying staple food oras deep fat fried snack food. Traditionally several variants of this product is being marketed by the catering establishments in the state. The present study was carried out to choose the product recipe as well as process involved in the preparation of kola, based on sensory trails and to assess various quality attributes of the products prepared during refrigerated storage (4±1°C).

Materials and Methods

This work was carried out in Meat, Poultry and Fish Processing Unit and Food and Industrial Microbiology Laboratory at College of Food and Dairy Technology, Koduveli to choose the recipe and process for preparation of kola.

This part specifically describes the raw material and ingredients used for preparation of kola, processing procedure adopted and techniques employed for measuring and analysing the parameters to attain the objective proposed in the study.

Raw materials and ingredients

Mutton was obtained from a FSSAI registered red meat and poultry processing unit functioning at Alamathi. Similarly, other ingredients like roasted gram powder, green chillies, chilli powder, karam masala, Fennel seeds, onion, coriander leaves, curry leaves, ginger, garlic, salt and oil were obtained from reputed, licensed super market.

Chemicals, media, buffers and reagents

All the chemicals used in the study were of analytical grade, from reputed national and international firms. Dehydrated culture media and broth used were obtained from Hi-media, Mumbai.

Preliminary experiments to choose the 'recipe and process combination' for Kola

For the standardization of recipe and process, the traditional knowledge on different recipes and processes of kola possessed by the caterers and homemakers were utilized for conducting preliminary experiments that are solely based on sensory trails. In this experiment, three recipe and processing procedure combinations of kola were gathered

from the caterers and homemakers. By comparing the sensory attributes (colour, flavour, texture and overall acceptability) of products prepared out of these three combinations using a sensory panel comprising students and staff of College of Food and Dairy Technology, one recipe and process combination has been chosen based on sensory scores for further study.

Evaluation of quality characteristics

The deep fat fried kola samples prepared out of chosen combination of recipe and process (*i.e.* standardized combination) were subjected to microbial, sensory and physico-chemical analysis45 min after the preparation and also during refrigerated storage (4±1°C) at periodic intervals..

Microbial quality

Microbial quality of fried kola samples were evaluated based on Total Viable Count (TVC), Coliform Count (CC) and Staphylococcal Counts (SC).

All microbial groups were determined using pour plate method, following the procedures described by American Public Health Association (APHA, 1984).

Five gram of kola sample was weighed near flame in a sterile stomacher bag and made into small pieces with sterile forceps and scissors. 45 ml of sterile peptone water (Hi media) was added to it and homogenized using stomacher for 2 minutes to get uniform homogenate. Decimal dilutions of the homogenate were prepared in sterile peptone water and appropriate serial dilutions were plated in duplicate. Different media and incubation time and temperature were used for counting different types of bacteria. All the work was carried out in a clean UV sterilized laminar air flow.

Total viable count

23.5 g of Plate Count Agar (PCA) was suspended in one litre of distilled water, boiled to dissolve completely and sterilised by autoclaving at 121°C (15 lb pressure) for 15 min. Final pH was adjusted to 7.0±0.2. Sterilized petridishes in duplicate were inoculated with one ml of aliquots of appropriate dilutions. About 10-15 ml of sterile PCA maintained at 44-46°C was poured and inoculums were mixed properly by rotating plates. After solidification, plates were incubated at 37°C for 48±1 hours. The number of colonies were multiplied by reciprocal of the dilution and expressed as log10cfu/g of sample.

Coliform count

41.5 g of Violet Red Bile Agar (VRBA) was suspended in one litre of sterilized distilled water and boiled to dissolve the medium completely. Final pH was adjusted to 7.4±0.2. Duplicate one ml volumes of suitable dilutions were placed in sterile petridishes and 10-15 ml of boiled VRBA was added to each plate after cooling to 45°C. Inoculums were mixed properly by rotating plates. After solidification, the plates were incubated at 37±1°C for 24 hrs. Red to pink colonies of 0.5 mm in diameter were counted and expressed as log10cfu/g of sample.

