Chapter one

INTRODCTION

Colostrum:

Colostrom is the first collection of a thick creamy liquid without blood or infection produced by the mammary gland of a parturient mother shortly with in the first 6 hours after birth. It isvery important part of breast milk and lays down the immune system and confers growth factors and other protective factors for the young ones in mammals. It is the source of passive immunity achieved by the mother and is transferred to the baby. Also it is the major source of the secretion of Ig and gives protection against gastrointestinal infection. Colostrums (also known as beestings or first milk) is a form of milk produced by the mammary gland in late pregnancy and the few days after giving birth.Human and bovine colostrum are thick sticky and yellowish, In human it has a high concentration of nutrient and antibody, but it is small in quantity.(Centists at Queen Mary, 2009).

Colostrums is not only a source of nutrients such as protein, carbohydrate, fat, vitamins and minerals but it also contain several biologically active molecules which are essential for special functions(Kulkarniandpimpale 1989)

Comparative Studies pertaining to colostrums nutritive value of immunoglobulin concentration and the factors affecting them are meager in Sudan.

Objectives:

The objectives of this study is to compare human and goat colostrums during the first three days after parturition to judge the similar benefit in those two Spp. and the possibility of goat's colostrum as a suitable substitute to human colostrums in nourishing infant.

Chapter Two

Literature Review

2.1Sudanese Nubian Goats:-

Historically this breed was developed along the Nile Valley of southern Egypt (Wawat) and northern Sudan (Kush). It is a dairy goat type characterized by fairly proportioned body size with small to medium size head, convex facial profile and large drooping ears usually turned out at the lower tips, The back is long and straight, The legs are long, strong and well proportioned, The udder is large and well shaped(El Naim,1979).

2.2 Colostrums definition:

Colostrums is a viscous mammary secretion during the first three days of lactations it provide all the essential components of nutrition and passive immunity required by the newborn calf.It is characterized by a lemon- yellow color andcontains high quality protein, fat, essential mineral, vitamins and electrolytes. The unique character of colostrums is the high concentration of secretary Ig A antibodies which confer local gastrointestinal immunity to the new natal calves (Smith,2002).

Colostrums is a mixture of lacteal secretions and constituents of blood serum such as immunoglobulin (Ig) and other serum protein that accumulate in the mammary gland during the pre partum dry period and are collected via milking at parturition (Foley and Otterby,1978).

2.3Colostrogenesis:-

This is the process of the colostrums synthesis by the lactating udder, in contrast to lactogensis which described the synthesis of milk colostrogenesis is inititiated during the last days pre-partum during the dry period. The triggering mechanism of colostrogenesis is the increase receptor sites for prolactin and growth hormone which synergize to stimulate the production of suitable enzymes for the formation of triglycerides, lactose and casein (Bentlen et al,).

There are many hormonal activities occurring before and during colostroegensis which regulate this process, Changes in hormonal activity include increased serum corticosteroid, Growth hormone and Prolactin approximately one week prepartum and marked decrease in serum progesterone 1-2 days pre partum(Tucker,1985).

2.4Physical properties of colostrums:-

Attention was paid to the colostrums physical properties.

The properties include PH, taste, odure, acidity, and other comparative physical characteristics of colostrums and milk.

2.5ColostrumsChemical Composition:-

Colostrums in day one is characterized by a high content of total protein (15.14-15.68%).The bulk of which is composed of serum protein (10.28-10.55%) containing 74.9-75.2% immunoglobulin,5.2-7.1 a-lacto globulin 15.2-17.5% B-globulins and 2.1-2.8 serum albumins Chemical composition and physical properties depend on various factors including the age of the animal, number of lactation cycles, breed, dite, and disease (Horne et al, 1986, Rodriguez et al, 2001). The gestational nutrition affects colostrums and milk

yield and nutrient content, even when lactational nutrient requirements are met (Meyer et al, 2011). Studies indicated the presence of different factors affecting milk composition.

2.5.1Water:

Water is the main constituent of colostrums and it forms the major part of it .water secreted in association with water soluble constituent such as sodium, potassium and chlorine. Long (1961) found that bovine colostrums contain 77.5 % water. Ewe colostrums contain 58.8 %water.

2.5.2fat

Fat is most variable constituent of milk that depended widely on several factors incloding breed, individuality of animal, stage of lactation, season, nutritional status, type of feed, health and age of animal and human, interval between milking and the point during when sample is taken(Fox Me Swean 1998). A high yield of milk usually is associated with low fat content and a low yield favors a high fat content (King1980), Roy (1980) reported that colostrums contains 3.5% while Naylor et al, (1991) reported a higher value of 6.7%(Naylor et al, 2007) In the other study conducted by (Kehoe et al.2007) they found that the fat ranged from 0.3% to 18%. In contrast (Tsioulaps et al .2007). postulatedfat content of bovine colostrum as 3.6%.Other found the content of fat in bovine colostrum about 7% (Szule and Zachwieja1998).

