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The Impact of Species and Breeds of Sudanese Animals on Meat Quality

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Abstract

This study reports the effect of types and genus of animal meats on nutritional value of meats, in Sudan, Khartoum state. In this study five pedigrees of animals were used, two kind from each pedigree (Kabashi and Hamari from Sheep, Baggara and Nilotic from Beef, Anafi and Hawari fom Camels, Ross and Hubbard from Chicken, Synodoutis. (Garqur or Galabeya.) and Bagrus. (Bayad or Kabarus.) from Fish), were taken samples from animals meat, chemical and physical characteristics of different meats were done, and comparison between different meats and animal fats with each other also were done. Proximate composition and physical characteristics (pH and colour), some minerals (K, Ca, Fe, P and I) and total cholesterol were studied. Results obtained revealed that the proximate composition for different animals meat, were showed a significant ($P \leq 0.05$)difference between each others, also a significant($P \leq 0.05$) variation in moisture content between pedigrees of some samples was observed, the results showed that the highest value of moisture content in Kabashi Sheep (76.47%) while Anafi (Camels)had lowest value (70.57%), the results showed that the highest value in protein content was observed by Hubbard Chicken (23.23%) while Hamari Sheep had lowest value (18.50%), in fats content the results revealed the highest value was obtained by Anafi Camel (5.00%) while the lowest value (0.94%) was recorded by Hubbard chicken. The ash content of Baggara Beef (1.60%) was showed a highest, while the lowest value (0.76%) was recorded by Hamari Sheep. Hubbard Chicken had a highest value of CHO while the lowest value (0.90%) was recorded by Kabashi Sheep. in significant variation ($P \leq 0.05$) was observed in PH and color between all samples. Minerals content (ppm) of meats were showed a significant difference ($P \leq 0.05$) among all types and pedigrees, Potassium (ppm) content showed a highest value in Anafi Camels (24.13), while Ross Chicken had a highest value in Ca content while the lowest value (0.04) was obtained by Hubbard Chicken. Iron (Fe ppm) was the highest value in Anafi (Camels) (6.70), while the Nilotic Beef had a lowest value (0.47). The phosphorus (ppm) showed a highest value in Bayad Fish (1.71), whereas Kabashi Camels had had a lowest value (0.47). The results showed that the highest value of iodine recorded by Nilotic Beef (0.18), while Baggara Beef and Ross Chicken were recorded the lowest values. Also total cholesterol (mg/100g) in meat samples was decreased in white meats. The results showed that the highest value of cholesterol recorded by Nilotic Beef (2700) while Garqur Fish had meat had a lowest value (316.67).

Keywords

Pedigrees, Animals, Color, Minerals, Total Cholesterol, Proximate Composition

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1. Introduction

Meat is an important source of high-value animal protein in many regions of the world. Around the globe, the diets of relatively more urbanised populations are characterised by a higher content of meat, poultry and other animal products than the less diversified diets of rural communities (WHO, 2003). Meat is the flesh of animals consumed for food. In the tropics, the bulk of the meat consumed is derived from sheep, cattle, goats, deer, rabbit, antelope, squirrel, rats, elephant, camel and other mammalian animals domesticated or wild; poultry, including chicken, turkey, duck, guinea fowl, geese and meat from other avian and reptilian animal; fish, cry fish, crabs,tobster and other sea foods; snails and other molluscs; and insects. (Ihekoronye and ngoddy, 1985). Regarded nutritionally, meat is a very good source of essential amino acids; and to a lesser extent, of certain minerals. although vitamins and essential fatty acid are also present, meat is not usually relied upon for these component inwell balanced diet. On the ather hand an organ meat, such as liver, is a valuable source of vitamins A,B_1 and nicotinic acid (Kowale, *et al*, 2008).

2. Material and Methods

Meat samples: Meat samples had been brought from different markets of Khartoum State.

Proximate composition of meat samples: Moisture content (%), Crude protein (%), Crude fat (%), Ash content (%) were determined according to AOAC (1995).

Total carbohydrate content (%): was calculated by difference according to Pearson, (1976) using the following formula:

Total carbohydrate% = 100- (moisture %+ crude fat %+ crude protein %+ ash %+ fiber %).

Physical properties of meat:

PH: determined by PH- meter described by (Kowale, *et al*, 2008).

Colour: determined by Lovibond Tintometer described by (Kowale, *et al*, 2008).

Minerals: determined by Atomic absorption spectrophotometer described by (Kowale, *et al*, 2008).

Estimation of total cholesterol (mg/100g): determined by Spectrophotometer described by (Kowale, *et al*, 2008).

Statistical analysis: The data were subjected to statistical analysis, each determination was carried out and analyzed in triplicate and figures were them averaged. The means were tested by analysis of variance (ANOVA) with a probability P≤ 0.05. (Duncan, B.O, 1955), (Peterson, 1985).

