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Standardization of Shredded Potato and Added Water Levels in the Development of Chevon Cutlets

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ABSTRACT

The objective of the present study was undertaken to standardize the levels of shredded potato and added water in the development of chevon cutlets. The lean meat was minced twice through 4 mm plate. The cutlets were prepared with the incorporation of shredded potato at 0, 5, 10 and 15% level and added water at 0, 3, 6 and 9%, respectively replacing the lean meat. A significant effect of mincing was observed with the highest scores for juiciness and texture for the products developed from twice minced lean meat. Cutlets prepared with the incorporation of 5% shredded potato were found to have better scores for almost all the sensory parameters. Incorporation of 3% added water significantly ($p<0.05$) increased the appearance and colour, texture, juiciness and rusk pick-up. Thus, good quality chevon cutlets could be prepared by incorporating 5% shredded potato and 3% added water.

Keywords: Cutlets, Chevon, Mincing, Shredded potato, Quality characteristics.

Meat cutlets are ready to eat convenient meat products that are very famous throughout the world and widely used in the breakfast. Cutlets are flat croquette of minced meat, flour, pulse, nuts, shredded potato, condiments, spices and often coated with rusk crumbs. The nutritive value and sensory quality of the cutlets can be further enhanced by utilization of goat meat. Being low in fat and total calories, the chevon cutlets will prove a better option for the non-vegetarian consumers. Development of fast food sector is mainly contributed to the rapid urbanization and change in the food habits. The ready to eat / ready to prepare (RTE/ RTP) food provided a suitable option for consumers in today's busy life style.

The goat meat is very popular and widely favoured by the consumers in most part of the globe including India. Unlike with pork or beef, there is no religious taboo

against chevon. Chevon is red meat that is often viewed as potential competitor to beef and sheep meat. It is almost universally acceptable and free from culture, tradition, social and economic conditions (Verma *et al.,* 2014; Khandagale *et al*., 2013; Singh *et al*., 2012). In India, it fetches highest price in comparison to other meat. According to Simela *et al.* (2008) chevon and chevon products are considered as high quality products on sensory evaluation by the trained panellists. Chevon has also been reported to contain higher collagen and has lower solubility than mutton and its intramuscular connective tissues remain unchanged during post-mortem ageing (Kannan *et al.,* 2005). Some peculiar qualities such as lower in calories, total fat, saturated fat and cholesterol makes it suitable for health conscious people. Chakraborty *et al.* (2003) recommended chevon for heart patients due to higher potassium and lower sodium content as well as availability of high quality protein. Chevon is a rich source of iron (3.88mg/100gm) than other meat such as beef. As goats are slaughtered at higher age, chevon is less tender due to presence of higher amount of connective tissue as well as goaty odour (Lawrie, 1985). The amount of connective tissue in meat increases with the advancement of age (Kumar *et al.,* 2012). Chevon has also been reported to contain higher collagen and has lower solubility than mutton and its intramuscular connective tissues remain unchanged during post-mortem ageing (Verma *et al.,* 2014). The high amount of connective tissue in chevon makes it tough and less juicy and during post-mortem aging intramuscular connective tissue remain unchanged (Kannan *et al.,* 2005) which could be overcome by suitable processing techniques (Hedrick *et al.,* 1994; Lawrie, 1985).

The potato (Solanum *tuberosum)* is widely used in the development of food products. These products are used for preparation of different variety of crispy food products including meat products (Sushant *et al*., 2010). The composition of potato starch is about 21% amylose, 75% amylopectin, 0.1% protein and 0.08% phosphorus (Friedman, 2003). It is added in the meat products as fillers, binders, fat replacers and sources of dietary fiber and natural antioxidants (Hedrick *et al*., 1994). Potato being a rich source of starches increases the water-binding properties of meat products (Chin *et al*., 1998; Kim and Lee, 1987; Prabhu and Sebranek, 1997). Rusk is a baked and ground material made from wheat flour with sizes ranging from coarse, granules, pinhead and superfine. Rusk shows very high water absorbing capacity (3-4 times of its weight) and it increases with the increase in the surface. It prevents excessive abrasive force on fat tissues before they become soaked and improves the texture of the products (Eissen, 2000).

Thus the present study was envisaged to standardize the levels of shredded potato and added water in the development of chevon cutlets.