Foly and Otterby (1978) claimed that fat percentage in colostrums was 6.7% compared to 4% in mature milk. Huber (1974) reported that bovine colostrum has fat content in the range of 4 to 5%. Bovine mature milk contain 4% fat (Walstra, 2006). Colostrum also is rich in fatty acid. Santschi (2009)

demonstrated a fatty acid profile of bovine colostrums as 65.5% .25.5%.3.6% are saturated,Mono- saturated and poly– unsaturated fatty acid, respectively. While Jensen (1995) demonstrated the fatty acid profile of mature milk as 65.3% and 23.2%, 6.1% saturated, mono- saturated and poly –unsaturated fatty acid respectively.

2.5.3 Protein:

The protein composition varies considerable, but not as such as the fat. The protein content varies among spices from 1% to 14% (Fox1992).In general protein plaies crucial role in animal metabolism acting as enzymes, hormone transport protein, structural protein, and protective structures. Additionally they contribute to the nutrition of mammals by supplying easily digestible and readily absorbable energy, as well as high level of essential amino acids.

Milk can be classified as major (98% of total milk protein). and minor (2% of total milk protein). Major milk proteins comprise casein and whey, While minor milk protein include the actual minor protein(Lactoferrin), milk fat globule membrane protein ,and all of milk enzymes (Topel, 2004). Roy (1980) found that colostrums contain about 14.3% protein in first 24 hours after calving. The protein of milk is one of the most constituent which affected by heat (Fox and MeSweeney 1998).

Kehoe et al. (2007) found that bovine colostrums contain about 14.9% protein while Tisioulaps et al,(2007)postulated percentage of protein in bovine colostrums in the range of 16.2% Foly and Otterby ,(1978) reported that bovine colostrums contain 14% protein.

2.5.4lactose :

Lactose is the main carbohydrate found and is essentially unique to milk (Yagil and Etozin1980: Abu-Lehia 1989 and Elamin and woliox,1992). Approximately 26% of the energy, Incow's milk is represent by lactose (Jackson, 2003). The content of lactose in colostrum is lower than those in milk(Ontsouka et al.,2003)

Colostrum is high in carbohydrate, high in protein, high in antibodies and low in fat (as human newborns may find fat difficult to digest])newborns have very small digestive system and colostroum delivers its nutrients in a very concentrated low volume form it has a mild laxative effect encouraging the passing of the babies first stool which is called meconium .Colostrum is not only a source of nutrients such as protein, carbohydrate, fat, vitamins and minerals but it also contains several biologically active molecules which are essential for specific functions (Kukarni and Pimpale 1989, Playford, 2001).

2.5.5Total solids:

Roy(1980) reported that colostrum contain 22.5%total solid during the first 24 hours while mature contain of 12.5% total solid. Kehoe et al.(2007) found that bovine colostrum contain about 27.6% total solids. Apercentage of 14 to 18%total solids in colostrum was reported (Daniel et al .1977, Huber, 1974.Folley and Otterby 1977).

Anifantkis (1986) reported that sheep colostrum contain about 28.9% total solid .Zhang et al.(2005) reported that camel colostrums contain about 20.16% total solids.

2.5.6 Minerals :

Kume and Tanade (1993) indicated that the colostrumaas concentration of calcium, phosphorus, magnesium, sodium, copper and manganese are highest at parturition and decrease rapidly by 24 hours postpartum. Roy (1980) reported

that colostrums contain about 0.26% calcium, 0.24% phosphors, 0.04% magnesium, 0.07%sodium, 0.14% potassium, 0.12% chloride and 0.2% iron, 0.06% copper .

Topel (2004),and Kehoe et al .(2007) reported that concentrations of macro element in colostrumswere 1.1g/Kg sodium, 2.8 g/Kg potassium, 4.7g/Kg calcium , and 0.79%g/Kg magnesium, while in mature milk the respective values were 0.5 g/kg sodium,1.5g/kg potassium, 1.2g/kg calcium, and 0.1g/kg magnesium.

2.5.7Vitamins:

Milk in addition to protein, carbohydrate, lipids and minerals also contain vitamins. These include the fat solube vitamins (A,D,E,K).In addition to vitamin A(Sawaya et al . 1984) the sow's milk vitamin A estimated 0.18g/kg while camel's milk contain 0.17-0.38 mg/kg. Vitamin E in bovine milk was estimated 0.2-1.0 mg/kg .The greater contentsof substances interfering free radical to oxidation ,SH groups) in goats milk (Bysokogorskii and Veselov, 2010) .