3. Results & Discussion

3.1. Proximate Composition (%) of Animal Meats

Moisture content (%): As shownin Table (1) the results obtainedshowed that the Moisture content (%) of raw Animal meat samples (Kabashi and Hamari Sheep was found to be (76.47%) and (76.23%) respectively, Baggara and Nilotic Beef was found to be (73.37%) and (73.47%) respectively,Anafi and Kabashi Camels was found to be (70.57%) and (70.93%) respectively, Ross and Hubbard Chicken was found to be (73.64%) and (72.30%) respectively, Garqur and Bayad Fish was found to be (74.70%) and (73.02%) respectively. The results showed that thehighest value of moisture contentwas recorded byKabashi Sheep (76.47%), while thelowest value (70.57%) was recorded by Anafi Camels. The results showed in significant difference (P≤ 0.05) between Sheep, Beef, Camels and Chicken genus, but there was a significant difference (P≤ 0.05) between Fish genus. The results showed there in significant difference (P≤ 0.05) between two types of Beef, Bayad Fish and two types of Chicken. The results obtained were lower than that reported by Jok, (1996) who reported78.9 – 80.7%, but was within the range 73.98 – 81.12% obtainedby Abdul Rehman, *et al*, (2006) there are found 69.55 - 75.99%, stated by Abdelbary and mohammed, (1993), 69.70 – 70.95% Conducted by (Al-Najdawi R. and Abdullah, 2001), Moharrery, (2006) who found 55.36 – 62.47% and Sueli and Baggio, (2006) reported 60.3 – 66.0%. The variation of moisture content (%) of raw animal meat samples attributed to much of there drinking water, environmental conditions, animals feeding, age, weight and may be animals type of breeding.

Protein content (%): As shownin Table (1) the results showed that the protein content (%) of raw animal meats samples (Kabashi and Hamari Sheep) was found to be 19.22% and 18.50% respectively, Baggara and Nilotic Beef was found to be 21.40% and 22.03% respectively,Anafi and Kabashi Camels was found to be 19.50% and 18.92% respectively, Ross and Hubbard Chicken was found to be 23.00% and 23.23% respectively, Garqur and Bayad Fish was found to be 20.29% and 21.77% respectively. The results showed higher value in Hubbard Chicken 23.23% while had lower value 18.50% Hamari Sheep. The results showed in significant difference (P≤ 0.05) between Sheep, Beef, Camels and Chicken genus with them, but there was a significant difference (P≤ 0.05) between fish genus with them.Also The results showed in significant difference (P≤ 0.05) in protein

content between Baggara Beef, Nilotic Beef, Ross Chicken, Hubbard Chicken and Bayad Fish, but there is a significant difference (P≤ 0.05) between them and other animal meat samples except Baggara Beef. The results showed in significant difference (P≤ 0.05) between Kabashi Sheep, Hamari Sheep, Baggara Beef, Anafi Camel, Kabashi Camel and Garqur Fish,but there is a significant difference (P≤ 0.05) between them and another Animals meats.in significant difference (P≤ 0.05) between Hamari Sheep andKabashi Camel and otherswas observed.The results obtained were lowerthan that reported by Joaquin, *et al*, (1997) 39.1% Hake and 43.6% Ling. but within the range of 20.35 – 20.85% reported by Al-Najdawi and Abdullah, (2001), who reported arange of20.97 – 21.63% notice by Suliman, *et al*, (2010) and Olafour, *et al*, (2011) who found 17.6-20.7%. Moharrery, (2006) who found 14.27 – 16.24 % and Ayhan, (1999) who found 15.5 – 18.2%.The variation in protein content (%) of raw animal meat samples attributed to the type of meats, type of protein in muscles, environmental conditions, animals feeding, age, weight and may be breeding of animals.

Fat content (%): As shownin Table (1) the results showed that the Fat content (%) of raw animal meat samples (Kabashi and Hamari Sheep) were found to be 2.49% and 3.47%, respectively, Baggara and Nilotic Beef was found to be 2.00% and 1.50%, respectively, Anafi and Kabashi Camels was found to be 5.00% and 4.61%, respectively, Ross and Hubbard Chicken was found to be 0.99% and 0.94%, respectively, Garqur and Bayad Fish were found to be 1.51% and 1.59%, respectively. The results obtainedshowed a highest value in Kabashi Camel (4.61%) while thelowest value (0.104%) was recorded by Garqur Fish,the results showed in significant difference (P≤ 0.05) between Beef, Camels, Chicken and Fish genus, but there is a significant difference (P≤ 0.05) inbetween Sheep genus.The results showed in significant difference (P≤ 0.05) between Sheep, Beef, Camels and Chicken genus, but there was a significant difference (P≤ 0.05) between Fish genus with them.Also The results showed in significantdifference (P≤ 0.05) between Kabashi Sheep, Baggara Beef, Nilotic Beef, Ross Chicken, Gargur Fish and Bayad Fish,but there was a significant difference (P≤ 0.05) between them and another Animal Meat Samples, So The results showedthere is a significant difference (P≤ 0.05) in fat content between the genus ofCamels meats andChicken genus.The results obtained were lower than that stated by Moharrery, (2006) who found 17.33 – 23.79 %, Abdul Rehman, *et al*, (2006) Beef who found 8.00%, Poultry 12.00% and fish 8.00%, (Al-Najdawi R. and Abdullah, 2001) who found 2.75 – 9.15% fat content of chicken meats, Aman and yosif, (1996) who reported 11-28% of Beef meats and 0.1 – 27% of fish and sea meats, Owen, (2005) reporteda range of 4 - 8% fact content of Beef and 4.7% of chicken, Ebrahim and Atif, 2003 reporteda range of 4.6 – 17% fat of fish. Moneer, (1987) found 8 – 24% fat of fish and khan, *et al*, (2009) found 8.00% in Beef, 12.00% poultry and 8.00% in fish, and Joaquin, *et al*, (1997) found 14.13 -14.80% in fish, but within the range 4.14 – 9.79%, reported by Abdelbary and mohammed, (1993), 1.05 – 2.83% in fish genusreported by Jok, (1996), 1.1 - 26.71% notice by (Farah and Fischer, 2004). The highest value of fat content reported by Suliman, *et al*, (2010) who found1. 88 – 3.37% in Beef genus.The variation in Fat content (%) of raw animal meats samples attributed to the type of animal meats, moisture content, environmental conditions, animals feeding, age, weight and may be animals type of breeding.

