EFFECTS OF BREED, AGE, PARITY, BODY CONDITION SCORE AND MANAGEMENT SYSTEM ON MILK COMPOSITION OF SHEEP IN MUBI, ADAMAWA STATE, NIGERIA

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Abstract

The two most common sheep breeds; Uda and Yankasa milk was studied. Significant breed difference (P<0.001) was depicted on milk Fat with Uda having higher (27.50±.15%) value than Yankasa (25.97±.15%). Magnesium and water content were observed higher in Yankasa (0.73±0.04 Cmol/100g and 81.22±.49% respectively) than Uda (0.55±0.04cmol/100g and 79.76±0.49% accordingly). Significant (P<0.05) age variability was also observed on carbohydrate (CHO), fat, Ash, water and magnesium content of milk. Age group of 5 years had highest CHO (112.92±18.05%) content followed by age group of 3 years (70.88±15.94%) while similar least values were observed on age group 2, 4, and >5 years (65.55±10.20%, 65.59±12.35% and 30.23±18.08% respectively). Fat content was recorded highest on age group >5 years (27.13±0.31%) and least on age group 2 years (26.26±0.17%). Ash content was observed highest (5.03±0.06%) on age group 5 years and least (4.85±0.04%) on age group 2 years. Age group 5 years had highest (82.79±1.01%) water content of milk while least value (77.50±0.57%) was in age group 2 years. Magnesium content was recorded highest (0.74±0.07 cmol/100g) in age group >5 years. Significant (P<0.05) parity difference was evident on most milk parameters except on protein and fat. Parity 2 had least (39.57±10.44%). Ash was highest in parity 1(5.14±0.03%) while parity 5 had least (4.1±0.17%). Water content was highest (83.48±0.54%) in parity 1 while least in parity 5 (78.62±2.68%) highest (0.85±0.19 cmol/100g) magnesium (Mg) content was in parity 4 while least (0.52±0.06 cmol/100g) on parity 3. calcium (Ca) was highest in parity 2 (0.25±0.02 cmol/100g). No significant variability was recorded due to body condition score (BCS). Management system effect (P<0.001) was evident on fat with extensive system having higher (27.50±0.15%) value than semi-intensive system. Water and Mg contents were higher (81.22±0.49% and 0.73±0.04 Cmol/100g) in semi-intensively kept sheep than the extensively kept (79.70±0.49% and 0.55±0.04% Cmol/100g accordingly). Generally, Yankasa sheep had better milk content value than Uda while higher parity ≥ 3 favors higher values of milk parameters; semi-intensive kept sheep performs better than extensively kept ones.

Keywords: Uda, Yankasa. Age, Parity, Milk Composition.

Introduction

Milk has long been recognized as the most complete single food available in nature for maintenance of health, protection and promotion of growth (Biswas 2006), milk supplies body building protein, bone forming minerals, health giving vitamins and furnishes energy giving lactose and milk fat (Biswas 2006). Although milk consist of 80-90% water, it also contains important nutrients: minerals, vitamins, fat, protein, and sugar which are very important in human diets as a source of protein for body growth and development, tissue repairs and other vital functions of the body (Matthewman, 1995).

In Nigeria, cattle are the primary source of milk for human consumption. Indigenous cattle breeds continue to dominate the traditional dairy sub-sector in spite of their law potential for milk production (RIM, 1992). Over the years, local milk production has consistently fallen short to supply especially in urban centers, leading to massive importation of milk and milk products. Continuous dependence on imported milk has discouraged local milk production and led to increase in cost of milk. Although there is affinity for milk product in the country, the high cost of milk has put these products beyond the reach of the average Nigerian, hence it is necessary to look for alternative sources of milk for local consumption (Adewumi, 2005 and Buffono *et al*, 1996). Local sheep breeds in Nigeria heve the potential to supply a significant portion of the milk deficit in the country because sheep numbers by far exceed that of cattle in both rural and urban communities (RIM, 1992 and Adewumi, 2005). Sheep unlike cattle are affordable by the poor families and produce more milk in relation to body size than cattle (Nuru, 1985). Sheep milk has been found to be richer in critical nutrients, except lactose than milk of humans, cattle and goats (Buffono, *et al*, 1996).

Total solid contents of sheep milk is about 20% much higher than cow or goats milk which each have total solids contents about 13% (Gatenty, 2002). Sheep milk has twice fat content and 40% more protein than cow milk which make the manufacture of cheese and other milk products from ewe milk efficient than cow (Harren,1994) and produce a higher yield of cheese per litter of milk with a higher retail price than cow milk (Chambertain, 1989).