2.5.8Immunological aspects of colostrums:

Colostrums is the major route through which calves acquire passive immunity because the dam placenta, impede transfer of immunoglobulin (Tizard,2004) The concentrations of immunoglobulin's, are highest at parturition and decrease rapidly with each subsequent milking (Rauprich et al ,2000:Blum and Hammon,2000:Play et al ,2000.and Blum ,2006) .Normally bovine colostrums contains 50-150 g/I immunoglobulin that are composed of about 85%-90%I g G (IgG 80%-90% of the total gG).7% IgM, 5%IgA(Larson et al ,1980).Each of the major Ig subclasses IgG.Ig A and Ig M have specific role in protecting the calves against disease or infection (Early et al, 2000). The immune factors in colostrums and milk play an important role in the host defenses of mammary

gland itself, protecting it from pathogenic organisms(Sordillo et al, 1977:Oviedo Boyso et al, 2007).

The concentrations of Ig G in bovine colostrums varies widely, based on mother number of pregnancies, the rate of transference of the compound to colostrums by mammary gland, and the actual volume of colostrums produced .First milking production greater than 8.5 Kg is associated with lower IgG concentrations due to dilution(Pritchett et al, 1991). Typical concentrations of 40-90 mg/I were reported by Quigley et al,(2001). Mehra et al,(2006) Kehoe et al,(2007). In contrast in mature milk IgG less than 1mg /I Kummer et al.(1990):Conessa et al,(2005).

Colostrum also contains other anti-microbial factors such as lactoferrin, lysozome and lactoperoxidase (Foley and Otterby, 1978:Riter,1978:Besser and Gay, 1994:Donovan and Odlie, 1994: Shams,1994), Colostrum also contain growth factors in higher concentration than milk, insulin like growth factors I and II insulin, protein and epidermal growth factor(Koldovsky, 1989. Odle 1994).

Immunoglobulin IgG is major anti- body which, act as the principle for macrophages, and is the primary immunoglobulin in transferring passive immunity to neonate (Butler,1983:Roitt et al, 1998)

Immunoglobulin Ig A protects the surface of mucosal membranes. Including the intestine and preventing pathogens from attaching the surface cell (Butler,1983:Roitt et al .1998). Immunoglobulin IgG provides the primary protective mechanism against septicemia fixes complement and is the major agglutinating antibody (Butler, 1969:Larson et al.,1980). Lactoferrinis a glycoprotein that binds iron thereby reduces its availability to microbes (Lee et al., 1998:Elass-Rochard et al.,1998).

The mean total immunoglobulin concentration of Goat colostrums was 54.4±26.4g/L. Total immunoglobulin was subdivided into subclasses: immunoglobulin Ig G (1and2) 49.1±25.7g/I (90.3%), immunoglobulin Ig M 3.±191.66g/I (6.0%) and
immunoglobulinIg A 2.00± 1.03G/L(3.7%) (Rudovskyet al., 2008).

Milk IgGI concentrations varied between 0.03 and 0.614 mg /mg and significantly correlated with lactation number, stage of lactation, daily milk production and somatic cell count in Holstein dairy cows(Liu et al .,2009). In goat, the level of protein and total IgG contents dropped quickly from the time of birth to 132 hour postpartum (Arguello et al., 2006).

2.6 **Transfer of Passive Immunity in Humans:-**

The transfer of passive immunity in humans follows a much different route than the bovine model described above, with immunoglobulin transport occurring in utero during the third trimester of pregnancy. As a result, immunoglobulins are found at much lowerconcentrations in human colostrum: IgA (the predominant form) at <20 mg/ml, and IgG at <1mg/ml (Fox and McSweeney 2003). In the human neonate, there is no macromolecular transport by the enterocyte to the portal blood stream, and intestinal proteases (pepsin, trypsin, chymotrypsin, carboxypeptidase, elastase) cleave milk Igsintotheir component light- and heavy peptide chains, although the ~75kDa secretory component (SC) is believed to confer some protection to secretory Ig A (Mehra, Marnila et al. 2006). In the human infant, the biological fate of ingested immunoglobulin proteins is to remain in the lumen of the intestine where they confer some measure of protectionagainst enteric pathogens (Fox and McSweeney 2003), and indeed, in specific human clinical trials the immunoglobulins in bovine milk have been shown to be effective against

enteropathic and enterotoxigenic E. coli, rotavirus, and Shigellaflexnrei (Li-Chan, Kummer et al. 1995)

Let mothers know that even one supplemental bottle of artificial infant milk can sensitize a newborn to cow's milk protein (Kalliomaki and Isolauri 2003). Formula changes the gut flora in breastfed babies by breaking down the mucosal barrier that colostrum provides them (Ogawa et al. 2002). This violation allows pathogens and allergens entry into the baby's system (Ogawa 1992). For this reason, artificial supplements should not be given to infants who are at a high risk for allergies (Zieger 2003). In susceptible families, cow's milk proteins may also increase the risk of a baby or child developing insulin-dependent diabetes mellitus.