Ash content (%): As shownin Table (1) the results showed that the Ash content (%) of raw Animal meat samples (Kabashi and Hamari Sheep was found to be 0.92% and 0.76%, respectively, Baggara and Nilotic Beef was found to be 1.60% and 1.21%, respectively, Anafi and Kabashi Camels was found to be 0.93% and 0.78% respectively, Ross and Hubbard Chicken was found to be 0.78% and 1.25%, respectively, Garqur and Bayad Fish was found to be 1.24% and 1.41%, respectively. The results showed higher value in Baggara Beef 1.60% while had lowest value 0.76% Hamari Sheep.The results showed in significantdifference (P≤ 0.05) between Camels genus with them and Chicken genus with them, but there was a significant difference (P≤ 0.05) between Sheep genus with them, Beef genus with them and Fish genus with them. The results showed in significantdifference (P≤ 0.05) between KabashiSheep, Nilotic Beef, Anafi Camels, Kabashi Camels, Ross Chicken, Hubbard Chicken and Garqur Fish, results showed in significantdifference (P≤ 0.05) between Ross Chicken, Hubbard Chicken and Hamari sheep, resultsobtained showed in significantdifference (P≤ 0.05) between Baggara Beef, Hubbard Chicken and BayadFish.The results obtained were lowerthan that reported by (Moharrery., 2006), Abdelbary and mohammed, (1993) found1.03 – 1.12% in Camels, Suliman, *et al*, (2010) found1. 32 – 1.45% in Camels, and 0.8 – 2 % in fish stated by Ebrahim, (2001).but within the range 0.32 – 1.25% in Chicken conducted by Al-Najdawi, Abdullah, (2001), and in Beef 1%, Chicken 1.4% notice by Owen, (2005). This results Increased for Jok Gal, (1996) 0.74 – 1.02% in Fish.The variation of Ash content (%) of raw animal meat samples attributed to lab condition, type of animal meats, environmental conditions, animals feeding, age, weight and may be animals type of breeding.

Carbohydrate content (%): As shownin Table (1) the results showed that the Carbohydrate content (%) of raw Animal meat samples (Kabashi and Hamari Sheep) was found to be 0.90% and 1.04% respectively, Baggara and Nilotic Beef was found to be 1.63% and 1.79%, respectively, Anafi and

Kabashi Camels was found to be 4.00% and 1.76% respectively, Ross and Hubbard Chicken was found to be 1.59% and 2.28% respectively, Garqur and Bayad Fish was found to be 2.26% and 2.21% respectively. The results showed a highest value in Hubbard Chicken 2.28% while the lowest value (0.90%) was recorded by Kabashi Sheep. The results showed in significantdifference (P≤ 0.05) between Sheep, Beef, Chicken and Fish genus with them, but there was a significant difference (P≤ 0.05) between Camels genus with them. Also The results showed in significantdifference (P≤ 0.05) between Baggara Beef, Nilotic Beef, Kabashi Camel, Ross Chicken, Hubbard Chicken, Gaqur Fish and Bayad fish,but there was a significant difference (P≤ 0.05) betweenthem and another animal meat samples. So there was a significant difference (P≤ 0.05) between Sheep genus and another animal meat samples. Also the results showed there is a significant difference (P≤ 0.05) between Anafi Camel and another animal meat samples.The results obtained were less than that concluded by Joaquin, *et al*, (1997) 3.13 – 11.2%, Ling. but within the range 0.1 – 1 %, reported by Moneer, (1987) and 1 – 3 % noticed by Ebrahim and Atif, 2003). The variation of Carbohydrate content (%) of raw animal meat samples attributed to type of meats colour, percentage of glycogen had been storage in animal meats, environmental conditions, animals feeding, age, weight and may be animals type of breeding.