MATERIALS AND METHODS

Source of raw materials

The round part of adult *Bhakarwal* goat meat was purchased from the local market of Jammu and were kept in low density polyethylene (LDPE) bags after removing the connective tissue, fascia and separable fat. Spice mix was prepared from 16 different spice ingredients as per the formulation developed in the laboratory (Table 1). The added water was added in the form of crushed ice. The spice ingredients were kept in hot air oven at 55-60^{0}C for overnight for drying. Condiments were prepared by making paste of peeled onion, ginger and garlic in the ratio of 3:1:1.

Table 1. Composition of spice mixture

Ingridients	Percent (%)
Aniseed (soanf)	12
Caraway seed (Ajwain)	04
Elaichi	04
White pepper	05
Bay leaves (Tejpatta)	02
Black pepper (Kali mirch)	10
Cardamom (Badi Elaichi)	05
Cinnamon (Dalchini)	05
Cloves (laung)	02
Degi mirch	05
Coriander (dhania)	15
Cumin seed (zeera)	15
Mace (javitri)	02
Nutmeg (Jaiphal)	02
Red Chilli (Lal mirch)	07
Turmeric (Haldi)	05

Preparation of chevon meat cutlets

The frozen goat meat was minced (once, twice and thrice) to know the effect of mincing. Curing ingredients, table salt, crushed ice (0%, 3%, 6% and 9%) sugar and sodium nitrite were added to it (Table 2) and this was kept for 15-20 min at refrigeration temperature (4±1^{0}C). The mixture was fried in 2.5% w/w refined oil for 8 minutes in shallow fat fried. The condiments and spice mixture were fried separately till the appearance of golden brown colour. The fried meat, fried condiments, gram flour, shredded potato (0%, 5%, 10% and 15%) and whole

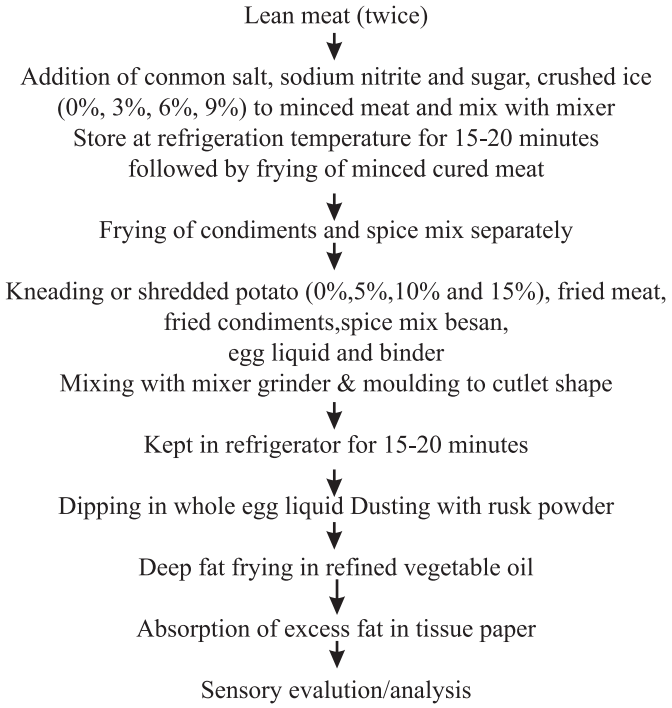

Figure 1: Flow diagram of preparation of chevon cutlets

egg liquid were mixed in mixer. The batter so formed after blending was used in the preparation of cutlets by using moulds. The moulds were kept at refrigerator temperature for retaining the shape for 15-20 minutes. The cutlets were dipped in whole egg liquid and rolled in rusk powder till uniform coating was formed on the surface and were deep fat fried in refined oil till golden brown colour. The internal core temperature was measured with the help of a thermometer (80^0C) and the excess fat was removed from the fried cutlets by using tissue paper.

