COMPARATIVE PROFILE OF BARBARI (*CAPRA AEGAGRUS HIRCUS*) CHEVON, KADAKNATH (*GALLUS GALLUS DOMESTICUS*) AND INDIAN BUFFALO (*BUBALUS BUBALIS*) MEAT

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ABSTRACT

The quality of Indian Barbari chevon, cara-beef and indigenous chicken like Kadaknath is unique in nature. So a comparative study was conducted to find out the quality characteristics of meat in terms of nutritional composition, mineral profile and fatty acid status. In nutritional composition, amount of protein (26.20%) was observed significantly ($P<0.05$) higher in Kadaknath meat than chevon and carabeef. The values observed for fat content was significantly ($P<0.05$) higher in chevon than Kadaknath meat and cara-beef. On mineral analysis it was evident that sodium was significantly ($P<0.05$) higher in chevon, potassium and zinc in carabeef and iron in Kadaknath meat. Fatty acid profile revealed significantly ($P<0.05$) different ratio of saturated fatty acids (SFA) and unsaturated fatty acids (USFA). In chevon SFA and USFA was almost same in ratio while kadaknath meat showed that ratio of SFA and USFA as 1:19. It is then concluded that Kadaknath meat is rich in unsaturated fatty acids. Organ wise kidneys of Kadaknath and heart of carabeef showed higher protein content than other organs. However, chevon organs were showed overall higher minerals contents.

Keywords: *Bubalus bubalis*, buffalo, Chevon, Kadaknath, carabeef, nutrients, minerals, fatty acids

INTRODUCTION

The meat have important role in human nutrition because of their nutritive value. The value of meat is measured in terms of major physico-chemical components such as proteins, fats, carbohydrates, minerals and fatty acids (Pearson and Gillet, 1996). The knowledge of physico-chemical and functional characteristics is essential to develop the meat products with superior product characteristics and excellent sensory attributes. These parameters are usually interrelated and change in one parameter significantly affects the other. The detailed information on nutritional and functional properties of different meat enables the processor sand consumers to select a particular food for a specific purpose. Meat is an important

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food for humans to fulfill the requirements of protein which is currently estimated to be 55 g per day for an adult man and 45 g for a woman. Meat is a food generally preferred due to unique taste and presence of protein of high biological value. The amount of meat consumed in different countries varies enormously with social, economic and political influences, religious beliefs and geographical differences. On the basis of these facts consumers select a particular meat and reject another. In general, consumption of goat meat is lower than buffalo meat (0.4 kg/capita/year compared to 40 kg/capita/year). The reasons may be higher cost and lower meat yield. Industrial countries are more concern with public health where coronary heart diseases and other diseases are common follows the dietary guidelines. These guidelines particularly recommend a reduction in fat consumption, especially saturated fatty acids. The goat meat is generally preferred due to the image of less cholesterol (40 mg/100 mg) as compared to cara-beef (70 mg/100 mg). Among the goat breeds, Barbari is the most promising meat goat in India after Black Bengal. Goat meat is also considered as hunger supportive agent and Vitamin -B present in goat meat helps in burn fat and iron recovery. Goat meat is also considered helpful in control of blood pressure, kidney diseases and strokes.

India is a major country producing cara-beef and its export share in global market is quite high. The share of Indian buffalo meat in total meat production of the country is around 42.61%. Buffalo meat is considered low fat meat which is depicted in poor marbling conditions. Kadaknath is a unique chicken breed known for protein content and enhancement of male vigour. It is a popular meat in tribal areas and used in various ceremonies. Keeping all these facts in mind a study was planned to compare chemical parameters, fatty acid composition and mineral contents of different meats available in local market.

MATERIALS AND METHODS

Source of raw materials

Three different kinds of meats (Carabeef, Chevon and Kadaknath) were purchased from meat market. The fatty acid composition, proximate and mineral content of *semimembranosus* and *biceps femoris* of buffalo and barbari goats as well as thigh and drumstick were used for analysis in Kadaknath. Each sample was manually deboned and dissected from the fat surface and the lean part was finely minced. The meat samples were stored at -18^{o}C until the analyses were carried out.