3.2. Physical Characteristics of Animal Meats

PH: As shownin Table (2) the results showed that the PHof raw Animal meat samples (Kabashi and Hamari Sheep was found to be 5.37 and 5.17 respectively, Baggara and Nilotic Beef was found to be 5.56 and 5.38 respectively, Anafi and Kabashi Camels was found to be 5.14 and 5.71 respectively, Ross and Hubbard Chicken was found to be 5.31 and 5.39 respectively, Garqur and Bayad Fish was found to be 5.60 and 5.08 respectively. The results showed higher value in Kabashi Camels 5.71 while had lowest value 5.08Bayad Fish.The results obtained were less than that founded by Manuel, *et al*, (2011) who found 5.57 – 6.84, Suliman, *et al*, (2010) who found 5.76 – 6.07 and Appa, *et al*, (2009) who found 6.49 – 6.79. but within the range 5.5 to 5.7 conducted by Kowale, *et al*, (2008). The results showed in significant difference (P≤ 0.05) between all Samples. The variation of PH value of raw animal meat samples attributed to type of meats, percentage of acidity in meats,period of meats storage, environmental conditions, animals feeding, age, weight and may be animals type of breeding.

3.3. Colour

Blue: As shownin (Table 2, figure 1) the results showed that the Blue Colour value of raw animal meat samples (Kabashi and Hamari Sheep) was found to be 1.20 and 1.27 respectively, Baggara and Nilotic Beef was found to be 1.30 and 1.27 respectively, Anafi and Kabashi Camels was found to be 1.17 and 1.20 respectively, Ross and Hubbard Chicken was found to be 1.2 and 1.27 respectively, Garqur and Bayad Fish was found to be 0.87 and 1.20 respectively. The results showed higher value in Baggara Beef 1.30 while had lower value 0.87 Garqur Fish.This results was higher for Kowale, *et al*, (2008) 0.8 except Garqur Fish sample it was within range.The results showed in significantdifference (P≤ 0.05) between samples except Garqur Fish. Samples. The variation of Blue colour value of raw animal meat samples attributed to type of meats, percentage of microorganism, period of meats storage, environmental conditions, animals feeding, age, weight and may be animals type of breeding.

Yellow: As shownin (Table 2, figure 1) the results showed that the Yellow Colour Value of raw Animal meat samples (Kabashi and Hamari Sheep) was found to be 2.60 and 2.53 respectively, Baggara and Nilotic Beef was found to be 2.57 and 2.50 respectively, Anafi and Kabashi Camels was found to be 2.63 and 2.70 respectively, Ross and Hubbard Chicken was found to be 2.37 and 2.27 respectively, Garqur and Bayad Fish was found to be 1.27 and 1.37 respectively. The results showed higher value in Kabashi Camels 2.70 while had lower value 1.27Garqur Fish.The results showed in significantdifference (P≤ 0.05) betweenBeef, Camels, Chicken and Fish genus with them, but there was a significant difference (P≤ 0.05) between Sheep genus with them. The results showed in significantdifference (P≤ 0.05) between Hamari Sheep, Baggara Beef, Nilotic Beef, Ross Chicken and Hubbard Chicken. Also results showed in significantdifference (P≤ 0.05) between Hubbard Chicken, Garqur and Bayad Fish. So the results showed in significantdifference (P≤ 0.05) between Kabashi Sheep, Anafi and Kabashi Camels.The results obtained within the range 1.8 reported by Kowale, *et al*, (2008). The variation inYellow colour of raw animal meat samples attributed to thetype of meats, storage, environmental conditions, animals feeding, age, weight and may be to theanimals breeding.

Red: As shownin (Table 2, figure 1) the results showed that the Red colour of raw animal meat samples (Kabashi and Hamari Sheep) was found to be 4.67 and 4.77, respectively, Baggara and Nilotic Beef was found to be 4.67 and 4.43, respectively, Anafi and Kabashi camels was found to be 5.63 and 5.67 respectively, Ross and Hubbard Chicken was found to be 2.77 and 2.63, respectively, Garqur and Bayad Fish was found to be 1.53 and 1.67 respectively. The results showedthat thehighest value in Kabashi Camels 5.67 while had lower value 1.53Garqur Fish. The results obtained thatshowed in significantdifference (P≤ 0.05) between Sheep,

Beef, Camels, Chicken and Fish genus. The results showed in significantdifference (P≤ 0.05) between Kabashi Sheep, Hamari Sheep, Baggara Beefand Nilotic Beef, but there was a significant difference (P≤ 0.05) between them and another Samples. Also the results showed in significantdifference (P≤ 0.05) between Anafi and Kabashi Camels, but there was a significant difference (P≤ 0.05) between them and another Samples. So the results showed in significantdifference (P≤ 0.05) between Ross and Hubbard Chicken, but there was a significant difference (P≤ 0.05) between them and another samples. Also the results showed in significantdifference (P≤ 0.05) between Garqur and Bayad Fish, but there is a significant difference (P≤ 0.05) between them and other samples. The Chicken genus results obtained within the range 2.9 noticed by Kowale, *et al*, (2008), Fish genus was lower than the other.The variation of Red colour of raw animal meat samples attributed to thetype of meats, hemoglobinin meats, iron content, environmental conditions, animals feeding, age andweight.