Staphylococcal count

63 g of Baird Parker Agar base (BPA) base was suspended in 950 ml distilled water, boiled to dissolve completely and sterilized by autoclaving at 121°C (15lb pressure) for 15 min. Final pH was adjusted to 7.0±0.2. Prior to pouring the medium into the petridishes, 50 ml of egg yolk tellurite emulsion was added and mixed well. Sterilized petridishes in duplicate were inoculated with one ml aliquots of appropriate dilutions and 10-15 ml of sterile

BPA (egg yolk tellurite added) was poured to each plate after cooling to 45°C. Inoculums were mixed properly by rotating plates. After solidification, the plates were incubated at 37±1°C for 24 hours. Black, shiny and regular shaped colonies were counted and expressed as log10cfu/g of sample.

Sensory quality

The fried kola samples were subjectively evaluated for colour, flavour, texture and overall acceptability on a sensory scale by a sensory evaluation panel comprising students and staffs of College of Food and Dairy Technology, Koduveli. For this purpose, a seven point hedonic scale was developed and used to evaluate the abovementioned sensory attributes.

The description of scale utilized in the study is given below.

Physicochemical characteristics

The fried kola samples were evaluated for physicochemical characteristics like pH and cooking loss/yield.

pH

pH of the fried kola samples were determined by homogenizing 10 g of sample with 90 ml of distilled water in Ultra Turrex (IKA, Model T-25, Germany) homogenizer for one min at 3000 rpm. pH of the suspension was recorded by immersing the combined glass electrode of digital pH meter.

Weight loss or gain

The fried kola samples were weighed after 45 min of preparation in electronic weighing balance. The differences in the weight of fried kola, before and after cooking, were expressed in percentage (%) of weight loss/gain.

Results and Discussion

Preliminary experiment

Based on the results of the preliminary experiment conducted, the recipe and process that were chosen for further study has been mentioned in Table 1 and flow chart, respectively.

Microbial quality

The mean total viable, coliform and staphylococcal counts of kola as affected by refrigerated storage (4±1°C) are presented in Table 2.

The mean TVC of fired Kola was 3.12±0.05 log cfu/g of sample on day 0 i.e. 45 min after the preparation of kola and increased to 5.09±0.18 log cfu/g on day 5 of refrigerated storage. The mean Coliform count was 1.02±0.54 log cfu/g of sample on day 0 and then the count has increased until the end of study period.

Similarly, the mean staphylococcal count of kola was 1.96±0.62 log cfu/g of sample on day 0 and the count reached 3.62±0.13 log cfu/g during the end of storage period.

In contrary to the results of present study, Turhan *et al.,* (2014) observed higher *Staphylococcal aureus* and *Coliform* counts in chicken meat balls. In the present study, the kola samples were deep fat fried and then stored whereas in Turhan's study the raw meat balls were subjected to refrigerated storage and analysis. This would be the reason why the lower counts were obtained in the present study.

It is important to note that the samples kept for analysis on day 7 had shown discernible signs of spoilage and hence, the samples were not subjected to analysis.

Table.1 Recipe for preparation of Kola chosen through preliminary experiment

S.No.	Ingredients	Quantity
1	Mutton	500 gms
2	Roasted gram powder	100 gms
3	Green chillies	3 Nos.,
4	Chilli Powder	1 TSP
5	Garam masala	1 TSP
6	Fennel Seeds	1 TSP
7	Onion	2 Nos.,
8	Coriander leaves	qs*
9	Curry leaves	qs*
10	Ginger	15 gms
11	Garlic	20 gms
12	Salt	2.5%
13	Oil	750 ml for frying

*quantity sufficient

Table.2 Microbial quality of fried kola samples kept at refrigerated condition (4±1°C)

Days of storage	Total Viable Count	Coliform count	Staphylococcal count
Day 0	3.12±0.05	1.20±0.54	1.96±0.62
Day 3	3.89±0.09	2.63±0.09	3.09±0.07
Day 5	5.09±0.18	3.18±0.04	3.62±0.13