The newborn's stomach at birth is the size of a marble, which means that it holds less than a quarter of an ounce of milk (Scammon and Doyle 1990). Colostrum's small doses are designed for the human infant. These early feeds are easily digestible. The laxative qualities of colostrum encourage the passage of meconium, the baby's first stool. As meconium is expelled from the baby's intestines, his stomach grows to the size of his fist. This growth occurs rapidly during the first three days of life.

Newborn mammals acquire immunity to certain infections via the colostrum. This seems more pronouced in calves than human babies. Immune globulins are absent from the blood of calves, but immune globulins appear in calf blood within 3 hours after colstrum is fed. The passage of immune globulins from food to blood occurs in all mammals without destruction during the first day or two after birth. Normally all proteins are digested, but Trypsins inhibitor in colostrum allows the immune globulins to reach the intestines without destruction. The globulins appear to pass from the intestine via the lymphatic

system to the heart as fats do in later life. Amino acids and simple sugars pass from the intestine via the portal vein to the liver.

Colstrum in general has been found to be of many beneficial effects,In goats it Is found to be nearly suitable for nourishing human being specially infant and elder people since it is quite digestable and free from any secretive milk factor. It is a virtual gold mine of health benefits. It burns fat, promotes muscle, helps to produce collagen, and slows the aging process. It is a known anti-inflammatory agent, pain reducer, and an anti-oxidant. A colostrum supplement is often taken by athletes, as it repairs muscle, skin, and cartilage. Colostrum helps to keep cholesterol levels low. It eases diarrhea, and aids the health of the stomach lining, bowels, and digestion. It helps to improve mental concentration and alertness, and eradicates bacteria, viruses, and parasites(Dr. Robert Preston, 1969).

2.7 Goat's Clostrum:

The consumption of colostrum by the progeny of ruminant species (cow, sheep, and goat) has a fundamental role in passive immune transfer and in the survival rate of newborns (Lascelles, 1979; Stelwagen et al., 2009; Hernández-Castellano et al., 2014a), as they are born hypo-gammaglobulinemic. For this reason, animals growing under an artificial rearing system need to be fed, by bottle, an adequate amount of colostrum during their first days of life, to obtain adequate passive immune transfer and increase future productivity (Morales-delaNuez et al., 2011). Nevertheless, the amount of colostrum produced by the dam and its composition can be affected by several factors such as nutrition or litter size (Banchero et al., 2004). In addition, lambs fed an inadequate amount of colostrum in the first hours of life are more susceptible to disease and

mortality (Ahmad et al., 2000; da Nobrega et al., 2005; Nowak and Poindron, 2006). Therefore, it is crucial to provide an optimal colostrum source, and consequently, several studies have investigated the use of bovine colostrum as an alternative source to feed lambs in early life (Quigley et al., 2002; Moretti et al., 2010). However, studies report that lambs fed with cow colostrum run the risk of developing anemia (Winter and Clarkson, 1992; Winter, 2011; Ruby et al., 2012). For this reason, it is necessary to study another colostrum source from a phylogenetically closer species, such as goat, which may provide similar passive immune transfer to sheep colostrum and therefore would not affect the future performance of the offspring.

Timing of the first colostrum feeding (**TFCF**) is another important factor that affects immune status and, therefore, the future productivity of adult animals (Hernández-Castellano et al., 2014b). For ruminants, the period between 12 and 36 h after birth is critical for absorption of colostrum IgG (Chen et al., 1999; Nowak and Poindron, 2006; Castro-Alonso et al., 2008) to acquire an adequate initial immunoglobulin concentration in blood (O'Doherty and Crosby, 1997; Quigley et al., 2000; Christley et al., 2003). Nevertheless, it is necessary to study how a delay in TFCF could affect the final immune status in the lamb's bloodstream, as this could affect the future performance.

