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## Studies on quality characteristics and storage life of developed chevon meat patties incorporated with carrot and pine apple pomace

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### Abstract

This study was conducted to evaluate the effects of dried pomace of carrot and pineapple on physico-chemical, polyphenol content and shelf life on the bases of sensory evaluation of developed chevon meat patties. Treated samples were prepared by incorporation of dried pomace of carrot (6%) and pineapple (4%) alone and in combination (3:2) using other ingredients similar to control. The samples were stored at refrigeration temperature ( $4\pm 1$  °C) to evaluate their sensory score at a regular interval of 4 days. Addition of pineapple and combination of carrot and pineapple showed significantly higher cooking yield, emulsion stability, water holding capacity and total phenol content as compared to control and carrot pomace alone. However, pH and firmness of all the treated products were decreased as compared to control but all the products including control were organoleptically acceptable till 12 days of storage. It is concluded that addition of dried pomace of pine apple alone (4%) or in combination with dried carrot pomace (3:2) improved the physicochemical properties of developed chevon meat patties and the products can be stored for 12 days at refrigeration temperature ( $4\pm 1$  °C).

**Keywords:** Chevon patties, dried carrot pomace, dried pineapple pomace, physico-chemical properties, sensory evaluation

### Introduction

Meat is an excellent source of proteins and suits human diet due to its satiating characteristics. It also has a great potential for delivering important nutrients with a high degree of bioavailability as compared to other foodstuffs [1, 2]. On the other hand, meat and meat products are very poor source of dietary fibre and their regular consumption is being associated with various health disorders such as colon cancer, obesity and cardiovascular diseases [3-5]. Dietary fibre imparts important functional properties to foods like increased water holding capacity, oil holding capacity, emulsification and gel formation. Dietary fibre incorporated into food products can modify textural properties, avoid syneresis, stabilises high fat foods and emulsions and improves shelf-life [6, 7]. It also acts as a satiety agent and contributes to weight management [8, 9]. Various types of fibres have also been studied alone or in combination for the formulation of low fat meat products [10, 11] and meat emulsions [12]. Red meat and pork products can benefit from lubrication, slipperiness and mouth feel due to presence of fiber as fat replacers [13]. Pineapple is a rich source of fibre and antioxidants namely flavonoids in addition to citric and malic acids and moderate amounts of ascorbic acid. Polyphenols possess beneficial properties, such as antioxidant, immune modulatory actions and anti-cancer and antibacterial activity [14]. Very little work has been done on the development of fibre enriched meat product using carrot fibre and pineapple pomace. Hence this study was carried out to evaluate the effects of fibre enrichment on physico-chemical and sensory properties of chevon patties.

### Material and Method

Fresh chevon meat was procured from local market and transported to the department of Livestock Products Technology, LUVAS Hisar. 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 pomace was again washed and squeezed in muslin cloth to remove excess of water. Then pomace was dried in hot air drier oven at  $58\pm c$  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.

For preparation of control patties(C), 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 were prepared by addition of dried pomace of carrot at 6% (T<sub>1</sub>), pineapple at 4% (T<sub>2</sub>) and a combination (T<sub>3</sub>) of 3% carrot and 2% pineapple. 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. After estimation of physico-chemical properties and polyphenol content samples were stored at refrigeration temperature (4±1 °C) for sensory evaluation at a regular interval of 4 days.

pH and Water holding capacity were determined by Trout *et al.* [15] and Wardlaw *et al.* [16] methods respectively. Emulsion Stability was evaluated by the method of Baliga and Madaiah [17] and method of Swain and Hills [18] was adopted to assess polyphenol content. Shear press value of cooked patties was analysed using Texture Analyser (TA.HD plus), Stable Micro Systems. Cooking yield was expressed as per cent weight of cooked sample. Sensory evaluation viz: colour, flavour, texture, tenderness, juiciness and over all acceptability of patties, using a 9-point Hedonic scale.

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

### Physico-chemical properties

Incorporation of pineapple and carrot pomaces resulted in lowering the pH of chevon meat patties but pH differ significantly ( $p < 0.05$ ) with addition of pineapple pomace and combination of both pomaces. This might be due to presence of citric acid in pineapple pomace [19]. All treatments have significantly ( $p < 0.05$ ) higher cooking yield as compare to control chevon patties but within treatments there is no significant difference. Higher cooking yield in fibre added chevon patties can be attributed due to water retaining properties of fibre [7].

Control chevon patties have the significantly ( $p < 0.05$ ) lower value of emulsion stability and water holding capacity as compare to all fiber enriched chevon patties. This might be due to water retaining properties of fibre [7]. Grossi *et al.* [20] reported high water binding capacity of dietary fibre enriched comminuted meat emulsion.