Table.3 Sensory quality of fried kola samples kept at refrigerated condition (4±1°C)

Days of storage	Colour	Flavour	Texture	Overall Acceptability
Day 0	6.50±0.22	6.83±0.16	6.68±0.21	6.50±0.22
Day 3	6.33±0.21	5.66±0.21	5.68±0.21	6.17±0.17
Day 5	5.83±0.17	5.16±0.16	5.50±0.22	5.33±0.21

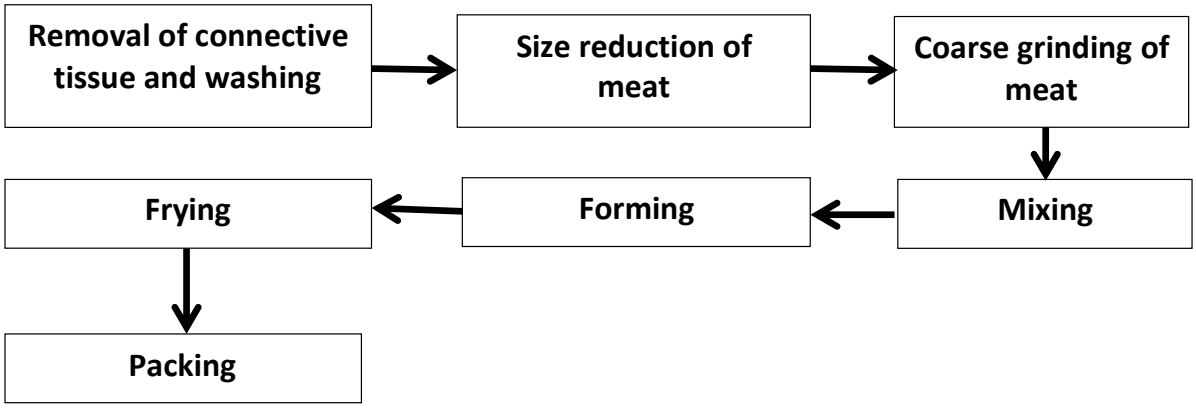
Table.4 Physio chemical quality of fried kola samples kept at refrigerated condition (4±1°C)

Days of storage	pH	Weight loss/gain (%)
Day 0	6.50±0.22	6.83±0.16
Day 3	6.33±0.21	5.66±0.21
Day 5	5.83±0.17	5.16±0.16

Seven point Hedonic Scale developed for sensory evaluation of fried Kola samples

Score	Attitude of Panel Member
7	Very much liked
6	Moderately like
5	Liked
4	Neither liked nor disliked
3	Disliked
2	Moderately dislike
1	Very much disliked

Flow Chart for Processing of Kola chosen through preliminary experiment



Sensory quality

The mean scores for sensory characteristics of fried kola as affected by refrigerated storage (4±1°C) are presented in Table 3.

The mean colour, flavour, texture and overall acceptability scores were varied between 'very much liked' (score 7) and 'moderately like' (Score 6). Upon storage at 4±1°C, the scores of all sensory attributes studied were gradually decreased as the storage days increased. The sensory scores obtained in the present study are in accordance with the results obtained by Turhan *et al.,* (2014).

Physicochemical quality

The mean pH and cooking loss/gain values (in %) of fried kola as affected by refrigerated storage (4±1°C) are presented in Table 4.

pH

On day 0, the mean pH of kola was 5.58±0.11 and increased to 6.57±0.05 on day 5 of refrigerated storage (4±1°C). With respect to pH, the result of the present study is in concordance with the results of Can and Harun (2014) who found a pH of 6.2 in chicken meat balls.

Cooking loss/gain

The mean cooking loss of fried kola was 26.86±1.86%. Conversely, Turhan *et al.,* (2014) reported that the cooking loss of 39.94±0.31% while preparing chicken meat balls. The difference in the cooking loss between the studies might be attributed to the difference in the level of grinding. In the present study, the meat was subjected to coarse grinding which would have let to maintain the intact structure of tissues. This

would have contributed to the better water holding and thereby decrease in cooking loss.

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