3.4. Minerals Composition (ppm) of Animal Meats

Potassium (K) content (ppm): As shownin Table (3) the results showed that the K content (ppm) of raw Animal meat samples (Kabashi and Hamari Sheep) was found to be 9.34 and 10.15, respectively, Baggara and Nilotic Beef was found to be 21.27 and 19.43, respectively, Anafi and Kabashi camels was found to be 24.13 and 18.33 respectively, Ross and Hubbard Chicken was found to be 21.40 and 20.87, respectively, Garqur and Bayad Fish was found to be 15.43 and 23.43 respectively. The results showed higher value in Anafi Camels 24.13 while had lower value 9.34 Kabashi Sheep. The results showed in significantdifference (P≤ 0.05) betweenSheep, Beef, Camels, Chicken Parentages with them, but there was a significant difference (P≤ 0.05) between Fish Parentages with them. The results showed there was no significant difference (P≤ 0.05) betweenBaggara Beef, Nilotic Beef, Anafi Camels, Kabashi Camels, Ross Chicken, Hubbard Chicken and Bayad Fish. The results showed in significantdifference (P≤ 0.05) betweenSheep parentages with them, but there was a significant difference (P≤ 0.05) between them and another Samples. Also the results showed in significant difference (P≤ 0.05) between Nilotic Beef, Kabashi Camels and Garqur Fish with them. The results obtained were less than that noticed by Abdelbary and mohammed, (1993) who found 208.33 – 250.29 mg/100g, Al-Najdawi and Abdullah, (2001) said 363.0 – 667.0 mg/100g, Joaquin, *et al,* (1997) conducted 491 – 605 mg/100g and Becker, *et al*, (2011) stated 2340 mg/kg. The results obtained within the range 179 – 180 mg/100g concluded by Ayhan, (1999), 170.6 – 293 mg/100g founed by Farah and Ficher, (2004). The variation of K content (ppm) of raw animal meat samples attributed toenvironmental conditions, animals feeding, age, weight.

Calcium (Ca) content (ppm): As shownin Table (3) the results showed that the Ca composition (ppm) of raw Animal meat samples (Kabashi and Hamari Sheep) was found to be 0.42and 0.70 respectively, Baggara and Nilotic Beef was found to be 21.27 and 0.21respectively, Anafi and Kabashi Camels was found to be 0.39 and 0.50 respectively, Ross and Hubbard Chicken was found to be 84.33 and 0.04respectively, Garqur and Bayad Fish was found to be 17.45 and 12.54 respectively. The results showed a highest value in Ross Chicken 84.33 while the lowest value (0.04) was recorded by Hubbard Chicken. The results showed in significantdifference (P≤ 0.05) betweenSheep, Camels and Fish, but there was a significant difference (P≤ 0.05) between Beef Parentages with them and Chicken Parentages with them. The results showed that in significant difference (P≤ 0.05) between Kabashi Sheep, Hamari Sheep, Nilotic Beef, Anafi Camels, Kabashi Camels and Hubbard Chicken. Also the results showed in significant difference (P≤ 0.05) between Baggara Beef, Garqur Fishand Bayad Fish, but there is a significant difference (P≤ 0.05) between Ross Chicken and another samples. The results obtained were less than that conducted by Abdelbary and mohammed, (1993) 8.73 – 11.48 mg/100g except Baggara Beef, RossChicken and Fish genus their results are higher than that, Becker, *et al*, (2011) found 280 mg/kg. The results obtained within the range 13.50 – 230.0 mg/100g noticed by Al-Najdawi and Abdullah, (2001), 7 – 24 mg/100g concluded by Ramos, et al, (2009), 11.3 – 12.3 mg/100g reported by Ayhan, (1999), 16.7 – 21.6 mg/100g said by Joaquin, *et al*, (1997), 6.5 – 7.5 mg/100g stated by Farah and Ficher, (2004). The variation of Ca content (ppm) of raw animal meat samples attributed to vitamin D content, environmental conditions, animals feeding, age, weight and may be animals type ofbreeding and lab condition.

3.5. Iron (Fe) Content (ppm)

As shownin Table (3) the results showed that the Fe composition (ppm) of raw Animal meat samples (Kabashi and Hamari Sheep) was found to be 1.14 and 0.62 respectively, Baggara and Nilotic Beef was found to be 0.63 and 0.47 respectively, Anafi and Kabashi Camels was found to be 6.70 and 6.40 respectively, Ross and Hubbard Chicken was found to be 6.0 6 and 4.61 respectively, Garqur and Bayad Fish was found to be 1.24 and 1.34 respectively. The results showed higher value in Anafi Camels 6.70 while had lower value 0.47 Nilotic Beef. The results showed in significant difference (P≤ 0.05) between Beef Parentages with them, Camels Parentages with them and Fish Parentages

with them, but there was a significant difference (P≤ 0.05) between Sheep Parentages with them and Chicken Parentages with them. The results showed in significant difference (P≤ 0.05) between Hamari Sheep, Baggara Beef and Nilotic Beef, but there was a significant difference (P≤ 0.05) between them and another samples. The results showed in significantdifference (P≤ 0.05) between Kabashi Sheep, Garqur Fish and Bayad Fish, but there is a significant difference (P≤ 0.05) between them and othersamples. The results showed in significantdifference (P≤ 0.05) between Anafi Camels, Kabashi Camels and Ross Chicken, but there isa significant difference (P≤ 0.05) between them and another samples. the results showed in significantdifference (P≤ 0.05) between Hubbard Chicken and another samples. The results obtained within the range of4.56 mg/kg said by Becker, *et al*, (2011). This results Increased for Abdelbary and mohammed, (1993) who found 2.84 – 3.39 mg/100g, Al-Najdawi and Abdullah, (2001) said 4.2 – 5.5 mg/100g, Ramos, *et al*, (2009) noticed 0.72 – 1.48 mg/100g, Ayhan, (1999) concluded 4.49 – 5.61 mg/100g, Joaquin, *et al*, (1997) stated 2.13 – 4.46 mg/100g, Farah and Ficher, (2004) reported1.5 – 2.1 mg/100g. The variation of Fe content (ppm) of raw animal meat samples attributed to hemoglobin, meat colour, environmental conditions, animals feeding, age, weight and may be animals type ofbreeding and lab condition.