One of the most important immune variables is the immunoglobulin concentration (mainly IgG and IgM). However, other immune variables directly affect lamb immune status, such as chitotriosidase (**ChT**) activity and complement system activity, and play an important role in the final animal productivity. As described by Argüello et al. (2008), ChT is an important component of innate immunity against chitin-containing pathogens. Chitotriosidase is a functional chitinase with a high homology to chitinases that

belong to family 18 of glycosyl hydrolases. Although research on chitotriosidase has been undertaken in humans (Musumeci et al., 2005) and goats (Argüello et al., 2008; Hernández-Castellano et al., 2011; Moreno-Indias et al., 2012b), this enzyme has never been described in sheep or lambs. Chitotriosidase is predominantly a secretory protein that is expressed only in the late stage of monocyte differentiation and it is capable of hydrolyzing chitin in the cell wall of fungi and nematodes (Barone et al., 1999).

Complement system activity—comprising the total (**TCA**) and alternative (**ACA**) pathways—plays an important role in host defense mechanisms against infectious microbes, because it is involved in specific and nonspecific immunity (Rodríguez et al., 2009). The complement system in mammals has been well described, particularly in humans and mice as well as in cows and goats (Castro et al., 2008; Mayilyan et al., 2008; Rodríguez et al., 2009; Moreno-Indias et al., 2012a). However, few studies have described complement system activity in sheep and lambs (Oswald et al., 1990).

2.8Colostrums quality:

Colostrums quality is an important factor in calves' survival. Acquisition of high colostrums is an important factor influencing neonatal calf health. It is measured by the amount of immunoglobulin found in colostrums. Generally values less than 20 mg/I indicates poor quality, 20 to 50 mg/I moderate and greater than 50mg/I excellent quality (Sheaer et al., 1992: Scott and fellah, 1983). 22%Brix score is the appropriate identification of good quality colostrums in dairy cattle (Bielmann et al., 2010). The variation in IgGcontent in Colostrums produced by Norwegian dairy cows indicate a need for improved colostrums quality control (Gulliksen et al.,2008).Swansonet al(2008).

2.9Colostrumspreservation:

Regular supply of high quality colostrums is an essential part of all new born calves' production system. In some situation, Colostrum may be unavailable from the dam,or it is of poor quality .In this situation the producer has to use previously stored colostrums. One strategy to prevent bacteria proliferation in the stage of colostrums include freeing, efrigeration, and the use of preservative agents such as potassium sorbate for refrigerated fresh colostrums (stewart et al ., 2005).

Freezing ofcolostrums has been reported to providmaximum retention of Ig and nutrients (Foley and Otterby,1987).

Holloway et al., (2002) found that freeing of colostrums for storage dose not affect IgGconcenteration in calves.

Colostrum can be stored at 18C-to 25℃ for at least six months without changing its quality (Roy, 1990:white, 1993) . Colostrum can be refrigerated cold at 1℃ to 2 ℃for up to one week or kept frozon at 20℃ for up to one year(Foly and Otterby,1978). Heat treatment is also used to preserved colostrums, one method of heat treatment is pasteurization.

According to(Godden et al .2006:McMartin et al.,2006) .Pasteurization can be carried out at lower temperature 60 ℃ for longer time minutes to sustain immunoglobulin concentration, immunoglobulin function and colostral fluid characteristics.

Chapter Three

Material and method

3.1 study site:

The presentwork was carried out at two locations during the period from 27.October.to-27.Novmber 2014. The first experimental site fromElshakhfodohl hospital in Omdurman for the human colostrums collected during the first three days after parturition .The sample s collected from six mothers. Theremothers in second lactation and three mothers in third lactation. From each mother were collected three samples with the resultant of 18 colostrum samples allowed in clean dry container and transferred direct to the laboratory of Food Research Center tosubjectedfor chemical analysis. The samples in day one were obtained 8 hrsafter parturition after about 8 hrs after from the Surgery operated mothers.

The second experimental was carried at the department of animal productionCollege of Agricultural studiesin Sudan university of Science and Technology.

500 ml colostrums sample from six Nubian goats at their 2^{nd} and 3^{rd} lactation immediately after parturition on day one, day two and day three of their colostraldays.Three samples from each goat with result of 18 colostrum samples were used in this study.The same procedure of sampling and analysis described for human colostrum was followed for goat's colostrum.A duplicable sample of colostrums for each day was subjected to analysis using of conventional method of human colostrum.

