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Studies on shelf life of developed dietary fibre enriched chevon meat patties

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Abstract
The present study was conducted to evaluate the shelf life of dried carrot pomace (DCP) and dried pineapple pamace (DPP) incorporated chevon petties. Treated samples were prepared by incorporation of 6% DCP, 2% DPP and a combination of 3% DCP and 2% DPP. The control product was prepared by using different ingredient and chevon without any pomace. After packaging in low density polyethylene (LDPE) pouches, samples were stored at refrigeration temperature (4±1 ^{0}C) and subjected to evaluate the TBARS and microbial quality at a regular interval of 4 days. Chevon petties with 3% DCP have lowest TBA value which indicates low lipolysis as compare to control and other treatments. Total plate count and yeast and mould count were within the acceptable limit up to 12th day of refrigerated storage. Coliform, *Staphylococcus aureus*, and *Listeria monocytogenes* were not detected during storage period in any sample.

Keywords: Chevon Petties, Dried Carrot Pomace (DCP), Dried Pineapple Pomace (DPP) and Microbial quality

Introduction
Meat is a highly nutritious and multi use food consisting of high quantity and quality of proteins, B-complex, vitamins and minerals especially iron and zinc with a high level of bioavailability Moreover, chevon (goat meat) as compared with beef and lamb has a lower fat content, which is more attractive to health-conscious consumers [1]. Average dietary fibre intake of healthy person should be at least 20-40 g /day [2] but animal foods are devoid with dietary fibre. Dietary fiber has been added to different meat products to overcome the problems caused by high amount of fat [3]. So, dietary fibre enrichment of ready to eat meat products is required in view of health of the consumers.

Traditional fruits have many health benefits and especially dried carrot and pineapple are typical source of dietary fibre [4-6], Pineapple and carrot pomace contains valuable sources of dietary fibre, they could be used as a potential food ingredient to improve nutritional quality of foods. Furthermore, fibres have technological properties, such as water holding capacity(WHC), swelling capacity (SWC) and oil holding capacity, which can be useful in products that require hydration, to avoid syneresis, improve yield and also to modify texture and viscosity [7, 8]. Due to high nutritive value of meat different microbe can easily grow on the meat resulted microbial deterioration and lipid oxidation which is the main cause of loss in quality of meat products [9]. But Consumers are now interested in foods which have good quality. So this study is related to the evaluation of microbial quality and lipid oxidation of dietary fibre enriched chevon petties.

Material and Method
The investigation was conducted in the department of Livestock Products Technology, College of Veterinary Sciences, LUVAS, Hisar. Fresh chevon meat was procured from local market and transported to the department on ice. The meat was deboned manually and stored in deep freezer for further use. Carrot and pine apple were procured from the local market and washed properly with clean water. After extraction of juice pomaces were again washed and squeezed in muslin cloth to remove excess of water Then pomaces were dried in hot air drier oven at 58±^{0}C for 18 h to a level of moisture <10%. Dried product will be grounded in a grinder, packed in a polythene bag and stored for further use.

Procedure for preparation of chevon patties- For preparation of control petties, minced meat was taken to which sodium chloride (2%), sodium tripolyphosphate (0.5%), sodium nitrite (150 ppm), spice mix (2%), condiments paste (3%) were added. Treatments consisted of addition of carrot pomace at 6% (DCP-6) and pineapple pomace at 4% (DPP-4). Further a combination (DPC-23) of 3% DCP and 2% DPP were prepared.

Other ingredients were used in similar concentrations as in control. Mixing of additives and dietary fiber sources were carried out in an electrical mixer/bowl chopper for 4-6 min to prepare emulsion. The control and treated products were packed in Low density polyethylene (LDPE) pouches then stored at refrigeration temperature (4±1 ^{0}C). Thiobarbituric acid reactive substances (TBARS) value as per Witte *et al*. [10] and microbiological characteristics viz., total plate count, coliform count *Staphylococcus aureus*, *Salmonella*, *Listeria monocytogenes*, yeast and mold count were determined by methods of APHA [11] at a regular interval of 4 days.

Statistical analysis: The results were analyzed statistically using a SPSS 16.0 software (IBM). Data were subjected to one way ANOVA and Duncan's test to find significant difference in treatments. A value of $p<0.05$ was used to indicate significant difference.

Result and Discussion

TBA value increased during storage period and maximum increase was observed in control, followed by pineapple and carrot pomace contains chevon meat patties(Table1).This effect can be attributed to presence of polyphenol in pineapple and carrot pomace chevon meat patties which are known to have antioxidant effect [12,13]. Devatkal *et al*. [14] also found low value of TBARS during storage of Kinnow rind powder extract goat meat patties.