3.6. Phosphorus (P) Content (ppm)

As shownin Table (3) the results showed that the P content (ppm) of raw animal meat samples (Kabashi and Hamari Sheep) were found to be 0.91 and 0.88, respectively, Baggara and Nilotic Beef was found to be 0.71 and 0.49 respectively, Anafi and Kabashi Camels was found to be 0.52 and 0.47 respectively, Ross and Hubbard Chicken was found to be 0.98 and 0.91 respectively, Garqur and Bayad Fish was found to be 1.59 and 1.71, respectively. The results showed that thehighest value of P recorded byby Bayad Fish 1.71, while Kabashi Camelshad alowest value (0.47).The results showed in significantdifference (P≤ 0.05) between the values of Pin Sheep, Camels and Chicken, whereas a significant difference (P≤ 0.05) between Beef Parentages with them and Fish Parentages with them. The results showed there was a significant difference (P≤ 0.05) between Bayad Fish and other samples. Also the results showed there was a significant difference (P≤ 0.05) between Garqur Fish and another Samples. The results showed in significantdifference (P≤ 0.05) between Kabashi Sheep, Hamari Sheep, Ross Chickenand Hubbard Chicken, but there was a significant difference (P≤ 0.05) between them and another Samples. Also the results showed there was a significant difference (P≤ 0.05) between Baggara Beef and another samples. So the results showed there was a significant difference (P≤ 0.05) between Nilotic Beef, Anafi Camels and Kabashi Camels and another samples. The results showed in significantdifference (P≤ 0.05) between Kabashi Sheep, Hamari Sheep, Ross Chickenand Hubbard Chicken, but there was a significant difference (P≤ 0.05) between them and another Samples. The results obtained were less than that noticed by Ramos, *et al*, (2009)173 – 206 mg/100g, Ayhan, (1999) stated 174 – 177 mg/100g. The variation of P content (ppm) of raw animal meat samples attributed to environmental conditions, animals feeding, age, weight and may be animals type ofbreeding and lab condition.

3.7. Iodine (I) Content (ppm)

As shownin Table (3) the results showed that the iodinecomposition (ppm) of raw Animal meat samples (Kabashi and Hamari Sheep) was found to be 0.12 and 0.05 respectively, Baggara and Nilotic Beef was found to be 0.04 and 0.18 respectively, Anafi and Kabashi Camels was found to be 0.10 and 0.06 respectively, Ross and Hubbard Chicken was found to be 0.04 and 0.13, respectively, Garqur and Bayad Fish was found to be 0.11 and 0.09 respectively. The results showed ahighest value in Nilotic Beef 0.18 while had lower value 0.04 Baggara Beef andRoss Chicken.The results showed in significantdifference (P≤ 0.05) between all samples.The results obtained within the range 0.845 mg/kg reported by Becker, *et al*, (2011).The variation of I content (ppm) of raw animal meat samples attributed to environmental conditions, animals feeding, age, weight and may be animals type ofbreeding and lab condition.

Total cholesterol %w / w (mg /100g) of animal meats: As shownin Table (4) the results showed that the total Cholesterol content (mg / 100 g) of raw Animal meat samples (Kabashi and Hamari Sheep, Baggara and Nilotic Beef, Anafi and Kabashi Camels, Ross and Hubbard Chicken and Garqur and Bayad Fish) was found to be 2500, 2400, 2000, 2700, 2016.67, 1050, 800, 950, 316.67 and 500, respectively. The results showed a highest value of total cholesterol in Nilotic Beef 2700, while Garqur Fish had a lowest value (316.67). The results showed in significant difference (P≤ 0.05) between Sheep genus, but there was a significant difference (P≤ 0.05) between other Animal genus with them. Also the results showed in significantdifference (P≤ 0.05) between Baggara Beef and Anafi Camel, but there was a significant difference (P≤ 0.05) between other Animal. The results obtained were less than that founded by Al-Najdawi R., B. Abdullah, (2001) 34.29 – 122.55 mg/100g, Anna Grau, et al, (2000) conducted 96.09 – 99.61and Sueli and Baggio, (2006) reported raw Beef (25.7 – 30.0), raw Chicken (61.9), but within the range of 63.5 – 2415.4 mg/100g noticed by ElJack, (1988). The variation of total cholesterol content (mg/100g) of raw animal meat samples attributed to

environmental conditions, animals feeding, age, weight and may be toanimals feeding.

Table 1. Proximate composition (%) of Animal Meats.