3.2 Chemical analysis of colostrum:-

3.2.1 Determination of moisture content:

Moisture was determined according to AOAC (1995). Five grams of colostrum were weighed. The samples were dried in oven over night at 105℃. After cooling in adesiccator they were weighed. The different in weight before and after divided as following:

$$\textbf{Moisture \%} = \frac{\textbf{differentinweight}}{\textbf{sampleweight}} \times \textbf{100}$$

3.2.2 Fat content:

The fat content was determined by Gerber method according to Bradly et al 1992 as follows; in a clean dry Gerber tube,10ml of sulphuricacid [density 1.815 gm/ml at 20 ℃were poured, then 10.94ml of colostrums sample were added amyl alchol (1-2ml) was into white particles could be seen-.the Gerber tubes were centrifuged at1100 revolutions per minute[rpm] for 4-5 min .the fat column was then read immediately.

3.2.3Protein content:

The protein content was determined by Kjedahl nitrogen method according to AOAC as followed:

Digtestion:

10 ml of colostrums were weighed and poured in a clean dry kjedahl flask and 2 gm of cuso4 were added concentrated Sulphuricacid (25ml) was added to the flask. The flasks were heated until a clear solution was obtained [2-3 hrs] and left for another 30 min. the flasks were removed and allowed to cool.

Distillation:

The digested sample was poured in a volumetric, flask (100 ml) and diluted to 100 ml with distilled water .five milliliters were distilled using 10 ml of 40% Na OH. The distillate was received in a conical flask [100ml] containing 25 ml of 2 % boric acid plus 3 drops of indicator (bromocresol green plus phenolphthalein red).The distillation was continued until the volume in the flask was 75ml,then the flask was removed from the distillatory.

Titration:

The distillate was titrated with 0.1 N HCL until the end point (red color]) was obtained .the protein in content was calculated from the following equation:-

$$N\% = \frac{T \times 0.1 \times 0.014 \times 100}{W}$$

T=Reading of titration

W= weight of the original sample

Protein (%)=%NX6.38

3.2.4Lactose content:

The lactose content determined by Anthrone method (Richard,1959) has been adopted one ml milk was pipette in a 500 milliliters volumetric flask and diluted to 500 milliliters with distilled water. The sample was mixed well then,0,5 milliliters was transferred in a boiling test tube (induplicate)the sample were placed in an ice bath and shacked while adding 10 ml of ice cold Anthrone .the tubes contents were mixed and then placed in a boiling water bath for 6 min ,then transferred back to the ice bath for 30 min. the opitical density of the

colored solution was then read and standard containing 100 mg/ ml of lactose and anthron agent were included in each batch of analysis .the percentage of lactose was then calculated using the following formula :

$$\textbf{Lactose}=\frac{\textbf{O.D(S)}-\textbf{O.D(B)}\times\textbf{4.75}}{\textbf{O.D(SD)}-\textbf{O.D(B)}}$$

Where:

O.D (S)=Optical density of sample.

O.D(SD)=Optical density of standard.

O.D(B)= Optical density of blank

3.2.5 Total solids (TS)Content :

The total solid content determined according to the modified method of AOCA (1990). Three grams of the sample were weighed in to a dry clean flat – Bottomed aluminum dish, and heated on steam bath for 10-15 min .the dish was placed in on oven at 105℃over night, cooled in a desiccators and weighed quickly .weighting were repeated until the difference between two successive reading was <0.1mg.the total solids content was calculated from the following equation:-

$$\text{T.S. \%}=\frac{W1}{W2}\text{X100}$$

Where:

W1=Weight of sample after drying

W2=Weight of sample before drying

3.2.6 Solids-non-fat content:

Solids-non-fat (SNF) content was determined from the following equation:-

SNF (%) =%TS-%Fat

3.2.7 Ash content:

The ash content was determined according to AOAC(1990).five gram of the sample were weighed into a suitable crucible and evaporated to dryness on stream bath ,then placed in a muffle furnace at ≤550C until ash is carbon free (2-3hrs),cooled in a desiccators and weighted .The ash content was calculated from the following equation:-

$$\text{Ash \%} = \frac{w1}{w2} \text{ x100}$$

Where: w1 = weight of ash

w2 = weight of sample

3.3 Physical analysis:

3.3.1Titratable acidity:

The acidity of colostrums was determined according to AOAC(1990).Ten milliliters of sample were placed in a white porcelain dish and five drops of phenolphthalein indicator were added .Titration was carried out using 0.1 N NaOH until a faint pink color with lasts for 30 seconds was obtained. The titration figure was divided by 10 to get the percentage of lactic acid.

3.3.2Determination of pH –value:-

pH- value was determined using pH-meter (HANNA-instrument, model 5A520, Bench meter).

3.4Statistical analysis:

The collected data was subjected to analysis of variance using General Liner Model(G.LM) of statistical package of social science (SPSS) programme.