Sheep milk is highly nutritious, richer in vitamins A, B, and E, calcium, Phosphorus, potassium and magnesium than cow milk (Anonymous, 2010). Sheep milk also contains a higher portion of short and medium chain fatty acids which have recognized health benefit. Short chain fatty acids have little effect on cholesterol level in humans and easier to digest. High vitamin D and calcium helps in fight against osteoporosis. Sheep milk is useful in the treatment of neurotic indigestion, insomnia, dyspepsia, peptic ulcer, pyloric stenosis and rheumatism and to some Nigerian consumers have a better and more natural taste than cow milk (Adewumi, *et al*, 2005).

In spite of these potentials, sheep have largely been neglected by researche's in the quest for increased milk production. It is therefore the intention of this study to evaluate the milk composition of the two most common sheep breeds in the study area as affected by breed, age, parity, BCS and management system, so as to highlight on issues of possible intervention.

Materials and Methods

Thirty (30) each of Uda and Yankasa ewes were randomly selected in the area of study.The Uda sheep are tall (ewes), hight at shoulder is about 65cm and matured body weight is about 40kg, coat color is white background with black or brown on the forequarter. Yankasa sheep has white color background with black patches around eyes, ears, feet and muzzle. Ewes are pulled and weigh about 20 to 25kg on average. Tail is thin and medium in length as described by Gatenty, (2002) and Oni, (2002).

Sample Collection

Milk samples were randomly collected from different herds of the two breeds of sheep in the study area. One hundred millitres (100mls) of milk from each animal of the two breed were collected into a clean and dry 150ml/sample bottles of known weight. After milking (hand milky), it was then transferred to laboratory for proximate analysis.

Determination of Milk Composition

Nutrition laboratory of Animal Production Department, Adamawa state university was used.

- Water – by oven dry method
- Carbohydrate – by differential methods
- Protein – by Kjaldahl method
- Fibre – by Trichloroacetic acid method
- Mineral – by Spectrophotometer
- Fat – by soxhlet method.

Materials

The following materials were used: sensitive weighing scale, beaker, heating mantle, drying pan, drying cabinet, Kjaldahl Flask, fume capboard with in–build extractor, sodium sulphate (anhydrous), copper sulphate (hydrated), sulphuric acid, heat source (electricity), distilled water, micro kjaldahl distillation, funnel, condenser, volumetric flask, reagent, 10m/s of prepared digester, 10 m/s of 40% sodium hydroxide, 10 m/s of boric acid, measuring cylinder Burate, tripod stand and 0.01ml hydrochloric acid, 1g defatted sample, filter paper. 1, plastic funnel, 250 ml conical flask, 60 ml beaker, hallow glass rod, connected to water tap, boiled distilled water, oven set at 105 ºc, porcelain crucible, muffle, furnace at 550ºC, desiccator, 100 ml. trichloroacetic acid and 10 ml of acetone. Thimble glass rod, petroleum heater (60 – 80ºC boiling point).

Data Collection and Analysis

Age of animals, Body condition score (BCS), parity, management system, breed, water, protein, carbohydrate, fiber, mineral and fat content of milk sample were collected. Data collected were subjected to analysis of variance (ANOVA).

Results and Discussion

Tables 1 and 2 show the means ±SE by breed, age , parity, BCS and management system on milk composition of Uda and Yankasa ewes. Significant ($P<0.001$) breed variations was evident on fat, water ($P<0.001$) Mg ($P<0.01$) content of sheep milk. Uda ewes had higher value of fat (27.50±0.15%) than Yankasa (25.97±0.15%) while Yankasa ewes had higher values of water (81.22±0.49%) and Mg (0.73±0.04 Cmol/100g) than Uda ewes (79.76±0.49% and 0.55±0.04 Cmol/100g respectively). Significant ($P<0.05$) age differences was observed on most milk parameter except on protein and calcium content. Age group of 5 years had highest (112.92±18.05%) CHO value followed by age group 3 years (70.88±15.94%) while similar values were observe on age groups 2, 4 and >5 years (65.55±10.20%, 65.59±12.35% and 30.23±18.08% respectively). Age effect on fat content was observed to be increasing with age indicating that age group >5 years has highest value (27.13±0.31%) while age group 2 years recorded the least (26.26±0.17%). Ash content milk was observed highest (5.03±0.06%) in age group 5years followed by similar values of age groups 2, 3, and >5 years (4.97±0.06%, 4.90±0.04% and 4.99±0.06% respectively) while least value was recorded on age group 2 years 4.85±0.04%). Water content of milk was observed to be increasing with age with highest value (82.70±1.01%) in age group 5 years while least water content was in age group 2 years (77.50±0.579). significant age group effect on Mg content of milk was pronounced showing age group >5 years with highest value (0.74±0.07 Cmol/100g) while least Mg content was recorded in age group 3 year (0.51±0.06 Cmol/100g).