Type Of Animals	Genus	Moisture	Protein	Fat	Ash	Carbohydrate
Sheep	Kabashi	76.47^{a}(±0.68)	19.22^{b}(± 0.60)	2.49^{c}(± 0.42)	0.92^{b}(± 0.096)	0.90^{c}(±0.17)
	Hamari	76.23^{a}(±0.21)	18.50^{bc}(± 0.15)	3.47^{b}(± 0.38)	0.76^{c}(± 0.08)	1.04^{c}(±0.28)
Beef	Baggara	73.37^{c}(±074)	21.40^{ab}(± 0.74)	2.00^{c}(± 0.141)	1.60^{a}(± 0.148)	1.63^{b}(±0.32)
	Nilotic	73.47^{c}(±0.93)	22.03^{a}(± 0.33)	1.50^{c}(± 0.21)	1.21^{b}(± 0.094)	1.79^{b}(±0.71)
Camels	Anafi	70.57^{e}(±0.12)	19.50^{b}(± 1.10)	5.00^{a}(± 1.23)	0.93^{b}(± 0.062)	4.00^{a}(±0.72)
	Kabashi	70.93^{e}(±0.008)	18.92^{bc}(± 0.19)	4.61^{a}(± 0.44)	0.78^{bc}(± 0.12)	1.76^{b}(± 0.27)
Chicken	Ross	73.64^{c}(±0.23)	23.00^{a}(± 0.15)	0.99^{cd}(± 0.20)	0.78^{bc}(± 0.098)	1.59^{b}(± 0.52)
	Hubbard	72.30^{cd}(±0.09)	23.23^{a}(± 0.46)	0.94^{d}(± 0.13)	1.25^{ab}(± 0.113)	2.28^{b}(± 0.16)
Fish	Garqur	74.70^{b}(±0.26)	20.29^{b}(± 0.45)	1.51^{c}(± 0.15)	1.24^{b}(± 0.073)	2.26^{b}(± 0.18)
	Bayad	73.02^{c}(±0.83)	21.77^{a}(± 1.13)	1.59^{c}(± 0.15)	1.41^{a}(± 0.35)	2.21^{b}(± 0.12)
S.E ±		0.09	0.141	0.104	0.033	0.094
C.V %		0.69	3.70	23.76	16.7	56.70

- Values are means of three replicates ± SD
- Means not sharing a common superscript letter in a column significantly different at P≤ 0.05.

Table 2. Physical characteristics of Animal Meats.

Type Of Animals	Parentages	PH	Colour		
			Blue	Yellow	Red
Sheep	Kabashi	5.37^{a}(± 0.008)	1.20^{a} (± 0.08)	2.60^{a}(± 0.081)	4.67^{b}(±0.047)
	Hamari	5.17^{a}(± 0.008)	1.27^{a}(± 0.62)	2.53^{b}(± 0.09)	4.77^{b}(± 0.047)
Beef	Baggara	5.56^{a}(± 0.042)	1.30^{a}(± 0.00)	2.40^{b}(± 0.08)	4.67^{b}(± 0.047)
	Nilotic	5.38^{a}(± 0.047)	1.27^{a}(± 0.62)	2.50^{b}(± 0.00)	4.43^{b}(± 0.20)
Camels	Anafi	5.14^{a}(± 0.025)	1.17^{a}(± 0.047)	2.63^{a}(± 0.09)	5.63^{a}(± 0.047)
	Kabashi	5.71^{a}(± 0.110)	1.20^{a}(± 0.00)	2.70^{a}(± 0.00)	5.67^{a}(± 0.09)
Chicken	Ross	5.31^{a}(± 0.008)	1.23^{a}(±0.09)	2.37^{b}(± 0.047)	2.77^{c}(± 0.047)
	Hubbard	5.39^{a}(± 0.21)	1.27^{a}(± 0.62)	2.27^{bc}(± 0.047)	2.63^{c}(± 0.09)
Fish	Garqur	5.60^{a}(± 0.25)	0.87^{b}(± 0.047)	1.27^{c}(± 0.047)	1.53^{d}(± 0.09)
	Bayad	5.08^{a}(± 0.049)	1.20^{a}(± 0.08)	1.37^{c}(± 0.047)	1.67^{d}(± 0.047)
S.E ±		0.030	0.024	0.014	0.071
C.V %		3.13	11.04	3.42	10.2

- Values are means of three replicates ± SD
- Means not sharing a common superscript letter in a column significantly different at P≤ 0.05.