Chapter four

The Results and discussion

The data pertaining to the mean chemical composition of colostrums obtained from human and goats is portrayed in table (4-1).

Table (4-1).Effect of Species on Chemical composition of colostrums during the first three days after parturitions

Variable	Human	Goat	SL
Moisture	84.89±.56432[a]	79.756 ± 1.41898[b]	**
Fat%	4.3444 ±.24149[b]	6.3944 ± .43072[a]	***
Cp%	3.7722±.39422[b]	9.0500±1.14280[a]	***
Lactose%	5.9928 ± .22490[a]	3.5306± 19393[b]	***
Ash%	0.9817 ±.16880[a]	1.2661 ±11868[a]	NS
Acidity	0.2872 ± .01395[a]	0.3356 ±.01910[a]	NS
pH	.5.8833±. .08828[a]	5.8833±.07013[a]	NS
Total solids	14.8833±.55249[b]	19.7439±1.48767[a]	*
S.N.F	10.7611±.34887[a]	13.8494±1.05861[a]	*

In this table, subsequent, a anddifferent superscript along on the two mean sig. different.

*>P0.05

***p>0.01.

The result indicated highly significant difference (P<0.01) between the Two species, in moisture, fat, protein, Lactose, ash, the human contended higher level of Lactose and moisture while, the goat colostrums was superior in fat and protein. The Goat colostrums also significantly (p<0.05 higher in TS with concentration of(19.7439±1.48767) and (14.8833±.55249) in human.

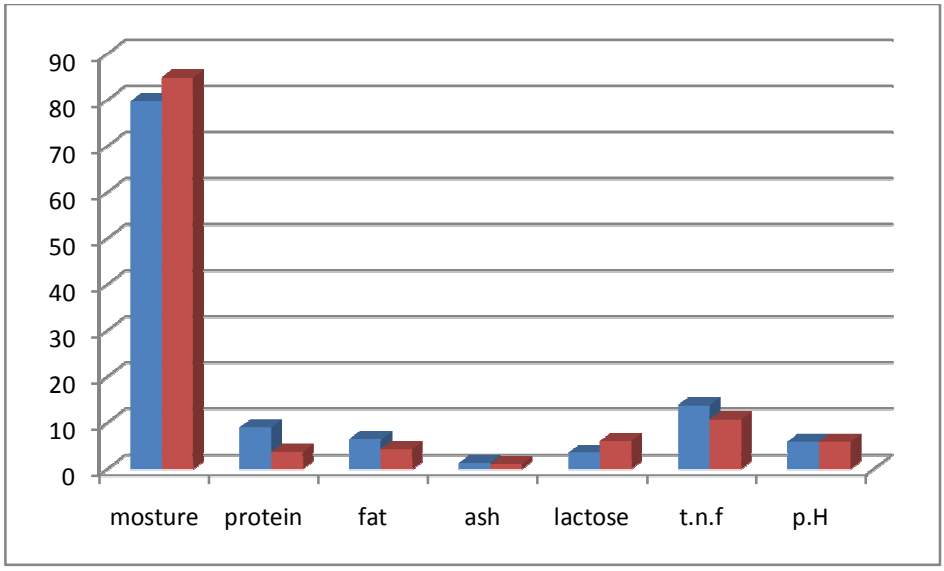
Moreover the goat colostrums characterized by high S.N.F (13.8494±1.05861) Than in human colostrum (10.7611±.34887).The moisture in human colostrums was higher than goat colostrum.

Human and goat'scolostrums no significant in ash content ($0.9817^{\pm}.16880^{a}$) and ($1.2661 \pm .11868^{a}$) for the two Spp. respectively .Also no significance in acidity and pH between human and goat Colostrum were found.

The Lactose content is minimum compared to lactose content of milk. This finding complies smoothly with previous finding authenticated by (Zister and Dirijaarea(2003),that lower lactose content in first day colostrums ensure high viscosity and prevent diarrhea. The concentration quality of colostrums. The density of colostrums is closely related to its of protein in first day colostrums indicates the immunological composition and provides information on its quality.

Lactose in human colostrums higher than goat colostrums.

Fig1: Illustrate the chemical composition colostrums in human and goats.