Significant ($P<0.05$) parity effect was recorded on most milk parameters except on protein and fat content of milk. Highest (93.16±7.8%) CHO content was recorded on parity 4 followed by parity 3 (81.52.±13.18%) while parity 2 had the least (39.57±10.44%). Ash content milk was recorded highest in parity 1 (5.14±0.03%) followed by similar values of parity 3 (5.07±0.03%) 4 (5.09±0.17%) then parity 2 (5.03±0.04%) while least value was in parity 5 (4.41±o.4%). Water content of milk was observed to be decrease with parity. Highest water content of milk (83.48±0.54%) was observed on parity 1 followed by parity 2 (80.48±0.58%) while parity 5 (78.62±2.68%) had the least value. Magnesium content of milk was highest (0.85±0.19 Cmol/100g) in parity 4 followed by parity 2 (0.70±0.04 mol/100g) while parity 3 had the least (0.52±0.02 Cmol/100g). Highest (0.25±0.02 Cmol/100g) ca contents was recorded in parity 2 followed by parity 1 (0.24±0.01 Cmol/100g) while parity 4 recorded the least (0.04±0.07 Cmol/100g). Non significant body condition score effect was recorded on milk parameters in the study.

Significant management system effect was pronounced on fat, water and Mg content of sheep milk. Intensively managed sheep milk had higher fat content (27.50±0.15%) than semi-intensively managed sheep milk (25.97±o.15%) Highest water (81.22±0.49%) and Mg (0.73±0.04 Cmol/100g) content of sheep milk was observed on semi-intensively managed sheep than the intensively managed ones (79.76±0.49% and 0.55±0.04 Cmol/100g respectively).

The significant breed variability recorded in fat, water and Mg content of sheep milk was evident in this study which is in agreement with the findings of (Gatenty, 2002) who reported that sheep breed selected for dairy production vary in fat, protein and total solids. Gatenty, 2002 also found that among 25 recognized dairy breeds of sheep found in the mediternean region, genetic variation exist in milk composition with concomitant changes in fat and total solids content.

Effect of age on most milk parameters in the study is line with the findings of Biswas, (2006) who reported that age affects milk composition with advancement in age up to third and fourth lactation (Gatenty, 2002).

Variation in milk composition found in this study agreed with what was reported by Butswat, et al., (2002) that milk yield and composition increased significantly up to the third parity and decline subsequently. The non – significant BCS on milk parameters in this study might be due to the two scales used and that more observations were recorded on one scale more than the other.

Significant management system management system effect recorded on fat, water and Mg content of sheep milk might be as result of the difference in nutrient supply to animals between the two systems. Under nourished animals tends to have low protein, fat and CHO content (Rim, 1992) . Also in support is the report of Caballero, et al., (1982) and Sheath, et al., (1995) who stated that under nutrition in relation to seasonal changes in forage or by – products available for the animals.

Table1: Means ±SE by breed Age, parity, BCS, and management system on milk composition of Uda and Yankasa ewes.