Table 1: TBA value (mg malondehyde/kg) of chevon meat patties incorporated with carrot and pineapple pomace stored at 4±1 ^{0}C. (n=6)

Day	Control	DCP-6	DPP-4	DPC-23
0 day	1.11 ±0.13^{dA}	0.95 ±0.13^{cA}	0.99 ±0.13^{dA}	0.98±0.11^{dA}
4 day	1.21 ± 0.09 ^{dA}	1.00 ± 0.11 ^{cB}	1.15 ±0.13 ^{cA}	1.18 ±0.10 ^{cA}
8 day	1.42±0.15^{cA}	1.20±0.14^{bB}	1.38±0.11^{bA}	1.40±0.12^{bA}
12 day	1.65±0.19^{bA}	1.32±0.13^{bB}	1.40±0.11^{bB}	1.42±0.12^{bB}
16 day	2.10±0.10^{aA}	1.85±0.11^{aB}	1.97±0.13^{aAB}	1.98±0.15^{aAB}

Mean±SD. Means with different small superscripts within a column and capital superscripts in a row differ significantly ($p<0.05$).

There was significant increase in total plate count for control and treated chevon meat patties during storage but TPC differ non significantly between the various sample at respective days of storage. The TPC observed during study were comparable to the observations made by Sahoo and Anjaneyulu [15] in meat nuggets, Devatkal *et al*. [16] found low value of TPC in goat meat nuggets added with pomegranate peel extract.

Table 2: Total plate count (log cfu/g) of Chevon meat patties added with dried pineapple pomace and carrot pomace at 4+1 ^{0}C (n=6).

Day	Control	DCP-6	DPP-4	DPC-23
0 day	2.88±0.28^{eA}	2.93±0.40 ^{dA}	3.09±0.36 ^{eA}	3.03±0.38 ^{dA}
4 day	3.42±0.32^{dA}	3.18±0.30 ^{dA}	3.53±0.28 ^{dA}	3.41±0.44 ^{dA}
8 day	4.27±0.33^{cA}	4.08±0.40 ^{cA}	3.99±0.43 ^{cA}	4.27±0.34 ^{cA}
12 day	5.35±0.42^{bA}	4.97±0.27 ^{bA}	5.23±0.40 ^{bA}	4.96±0.30 ^{bA}
16day	6.12±0.38^{aA}	5.98±0.39 ^{aA}	6.06±0.28 ^{aA}	6.17±0.47 ^{aA}

Mean±SD. Means with different small superscripts within a column and capital superscripts in a row differ significantly ($p<0.05$)

Coliforms, *Staphylococcus aureus*, *Salmonella*, *Listeria monocytogenes* were not detected in any of the samples on any interval of storage period. It reflects the hygienic conditions followed during the processing and handling of the products as well as the high treatment employed during cooking. Similar findings were also observed by Suman [17], Kumar and Sharma [18] in low fat ground buffalo meat patties, pork patties.

Table 3: Yeast and Moulds count (log cfu/g) of Chevon meat patties added with dried pineapple pomace and carrot pomace at 4+1 ^{0}C (n=6)

Day	Control	DCP-6	DPP-4	DPC-23
0 day	1.15±0.23^{cA}	1.40±0.24 ^{cA}	1.48±0.27^{cA}	1.38±0.39^{dA}
4 day	1.45±0.46^{cA}	1.55±0.34 ^{cA}	1.62±0.38 ^{cA}	1.46±0.25^{dA}
8 day	2.19±0.44^{bA}	2.00±0.28 ^{bA}	2.34±0.38 ^{bA}	2.20±0.27 ^{cA}
12 day	2.62±0.39^{bA}	2.64±0.45 ^{aA}	2.97±0.35 ^{aA}	2.75±0.40 ^{bA}
16 day	3.17±0.32^{aA}	3.02±0.29 ^{aA}	3.20±0.31 ^{aA}	3.29±0.53^{aA}

Mean±SD. Means with different small superscripts within a column and capital superscripts in a row differ significantly ($p<0.05$).

Yeast and Moulds count of control and treated chevon meat patties were around 1 log cfu/g. There was significant increase yeast and moulds count for control and treated chevon meat patties and reached to around 2 log cfu/g for control, DPP-6, DCP-4 and DPC-23 and on 12th day. On 16th day, counts of around 3 log cfu/g were observed as showed in (Table 3). The growth of yeast and mould may be due to reduction in aw level as result of moisture loss during storage.

Conclusion

On the basis of above studies we can conclude the control as well treated samples were safe up to 12th day of refrigerated storage i.e 4±1 ^{0}C. Carrot pomace was more effective in retarding the development of oxidative rancidity during storage than pineapple pomace but the total plate count as well as yeast and mold counts vary non significantly between control and pomaces incorporated samples.

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