**Table 1:** Physico-chemical properties of developed Chevon meat patties (n=6. Mean± SD)

Treatments	pH	Cooking yield (%)	Emulsion stability (%)	Water holding capacity (%)	Firmness Kg/cm <sup>3</sup>
C	6.28±0.03 <sup>a</sup>	75.13±1.61 <sup>b</sup>	82.53±1.10 <sup>c</sup>	35.67±1.44 <sup>c</sup>	0.90±0.22 <sup>a</sup>
T <sub>1</sub>	6.13±0.02 <sup>a</sup>	81.83±1.26 <sup>a</sup>	87.63±1.29 <sup>b</sup>	40 ±2.50 <sup>b</sup>	0.80±0.11 <sup>a</sup>
T <sub>2</sub>	5.92±0.02 <sup>b</sup>	82.83±1.53 <sup>a</sup>	91.33±1.10 <sup>a</sup>	43.33±1.44 <sup>a</sup>	0.28±0.03 <sup>b</sup>
T <sub>3</sub>	5.96±0.01 <sup>b</sup>	82.17±1.89 <sup>a</sup>	91.80±1.40 <sup>a</sup>	44.17±1.44 <sup>a</sup>	0.33±0.03 <sup>b</sup>

Means with different superscripts within a column differ significantly ( $p < 0.05$ ). C- Control sample, T<sub>1</sub>- 6% dried carrot pomace, T<sub>2</sub>- 4% dried pineapple pomace and T<sub>3</sub>- combination of 3% carrot and 2% pineapple dried pomace.

After addition of pomaces there was significant ( $p < 0.05$ ) decrease in shear press value (firmness) of chevon patties. Saleh and Ahmed [21] documented that hardness was decreased by the addition of carrot and sweet potato to beef

patties. They reported that the addition of vegetables may reduce the friction and/or binding among meat particles and hence reduce the hardness.

**Table 2:** Polyphenolic content of chevon patties incorporated with dried carrot pomace and pineapple pomace (n=6, mean ± SD)

Treatment	Polyphenolic content (mg/100g)
C	0.37±0.08 <sup>d</sup>
T <sub>1</sub>	23.9±0.09 <sup>a</sup>
T <sub>2</sub>	16.3±0.06 <sup>c</sup>
T <sub>3</sub>	20.5±0.10 <sup>b</sup>

Means with different superscripts within a column differ significantly ( $p < 0.05$ ). C- Control sample, T<sub>1</sub>- 6% dried carrot pomace, T<sub>2</sub>- 4% dried pineapple pomace and T<sub>3</sub>- combination of 3% carrot and 2% pineapple dried pomace.

Polyphenolic content of all samples differ significantly ( $p < 0.05$ ) from control and highest polyphenol content (23.9mg/100gm) was observed in T<sub>1</sub>. This increase in polyphenolic content is due to polyphenolic content of pineapple (Gorinstein *et al.*) [22] and carrot pomace (Shyamala and Jamuna) [23].

### Sensory evaluation

Addition of dietary fibre results in lowering the colour value but not significantly up to 8 day of storage. Flavour tends to

decrease significantly ( $p < 0.05$ ) after addition of dietary fibre. But all samples were moderately accepted for colour and flavor till the last day of storage. Texture of chevon meat patties decreased with addition of dietary fibre and control sample have significant ( $p < 0.05$ ) lower texture value on 8th and 12th day from all other treatments. All patties were moderately liked (i.e. 7) till 12 days. Lin and Lin [24] also reported the detrimental effect on textural after addition of bacterial cellulose (Nata) in meatball.

**Table 3:** Sensory scores of dried pineapple pomace and carrot pomace incorporated chevon patties stored at 4±1 °C (n=12)