Sources of variation	**N**	**CHO (%)**	**Protein (%)**	**Fat (%)**	**Ash (%)**
Breed		**NS**	**NS**	*******	**NS**
Uda	30	62.40 ± 8.73^{a}	26.89 ± 0.23^{a}	27.50 ± 15^{a}	4.91 ± 0.03^{a}
Yankasa	30	75.66 ± 8.73^{a}	26.91 ± 0.23^{a}	25.97 ± 0.15^{b}	4.99 ± 0.03^{a}
Age(yrs)		**NS**	**NS**	*****	*****
2	22	65.55 ± 10.20^{b}	26.92 ± 0.27^{a}	26.26 ± 0.17^{e}	4.85 ± 0.04^{b}
3	9	70.88 ± 15.94^{ab}	26.67 ± 0.42^{a}	26.45 ± 0.27^{d}	4.97 ± 0.06^{ab}
4	15	65.59 ± 12.35^{b}	26.73 ± 0.33^{a}	26.92 ± 0.21^{c}	4.90 ± 0.04^{ab}
5	7	112.92 ± 18.05^{a}	27.17 ± 0.48^{a}	26.93 ± 0.031^{b}	5.03 ± 0.06^{a}
>5	7	30.23 ± 18.08^{b}	27.02 ± 0.48^{a}	27.13 ± 0.31^{a}	4.99 ± 0.06^{ab}
Parity		*****	**NS**	**NS**	*****
1	25	50.86 ± 9.57^{d}	27.04 ± 0.25^{a}	27.46 ± 0.16^{a}	5.14 ± 0.03^{a}
2	21	39.57 ± 10.44^{e}	26.96 ± 0.28^{a}	$27.10 \pm 0..18^{a}$	5.03 ± 0.04^{b}
3	12	81.52 ± 13.81^{b}	27.03 ± 0.36	27.00 ± 0.24^{a}	5.07 ± 0.05^{ab}
4	1	93.16 ± 47.82^{a}	25.50 ± 1.26^{a}	26.33 ± 0.82^{a}	5.09 ± 0.17^{ab}
5	1	80.06 ± 47.82^{c}	27.98 ± 1.26^{a}	25.80 ± 0.82^{a}	4.41 ± 0.17^{c}
BCS		NS	NS	NS	NS
2	59	64.24 ± 6.23^{a}	26.29 ± 0.16^{a}	26.31 ± 0.11	4.86 ± 0.02^{a}
3	1	73.82 ± 47.82^{a}	27.57 ± 1.26^{a}	27.17 ± 0.82^{a}	5.04 ± 0.17^{a}
Mgt sty		**NS**	**NS**	*******	**NS**
IMS	30	62.40 ± 8.73^{a}	26.89 ± 0.23^{a}	27.50 ± 0.15^{a}	4.91 ± 0.03^{a}
SIMS	30	75.66 ± 8.73^{a}	26.91 ± 0.23^{a}	25.97 ± 0.15^{b}	4.99 ± 0.03^{a}

Note: N = of observations, CHO = Carbohydrate, NS = No Significant, *= P<0.05, *** =P<0.001, BCS = Body Conclusion Score, IMS = Intensive Management System, SIMS = Semi –intensive Management system.

Table 2: Means ± SE by breed, Age, Poultry, BCS and Management System on Milk composition of Uda and Yankasa ewes.

Source of variation	N	Water (%)	Mg(cmol/kg)	Ca (cmol/kg)
Breed		*	**	NS
Uda	30	79.76 ± 0.49^{b}	0.55 ± 0.04^{b}	0.19 ± 0.01^{a}
Yankasa	30	81.22 ± 0.49^{a}	0.73 ± 0.04^{a}	0.20 ± 0.01^{a}
Age (yrs)		*	*	NS
2	22	77.50 ± 0.57^{c}	0.61 ± 0.04^{ab}	0.18 ± 0.02^{a}
3	9	79.50 ± 0.89^{bc}	0.51 ± 0.06^{b}	0.21 ± 0.02^{a}
4	15	81.29 ± 0.69^{ab}	0.63 ± 0.05^{ab}	018 ± 0.02^{a}
5	7	82.79 ± 1.01^{a}	0.70 ± 0.07^{ab}	0.18 ± 0.03^{a}
>5	7	81.39 ± 1.01^{ab}	0.74 ± 0.07^{a}	0.24 ± 0.03^{a}
Parity		*	*	*
1	25	83.48 ± 0.54^{a}	0.56 ± 0.04^{d}	0.24 ± 0.01^{b}
2	21	$80.48 \pm 0.58^{\mathbf{b}}$	0.70 ± 0.04^{b}	0.25 ± 0.02^{a}
3	12	79.81 ± 0.77^{d}	0.52 ± 0.06^{e}	0.22 ± 0.02^{d}
4	12	180.08 ± 2.68^{c}	0.85 ± 0.19^{a}	0.04 ± 0.07^{e}
5	1	78.62 ± 2.68^{e}	0.56 ± 0.19^{c}	0.23 ± 0.07^{c}
BCS		**NS**	**NS**	**NS**
2	59	80.24 ± 0.35^{a}	0.57 ± 0.03^{a}	0.19 ± 0.01^{a}
3	1	80.74 ± 0.68^{a}	0.77 ± 0.19^{a}	0.20 ± 0.07^{a}
Mgt. Syst.		*	**	**NS**
IMS	30	79.76 ± 0.49	0.55 ± 0.04^{b}	0.19 ± 0.01^{a}
SIMS	30	81.22 ± 0.49^{a}	0.73 ± 0.04^{a}	0.20 ± 0.01^{a}

Note: N = Number of observations, BCS = Body conclusion score, Mg = magnesium, ca 2 calcium *=P<0.05, **= P<0.01, Mgt. Syst. = management System, IMS = intensive management System, SIMS = Semi-Intensive management system.

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