Physico-chemical analysis

The products were evaluated for pH, rusk pick up percentage, product yield, percent shrinkage and proximate composition. The pH of both raw and fried chevon meat cutlets was determined (Keller *et al.*1992). The cooking yield was recorded by noting the weight of cutlets before and after frying.

$$\text{Cooking Yield (\%)} = \frac{\text{Weight of fried enrobed cutlets}}{\text{Weight of raw enrobed cutlets}} \times 100$$

The rusk pick up percent was determined as per formula given by Hsia *et al*. (1992) by noting the weights of cutlets before and after rusk pick up.

$$\text{Rusk powder pick up (\%)} = \frac{\text{Weight of cutlet after dusting - weight of cutlet before dusting}}{\text{Weight of cutlet before dusting}} \times 100$$

Proximate composition

Proximate composition such as moisture (oven drying), ether extract (Soxhlet apparatus), ash (muffle furnace) of both raw and fried goat meat cutlet was determined using AOAC (1995) methods.

Table 2: Basic formulation for the preparation of chevon cutlets.

Ingredients	Control	Level of added water			Level of shredded potato		
		T1 (3%)	T2 (6%)	T3 (9%)	T1 (5%)	T2 (10%)	T3 (15%)
Meat	82	79	76	73	77	72	67
Condiments*	10	10	10	10	10	10	10
Spices	2	2	2	2	2	2	2
Salt	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Sugar	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Gram flour	2	2	2	2	2	2	2
Sodium nitrite	150ppm	150ppm	150ppm	150ppm	150ppm	150ppm	150ppm
Whole egg liquid	2	2	2	2	2	2	2

*Onion3: garlic 1:ginger1

Sensory analysis

A trained sensory evaluation panel (Keeton, 1983) consisting of seven members from the scientists and post-graduate students of the Division of Livestock Product Technology, Faculty of Veterinary Science and Animal Husbandry, SKUAST of Jammu evaluated the cutlets. The products were evaluated for appearance and colour, flavour, juiciness, texture and overall acceptability, using an 8-point descriptive scale, where 8 is extremely desirable and 1 is extremely undesirable. The panellists were seated in a room free of noise and odours and suitably illuminated. Coded samples for sensory evaluation were prepared and served warm to the panellists. Water was provided for oral rinsing between the samples.

Statistical analysis

Means and standard errors were calculated for different parameters. Data obtained in the study were analyzed statistically on'SPSS-16.0' software package as per standard methods (Snedecor & Cochran 1994). Duplicate samples were drawn

for each parameter and the experiment was replicated thrice (n = 6). Sensory evaluation was performed by a panel of seven member judges three times, so total observations being 21 (n = 21). Data were subjected to one-way analysis of variance and level of significance among the treatments

Table 3. Effect of shredded potato levels on the physic-chemical parameters in the raw and cooked chevon cutlets (Mean±SE)

Parameters	Control	Treatment I	Treatment II	Treatment III
Raw chevon cutlets				
P^H	5.86±0.016^b	5.89±0.006^a	5.90±0.002^a	5.91±0.006^a
Moisture	57.11±0.20^b	57.17±0.21^b	57.51±0.09^b	59.29±0.24^a
Fat	14.0±0.32^a	13.51±0.26^b	13.18±0.12^b	12.85±0.30^b
Ash	2.71±0.20^a	2.39±0.09^b	2.37±0.70^b	2.38±0.004^b
Cooked chevon cutlets				
P^H	5.87±0.006^b	5.89±0.012^a	5.91±0.015^a	5.92±0.003^a
Moisture	54.53±o.125^c	54.85±0.087^c	55.64±0.053^b	56.21±0.15^a
Fat	22.00±0.10^a	21.64±0.101^b	21.25±0.13^c	20.73±0.063^d
Ash	2.75±0.03^a	2.40±0.07^b	2.38±0.06^b	2.37±0.02^b
Cooking yield	97.28±0.37^a	94.97±0.44^b	94.27±0.13^b	93.41±0.14^c
Rusk pick up	5.84±0.027^d	5.95±0.019^c	6.16±0.14^b	6.48±0.014^a

n= 6 for each treatment. Mean with different superscript differ significantly ($p<0.05$) in a row

Control= 0% shredded potato, Treatment I= 5% shredded potato, Treatment II= 10% shredded potato and Treatment III= 15% shredded potato