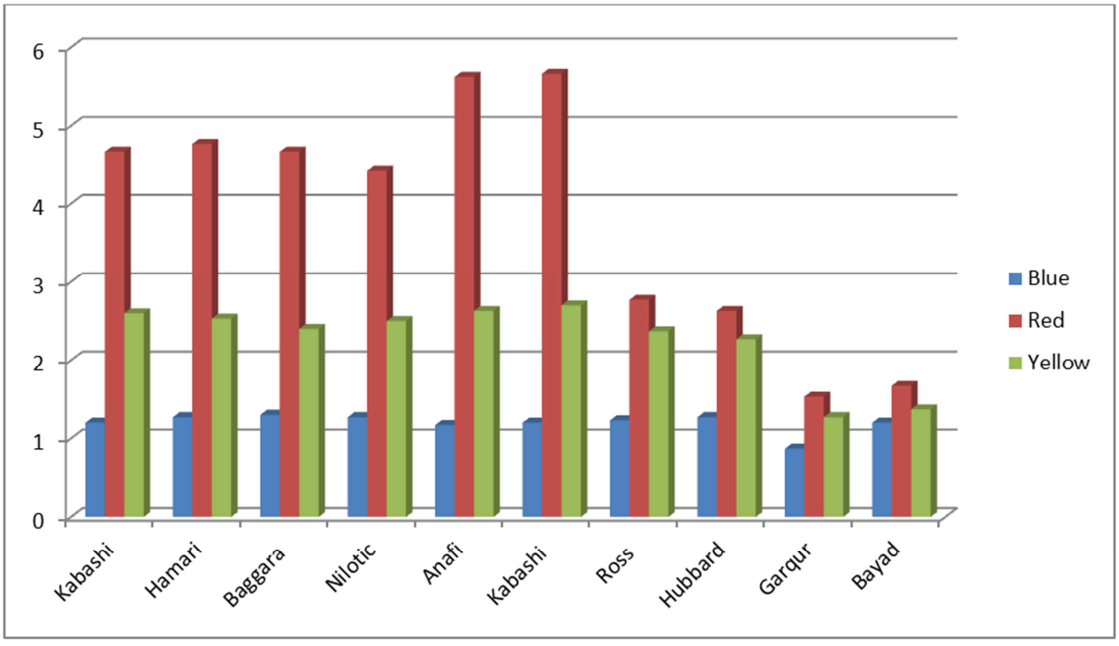

Fig. 1. Colour means in animal meats.

Table 3. Minerals composition (ppm) of Animal Meats.

Type Of Animals	Parentages	K	Ca	Fe	P	I
Sheep	Kabashi	9.34^{c}(±1.49)	0.42^{d}(±0.131)	1.14^{d} (±0.14)	0.91^{c}(±0.008)	0.12^{a}(±0.025)
	Hamari	10.15^{c}(±1.29)	0.70^{d}(±0.00)	0.62^{e}(±0.24)	0.88^{cd}(±0.008)	0.05^{a}(±0.01)
Beef	Baggara	21.27^{a}(±0.93)	21.27^{b}(±0.93)	0.63^{e}(±0.17)	0.71^{e}(±0.010)	0.04^{a}(±0.02)
	Nilotic	19.43^{ab}(±1.90)	0.21^{d}(±0.05)	0.47^{e}(±0.12)	0.49^{f}(±0.017)	0.18^{a}(±0.23)
Camels	Anafi	24.13^{a}(±1.02)	0.39^{d}(±0.036)	6.70^{a}(±0.37)	0.52^{f}(±0.013)	0.10^{a}(±0.017)
	Kabashi	18.33^{ab}(±1.44)	0.50^{d}(±0.11)	6.40^{a}(±0.43)	0.47^{f}(±0.014)	0.06^{a}(±0.036)
Chicken	Ross	21.40^{a}(±0.49)	84.33^{a}(±9.67)	6.0 6^{ab}(±0.04)	0.98^{e}(±0.006)	0.04^{a}(±0.047)
	Hubbard	20.87^{a}(±0.63)	0.04^{d}(±0.02)	4.61^{e}(±0.21)	0.91^{e}(±0.0016)	0.13^{a}(±0.014)
Fish	Garqur	15.43^{b}(±3.21)	17.45^{b}(±1.25)	1.24^{d}(±0.078)	1.59^{b}(±0.120)	0.11^{a}(±0.013)
	Bayad	23.43^{a}(±2.05)	12.54^{bc}(±0.45)	1.34^{d}(±0.09)	1.71^{a}(±0.080)	0.09^{a}(±0.013)
S.E ±		0.365	0.693	0.059	0.0106	0.017
C.V %		10.88	27.5	11.08	6.36	101.15

- Values are means of three replicates ± SD
- Means not sharing a common superscript letter in a column significantly different at P≤ 0.05.

Table 4. Total Cholesterol %w / w (mg /100g) of Animal Meats.

Type Of Animals	Parentages	Total Cholesterol
Sheep	Kabashi	2500^{b}(± 40.82)
	Hamari	2400^{b}(± 40.82)
Beef	Baggara	2000^{c}(± 0.00)
	Nilotic	2700^{a}(± 81.64)
Camels	Anafi	2016.67^{c} (± 23.57)
	Kabashi	1050^{d}(± 40.82)
Chicken	Ross	800^{e}(± 40.82)
	Hubbard	950^{d}(± 40.82)
Fish	Garqur	316.67^{g}(± 23.57)
	Bayad	500^{f}(± 40.82)
S.E ±		9.428
C.V %		3.38

- Values are means of three replicates ± SD
- Means not sharing a common superscript letter in a column significantly different at P≤ 0.05.

4. Conclusion

The results obtained shows that the protein content hada highest content in chicken meats, andBaggara beef meats had a highestvalue of cholesterol than sheep (anafi), Camel (kabashi), chicken and fish, therefore we recommend to eat the white meat more than red meats to avoid the effect of cholesterol on health.

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