Physico-chemical and nutritional assessment

Atleast three samples from each meat sample were used for the analyses. The meat samples were analyzed in triplicate for proximate composition following the procedure of Bligh and dyer (1959) for fat, AOAC (1984) for moisture and ash contents and total crude protein by Kjeldahl method (AOAC, 1990). Fatty acid analysis was carried out by Gas Chromatography following the procedure of AOAC (1984). Mineral analysis was carried out as per the procedure described by Kolmer *et al.* (1951).

Statistical analysis

The data obtained in the study on various parameters were statistically analyzed on 'SPSS-19.0' software package using standard methods of Snedecor and Cochran (1994). Data was subjected to one way analysis of variance, homogeneity test and Duncan's Multiple Range Test (DMRT) for comparing the means to find out the significant

differences in the values obtained among various edible offals and reference muscle.

RESULTS AND DISCUSSION

pH

The range of ultimate pH value was 5.61±0.06 to 5.67±0.07 in which carabeef showed lowest and chevon highest ultimate pH. But all three meat showed non significant values with each other. The observed pH range in all three meats was in the range as reported by various scientists for particular type of meat (Umaraw *et al*., 2015 for chevon, Kandeepan and Biswas, 2007 for buffalo meat) (Figure 1).

Water holding capacity

Water holding capacities of all meat were in the good range (14.17±0.83 to 15.56±0.11). It means all types of meat are good for product development because water holding capacity is having direct bearings on product yield. Highest water holding capacity is observed in carabeef followed by Kadaknath meat and chevon. Both red meats have significantly ($P<0.05$) different values from each other. The highest water holding capacity in carabeef could be due to more hydrophilic group of amino acids in this meat type.

Proximate values Moisture

The range of percent moisture observed was 71.49^{b}±0.56 to 76.06^{a}±0.21. The moisture values of different meat samples varies significantly ($P<0.05$) with each other which might be due to structural changes in the muscle structure of different animal species. However, moisture values of studied meat samples were very near to the

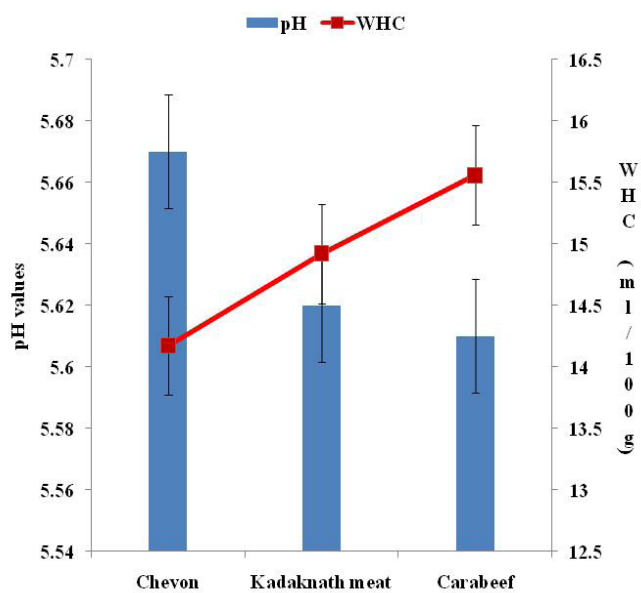

Figure 1. pH and WHC values of market meat of different species.

values reported by Sen *et al.* (2004); Babikar *et al.* (1990) in different meats. Russo *et al.* (2003) reported moisture content in red meat from 70.38 to 78.94%.

Protein

Percent protein content in different meats showed highest value in Kadknath meat (26.20±0.96) followed by chevon (21.21±0.19) and carabeef (20.50±0.56). It was evident from the results that Kadaknath meat had significantly (P<0.05) higher value of protein in comparision to both red meats. The highest value of protein is also reported in Kadaknath meat by various scientists among all chicken breeds (Kumar, 2011; Mohan *et al*., 2008). But red meat obtained from market also showed good amount of protein as reported by various scientist for chevon and carabeef (Niedziolka *et al*., 2006; Qwele *et al.*, 2013). Williams (2007) reported that raw red meat contains around 20% proteins which are 94% digestible.

Fat

The market meats taken for study showed significantly (P<0.05) higher fat percent in Chevon than other two species which were also significantly (P<0.05) different with each other. The range of fat observed in different meats was 0.98^{c}±0.01 to 2.76^{a}±0.06. The least fat value was observed in Kadaknath meat which is the characteristics of this chicken breed as reported by various scientists. Fat values in red meat were according to the reports of Sen *et al*. (2004); Park *et al.* (1991). Anjaneyulu *et al.* (1985) reported the fat value in buffalo meat 1.5%. (Figure 2).