Day	C	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
<b>Colour</b>				
0 day	7.83±0.54 <sup>aA</sup>	7.79±0.75 <sup>aA</sup>	7.58±0.63 <sup>aA</sup>	7.67±0.62 <sup>aA</sup>
4 day	7.75±0.50 <sup>aA</sup>	7.63±0.71 <sup>aA</sup>	7.38±0.61 <sup>abA</sup>	7.58±0.63 <sup>aA</sup>
8 day	7.71±0.69 <sup>aA</sup>	7.58±0.66 <sup>aA</sup>	7.17±0.72 <sup>abA</sup>	7.63±0.61 <sup>aA</sup>
12 day	7.63±0.64 <sup>aA</sup>	7.54±0.70 <sup>aA</sup>	7.00±0.60 <sup>ab</sup>	7.46±0.66 <sup>aAB</sup>
<b>Flavour</b>				
0 day	8.08±0.70 <sup>aA</sup>	7.46±0.45 <sup>ab</sup>	7.38±0.88 <sup>ab</sup>	7.46±0.66 <sup>ab</sup>
4 day	7.96±0.81 <sup>aA</sup>	7.38±0.43 <sup>abA</sup>	7.33±0.72 <sup>abA</sup>	7.33±0.78 <sup>aA</sup>
8 day	7.63±0.64 <sup>aA</sup>	7.13±0.53 <sup>abAB</sup>	7.04±0.62 <sup>ab</sup>	7.13±0.71 <sup>aAB</sup>
12 day	7.50±0.56 <sup>aA</sup>	7.00±0.52 <sup>ba</sup>	7.00±0.56 <sup>aA</sup>	7.08±0.70 <sup>aA</sup>
<b>Texture</b>				
0 day	8.20±0.58 <sup>aA</sup>	7.63±0.77 <sup>aA</sup>	7.67±0.91 <sup>aA</sup>	7.54±0.89 <sup>aA</sup>
4 day	7.92±0.56 <sup>aA</sup>	7.50±0.90 <sup>aA</sup>	7.58±0.47 <sup>aA</sup>	7.42±0.67 <sup>aA</sup>
8 day	7.96±0.54 <sup>aA</sup>	7.38±0.77 <sup>ab</sup>	7.29±0.62 <sup>ab</sup>	7.29±0.62 <sup>ab</sup>
12 day	7.75±0.58 <sup>aA</sup>	7.25±0.78 <sup>ab</sup>	7.17±0.54 <sup>ab</sup>	7.08±0.47 <sup>ab</sup>
<b>Tenderness</b>				
0 day	8.08±0.51 <sup>aAB</sup>	7.50±0.64 <sup>ab</sup>	8.33±0.65 <sup>aA</sup>	7.71±0.86 <sup>ab</sup>
4 day	7.96±0.66 <sup>aAB</sup>	7.33±0.69 <sup>ab</sup>	8.42±0.79 <sup>aA</sup>	7.75±0.84 <sup>ab</sup>
8 day	7.96±0.75 <sup>aA</sup>	7.29±0.50 <sup>ab</sup>	8.25±0.69 <sup>aA</sup>	7.67±0.81 <sup>aAB</sup>
12 day	7.88±0.61 <sup>aA</sup>	7.13±0.64 <sup>ab</sup>	8.17±0.83 <sup>aA</sup>	7.58±0.82 <sup>aAB</sup>
<b>Juiciness</b>				
0 day	7.42±0.47 <sup>ab</sup>	7.88±0.68 <sup>aAB</sup>	8.17±0.75 <sup>aA</sup>	7.67±0.54 <sup>aAB</sup>
4 day	7.33±0.65 <sup>ab</sup>	7.71±0.45 <sup>abAB</sup>	8.00±0.85 <sup>abA</sup>	7.63±0.48 <sup>aAB</sup>
8 day	7.17±0.33 <sup>aA</sup>	7.38±0.48 <sup>bcA</sup>	7.54±0.50 <sup>ba</sup>	7.21±0.58 <sup>abA</sup>
12 day	7.04±0.50 <sup>aA</sup>	7.25±0.45 <sup>ca</sup>	7.46±0.66 <sup>ba</sup>	7.17±0.74 <sup>ba</sup>
<b>Overall acceptability</b>				
0 day	8.21±0.62 <sup>aA</sup>	7.54±0.66 <sup>ab</sup>	7.46±0.66 <sup>ab</sup>	7.58±0.67 <sup>ab</sup>
4 day	7.96±0.62 <sup>aA</sup>	7.46±0.66 <sup>ab</sup>	7.42±0.47 <sup>ab</sup>	7.50±0.48 <sup>ab</sup>
8 day	7.88±0.53 <sup>aA</sup>	7.29±0.62 <sup>ab</sup>	7.13±0.68 <sup>ab</sup>	7.13±0.68 <sup>ab</sup>
12 day	7.75±0.40 <sup>aA</sup>	7.17±0.58 <sup>ab</sup>	7.08±0.70 <sup>ab</sup>	7.08±0.70 <sup>ab</sup>

Means with different small superscripts within a column and capital superscripts in a row differ significantly ( $p < 0.05$ ). C- Control sample, T<sub>1</sub>- 6% dried carrot pomace, T<sub>2</sub>- 4% dried pineapple pomace and T<sub>3</sub>- combination of 3% carrot and 2% pineapple dried pomace.

Tenderness score for control on 8<sup>th</sup> and 12<sup>th</sup> day differ significantly ( $p < 0.05$ ) from T<sub>1</sub> as showed in table 3. T<sub>2</sub> have a score above 8.00 i.e. liked very much on 12<sup>th</sup> day while other treatments had score above 7.00 i.e. moderately acceptable indicating water retaining property of fibre during storage, resulting into higher tenderness scores. These results telly with Saleh and Ahmed [21] who reported that hardness was decreased by the addition of carrot and sweet potato to beef patties.

Juiciness scores and for control and other treatments were above 7.00 (i.e. moderately liked) after 12 day of storage. Chevance *et al.* [25] also reported similar finding after addition of dietary fibre in the meat products. There was significant ( $p < 0.05$ ) difference in overall acceptability scores of control as compare to all treatments but overall acceptability scores for all samples were above 7.00 during complete storage period. Good scores of juiciness and tenderness contributed to overall acceptability of product up to 12<sup>th</sup> day of storage.

### Conclusion

Incorporation of dried pineapple pomace and carrot pomace improved the cooking yield, emulsion stability, water holding capacity and Polyphenol content of developed chevon patties. Storage period did not affect the quality characteristics and sensory scores significantly ( $P < 0.05$ ) till the end of storage and patties can be stored up to 12 days with good quality characteristic and highly acceptable sensory scores.

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