RESULTS AND DISCUSSION

Effect of shredded potato

Physico-chemical parameters

The mean values of various physic-chemical parameters chevon cutlets containing shredded potato at 0%, 5%, 10% and 15% levels are presented in the Table 3. The pH of the raw and cooked control (0% potato levels) was significantly ($p< 0.05$) lower than the raw treatments i.e. treatment I (5% shredded potato), treatment II (10% shredded potato) and treatment III (15% shredded potato). This could be due to comparatively higher pH of potato juice and the present findings are in agreement with the Ali *et al*. (2011) in beef patties. In the raw product, significantly

higher ($p<0.05$) moisture percent is reported for the treatment III as compared to others. The moisture percentage increased with the increasingly levels of shredded potato in the product in both raw as well as cooked product. This could be due to the replacement of lean meat having lower moisture with the potato having higher moisture as well as ability of potato to bind water (Mansour, 2003; Khalil, 2000; Bullock *et al.,* 1995; Berry and Wergin, 1993). The cooked chevon cutlets showed less moisture than the raw products due to release of water loosely bound with protein or hydrated shredded potato during cooking process (El-Beltagy *et al.,* 2007; Mansour, 2003; Ali *et al*., 2011). The fat percent of raw product decreased with the increasing level of potato in the product and the raw control was having significantly higher fat percent than the treatments. This could be due to presence of very low fat percent (0.1%) in the potato as compared to the replaced chevon meat. The cooking yield of control was significantly ($p< 0.5$) higher than the treatments. The cooking yield of treatment I and II were comparable and were significantly ($p<0.05$) higher than the treatment III. This could be due to the better water binding capacity of the meat as compared to the shredded potato (Mansour, 2003; Khalil, 2000; Berry, 1997; Ali *et al*., 2011). The rusk pick up percent increased significantly ($p<0.5$) with the increasingly levels of shredded potato levels in the product. This might be due to the increase in moisture content in the product which facilitates the large pick up of the rusk materials (Essien, 2000).

Table 4: Effect of shredded potato levels on the sensory scores of cooked chevon cutlets (Mean±SE)

Attributes	Control	Treatment I	Treatment II	Treatment III
Appearance and Colour	6.67±0.16	6.58±0.13	6.81±0.15	6.44±0.06
Flavour	6.67±0.06^{b}	6.88±0.06^{a}	6.57±0.08^{b}	6.1±0.050^{c}
Juiciness	6.45±o.10^{b}	6.80±0.20^{a}	6.53±0.08^{ab}	6.47±0.08^{c}
Texture	6.47±0.09^{b}	6.73±0.09^{a}	6.62±0.07^{ab}	6.20±0.03^{c}
Overall Acceptability	6.57±0.06^{b}	6.88±0.14^{a}	6.53±0.06^{b}	6.25±0.04^{c}

Mean±SE with different superscripts in a row differ significantly ($P<0.05$) Mean are scores given by sensory panellists on 8 point hedonic scale where 1 = Extremely undesirable and 8 = extremely desirable

n = 21 for all sensory attributes

Control= 0% shredded potato, Treatment I= 5% shredded potato, Treatment II= 10% shredded potato and Treatment III= 15% shredded potato

Sensory attributes

The chevon cutlets containing 5% shredded potato levels (Treatment I) showed improved sensory attributes except flavour as compared with the control and treatment II and III (Table 4). The appearance and colour of the treatment I was marginally higher than the other treatments as well as contol due to dilution of meat pigments become more prominent at higher potato levels (Ali *et al*., 2011). The juiciness and texture scores of treatment I and II were comparable. The improved texture in the treatment I and II over control upon addition of potato could be due to gelatization of the starch (Ahmed *et al*., 2007) which in turn become prominent at treatment III. The overall acceptability of the treatment I were significantly ($p<0.5$) higher than the control and other treatments, whereas the overall acceptability of treatment II and control were comparable. Based on the sensory parameters, treatment I with 5% shredded potato level was considered as optimum and used for further studies.

Table 5. Effect of ice on the physic-chemical parameters of raw and cooked chevon cutlets (Mean±SE)

Parameters	Control	Treatment I	Treatment II	Treatment III
Raw chevon cutlets				
P^H	5.86±0.004^c	5.91±0.004^b	5.93±0.003^a	5.94±0.002^a
Moisture	57.38±0.33^d	58.24±0.34^{cd}	58.94±0.24^{bc}	59.51±0.41^a
Fat	13.85±0.18^a	13.77±0.15^a	13.19±0.23^b	12.74±0.20^b
Ash	2.67±0.084^a	2.59±0.064^a	2.47±0.87^{ab}	2.36±0.055^b
Cooked chevon cutlets				
P^H	5.89±0.013^c	5.93±0.005^b	5.94±0.004^{ab}	5.96±0.007^a
Moisture	54.72±0.17^a	55.45±0.81^{bc}	56.38±0.42^c	56.54±0.47^c
Fat	21.88±0.32^a	21.10±0.52^b	20.79±0.41^c	19.90±0.31^d
Ash	2.86±0.057^a	2.59±0.46^{ab}	2.51±0.17^b	2.44±0.01^c
Cooking yield	97.49±0.12^a	97.42±0.07^b	96.98±0.008^c	96.47±0.19^c
Rusk pick up	5.75± 0.04^a	5.77± 0.08^a	6.17± 0.07^b	6.40± 0.01^c