Ash

The range of ash value in different meats was from 0.19±0.03 to 0.96±0.04. Overall ash contents in red meats were significantly (P<0.05) higher than Kadaknath meat. It could be due to higher mineral content in red meat as well as higher connective tissues. However, ash values observed in study were lower than reported by Arguello *et al.* (2005) and Qwele *et al.* (2013).

Fatty acids

The fatty acid values showed significantly (P<0.05) higher saturated fatty acids in red meats while Kadaknath meat was rich in unsaturated fatty acids. Among unsaturated fatty acids mono unsaturated fatty acids were higher in Kadaknath than Polyunsaturated fatty acids. The ratio of saturated and unsaturated fatty acids in red meat was almost similar but kadaknath showed 1:19. Higher saturated fatty acids in red meats could be due to biohydrogeneration in rumen of these meat animals. In red meats SFA values were similar to the reports of Park and Washington (1993); UFA to Hodson *et al*., 2001) however, PUFA values were lower than the values reported by Park and Washington (1993) (Figure 3).

Mineral profile

Good range of minerals was reported in red meat of chevon and carabeef. Mineral profile of chevon showed highest sodium values while carabeef was rich in potassium and zinc. The value of iron was observed highest in Kadaknath meat. So kadaknath can be recommended for cure of iron deficiency diseases. Mineral profile in red meat was in accordance to Casey *et al.* (2003); Johnson *et al.* (1995) (Table 1).

Nutritional profile of different organs of various animal species

There were three important organs i.e. liver, kidneys and heart taken to know how about the nutritional status. So that they can be incorporate

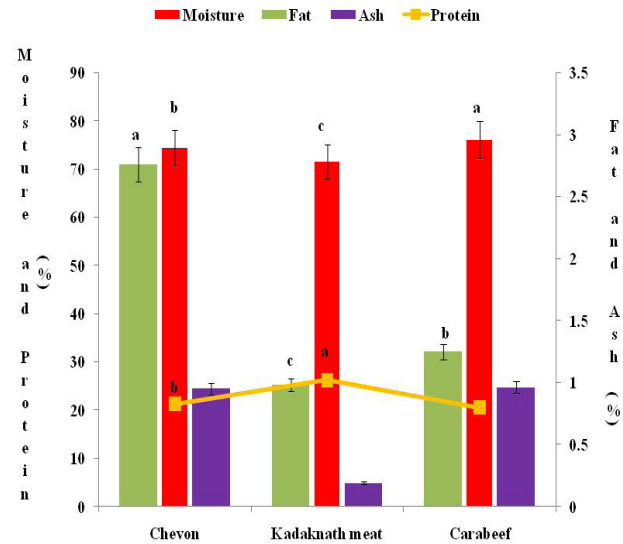

Figure 2. Nutritional characteristics of market meat of different species.

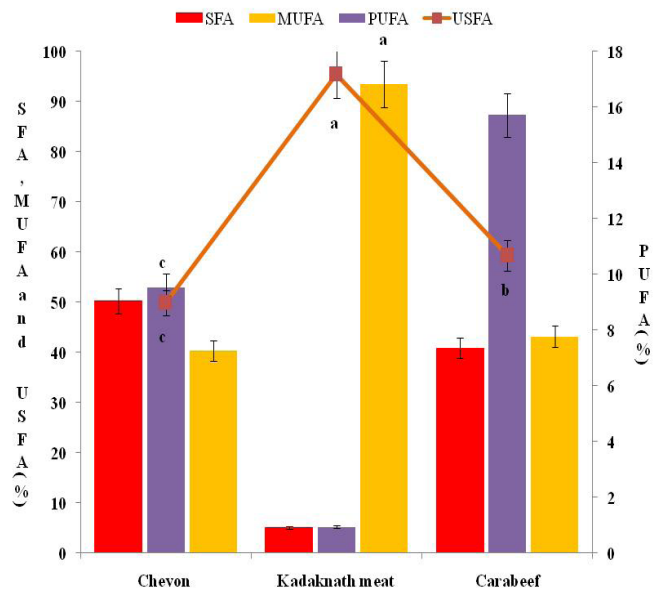

Figure 3. Fatty acid status of market meat of different species.

in various values added products. Among the liver of different species carabeef liver was significantly (P<0.05) rich in fat and potassium content while chevon liver was significantly (P<0.05) dense in protein, iron and zinc. The liver of Kadaknath was showing significantly (P<0.05) higher value of sodium.