n= 6 for each treatment. Mean with different superscript differ significantly ($p<0.05$) in a row

Control= 0% ice, Treatment I= 3% ice, Treatment II= 6% ice and Treatment III= 9% ice

Effect of added water

Physico-chemical parameters

The pH of the raw chevon cutlets increased significantly ($p< 0.05$) for treatment I

than the control (without ice), however the pH of raw treatments were comparables (Table 5). This could be due to the near neutral pH of the ice. The pH of the cooked products increased significantly ($p< 0.05$) in the treatment I than the pH of control. The pH of the cooked treatment II was comparable to the treatment I and III, however it was significantly ($p<0.5$) higher for treatment III as compared to the control and treatment I. The moisture content of the raw control was comparable to the treatment I. The moisture content of treatment II showed significantly ($p<0.05$) higher moisture than the control and significantly ($p<0.05$) lower than treatment III. The obvious reason of this is the addition of ice by replacing lean meat. The moisture content of the cooked chevon cutlets was significantly ($p<0.5$) increased in the addition of 3% ice in treatment I. The fat percent of the raw control and treatments showed significantly ($p<0.5$) decreasing trends with the increasing level of ice. The cooking yield was significantly ($p<0.5$) decreased in treatment I which in turn showed significantly ($p<0.5$) lower cooking yield than treatment II. The rusk pick up percent showed an increasing trends with the increasing levels of ice and it was significantly ($p<0.5$) higher for the treatment II than the control and treatment I. The rusk pick up percent of the treatment III was significantly ($p<0.5$) higher than the treatment II due to higher moisture facilitates higher rusk pick up (Essien, 2000).

Table 6: Effect of ice on the sensory scores of cooked chevon cutlets (Mean±SE)

Attributes	Control	Treatment I	Treatment II	Treatment III
Appearance and Colour	6.60±0.053^{b}	6.91±0.063^{a}	6.53±0.042^{b}	6.48±0.050^{b}
Flavour	6.72±0.013	6.57±0.074	6.72±0.091	6.64±0.081
Juiciness	6.61±0.067^{b}	6.87±0.07^{a}	6.88±0.08^{a}	6.90±0.09^{a}
Texture	6.70±0.07^{b}	6.98±0.09^{a}	6.77±0.052^{b}	6.47±0.56^{c}
Overall Acceptability	6.48±0.11^{b}	6.87±0.12^{a}	6.70±0.057^{ab}	6.46±0.05^{b}

Mean±SE with different superscripts in a row differ significantly ($P<0.05$) Mean are scores given by sensory panellists on 8 point hedonic scale where 1 = Extremely undesirable and 8 = extremely desirable

n = 21 for all sensory attributes

Control= 0% ice, Treatment I= 3% ice, Treatment II= 6% ice and Treatment III= 9% ice

Sensory parameters

The mean value of appearance and colour, juiciness, texture and overall acceptability of treatment I showed significant ($p<0.5$) increase than the control (Table 6). Within treatments, the juiciness scores are comparable. The mean value of appearance and colour for control is comparable to the treatment I and treatment II. The treatment I showed significant ($p<0.05$) increased texture than

control whereas the texture scores of treatment II was significantly lower than the treatment I. This might be due to the addition of ice in extent to the desired level. The rusk pick up of the meat chevon cutlets increased the texture, flavour and appearance and colour (Rao and Delaney, 1995). Thus based on the sensory analysis, the treatment I with 3% level of ice was considered optimum.

CONCLUSION

It was concluded that during the preparation of chevon cutlets, twice mincing of the lean meat, 5% shredded potato and 3% ice by replacing the lean meat were considered optimum for preparation of good quality chevon cutlets.

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