Kidneys of all these species also showed good amounts of nutrients. But chevon kidneys were rich in most of the minerals taken up for study. Kadaknath kidneys were evident for significantly (P<0.05) higher values of fat and protein.

Heart of all species showed good nutritional status. Buffalo heart was found rich in protein, iron and potassium while Kadaknath heart showed significantly (P<0.05) higher values of fat, zinc and sodium.

The organs of Barbari goat showed protein and fat values in accordance to the reports of Umaraw *et al*. (2015). Mineral profile in organs was in accordance to Wanzahari *et al*. (1985); Casey *et al*. (2003) (Table 2).

CONCLUSIONS

It was evident from the results that Kadaknath meat was higher in protein, iron and MUFA contents and low in fat content. Chevon exhibited comparatively higher fat, sodium and SFA values than other meat species. Cara-beef was relatively higher in WHC, Moisture, ash, potassium and zinc content. The studied organs in different species showed some unique characteristics like Barbari goat livers were found rich in protein, iron and zinc while buffalo livers were higher in fat and potassium contents and kadaknath with sodium. All studied nutritional components in kidney of goat showing higher values except protein and fat. Heart of buffalo was higher in protein, iron and potassium while kadaknath heart was rich in fat, sodium and zinc.

Table 1. Mineral profile of market meat of different species.

Parameters	Chevon	Kadaknath meat	Carabeef
Sodium	$69.78^{a}\pm0.55$	$37.60^{c}\pm0.53$	$50.00^{b}\pm1.00$
Potassium	$344.03^{b}\pm1.00$	$91.29^{c}\pm7.84$	$363.00^{a}\pm6.00$
Copper	$0.36^{a}\pm0.04$	$0.00^{c}\pm0.00$	$0.15^{b}\pm0.03$
Iron	$3.88^{b}\pm0.06$	$9.51^{a}\pm0.26$	$1.78^{c}\pm0.11$
Zinc	$4.15^{a}\pm0.02$	$2.85^{b}\pm0.13$	$4.23^{a}\pm0.18$

Mean ± S.E. with different superscripts row wise differ significantly (P<0.05).
n = 60

Table 2. Nutritional profile of different organs of various animal species.

Nutritional parameters	Organs								
	Liver			Kidneys			Heart		
	Buffalo	Goat	Kadaknath	Buffalo	Goat	Kadaknath	Buffalo	Goat	Kadaknath
Protein	20.06±0.63	21.06±0.65	19.63±0.30	18.70^{b}±0.25	17.23^{c}±0.18	19.10^{a}±0.00	18.29^{a}±026	17.85^{a}±0.07	12.02^{b}±0.07
Fat	8.37^{a}±0.13	7.53^{b}±0.08	4.93^{c}±0.03	1.56^{c}±0.08	2.58^{b}±0.04	2.89^{a}±0.00	3.01^{b}±0.03	5.70^{a}±0.15	6.42^{a}±0.48
Iron	5.75^{c}±0.03	9.75^{a}±0.14	7.97^{b}±0.03	5.67^{b}±0.14	9.59^{a}±0.30	0.00^{c}±0.00	4.97^{a}±0.04	3.92^{b}±0.03	3.50^{c}±0.10
Zinc	3.62^{b}±0.07	4.29^{a}±0.07	2.19^{c}±0.05	1.90^{b}±0.05	2.69^{a}±0.10	0.00^{c}±0.00	1.53^{b}±0.05	1.61^{b}±0.03	1.88^{a}±0.05
Sodium	78.00^{b}±0.57	68.33^{c}±0.88	248.53±3.76	156.00^{b}±3.51	190.00^{a}±1.15	0.00^{c}±0.00	90.86^{b}±0.14	85.33^{c}±1.76	176.33^{a}±1.20
Potassium	318.33^{a}±0.88	297.67^{b}±4.84	80.80^{c}±1.17	250.67^{b}±2.33	260.33^{a}±1.45	0.00^{c}±0.00	275.00^{a}±3.60	252.00^{b}±5.68	102.60^{c}±5.67

Mean ± S.E. with different superscripts row wise differ significantly ($P<0.05$).

n = 60

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