- Goat Colostrum
- Human Colostrum

Table (4-2) Effect of colostral days on the Quality of the goat colostrum during the first three days after parturition:

Variable	Day=1	Day=2	Day=3	SL
Moisture	72.493±.296^{c}	80.195±.296^{b}	86.580±.296^{a}	***
Fat	8.400±.266^{a}	6.283±.266^{b}	4.500±.266^{c}	***
Protein	14.648±.424^{a}	8.865±.424^{b}	3.637±.424^{c}	***
Lactose	2.525±.108^{c}	3.643±.108^{b}	4.423±.108^{a}	**
Ash	1.933±.112^{a}	1.005±.112^{b}	.860±.112^{b}	***
T.S	27.507±.684^{a}	18.305±.684^{b}	13.420±.684^{c}	***
S.N.F	19.107±.403^{a}	13.522±.403^{b}	8.920±.403c	***
Acidity	.423±.010^{a}	.342±.010^{a}	.242±.010^{a}	NS
pH	5.567±.062^{c}	5.850±.062^{b}	6.233±.062^{a}	***

The data in table (4-2)describes the impact of colostral days on colostrums quality in the studied goats. The results indicated significant effects of days on the investigation component. The higher lactose was obtained in samples of the third day.

The data revealed a significant role of colostrums on moisture, fat, protein, ash, total solid, S.N.F, lactose, except in acidity no sig or not effected by Colostral days.

The first day moisture was lower and increased in 2nd

Colostral days excelled in the 3rddays.While the fat was secured significant higher value in the first day(8.400±.266). But in second and third day was lowered (6.283±.266% and 4.500±.266%) respectively. In the first colostral day

the fat is high and then decreased on subsequent postpartum days with anon consistent pattern. There was no particular trend observed for the fat content which varied throughout sampling period. The fat is the most variable constituent of milk depend widely on several factors such as breed, individual of animal, stage of lactation, season of calving, nutritional status, type of feed, health, age of animal, interval between milking and the point during when sampling taken (Fox and MCS wean 1998).

The higher protein content in the first day of the colostral period secured a value of (14.648±.424%) was the similar comparable value (14.9%)of first day colostrums protein reported by Kehoe et al., (2007); and (16.2%) Tsioulaps et al.,(2007).

In first day of colostral period in this studies the total solid was reported (27.507±.684%) higher than Roy (1980) who reported that colostrum content 22.5% total solid during the first 24 hours while mature content 12.5%total solid. A greed with Kehoe et al (2007) who found that bovine colostrms content about 27.6% total solid. Percentage of 14 to 18%total solid in colostrums was reported (Daniels et al.1977;Huber, 1974;Folly and Otterby;1977)

The total not fat in the first day was higher (19.107±.403%) than second and third days in this studies (13.522±.403 and 8.920±.403%) respectively.

Table(4-3): Effect of colostral days on the Quality of human colostrum during the first three days after parturition.

Variable	Day=1	Day=2	Day=3	SL
Moisture%	82.317±.296[c]	84.533±.296[b]	87.833±.296[a]	***
Fat%	5.567±.266[a]	4.267±.266[b]	3.200±.266[c]	***
Protein%	5.450±.424[a]	4.233±.424[b]	1.633±.424[c]	***
Lactose%	4.967±.108[c]	5.933±.108[b]	7.078±.108[a]	**
Ash%	1.700±.112[a]	1.028±.112[b]	.217±.112[c]	***
S.N.F%	12.117±.403[a]	11.200±.403[b]	8.967±.403[c]	***
T.S%	17.017±.684[a]	15.467±.684[b]	12.167±.684[c]	***
Acidity	.352±.010[a]	.290±.010[a]	.220±.010[a]	NS
pH	5.483±.062[c]	5.900±.062[b]	6.267±.062[a]	***

The particulars of colostral days on the chemical composition of human colostrums are stated in table (4-3).

The data revealed a sig role of colostral day on moisture, fat, protein, lactose, ash, TS and S.N.F. While in Physical composition (acidity and pH)were not affected by colostrul days. The first day samples secured significantly higher values in fat, protein, Ash, TS and S.N.F. While the second colostral day excelled the third day in T.s(15.467±.684 % and 12.167±.684)respectively. but moisture and lactose increased in second and third colostral days

In the first colostral days the fat is high and was decreased on the second and third colostral days.

The protein content in the human colostrums was reported highest in first colostral days (5.450±.424%) and was decreased on the second and on third colostral days (4.233±.424 and 1.633±.424%) respectively.

Such result reflected same altitude for goat colostrums during the three days after parturition.For the fat content the same pattern of decrease was also observed in goat colostrums. While the lactose reflected an opposite trend in both human and goats colostrums during three days after parturition.

As for the pH value and acidity the result of this study indicated anon significant different between the two species (human and goats). The thing that indicatesimilar physical and chemical nutritional similarities between human and goats' colostrums with similar in enzyme Chitotriosidase in the two species as reported by many researchers Musumeci et al., (2005), Arguello et al., (2008);Hernandez-Castellano et al.,(2011);Moreno-Indias et al.,(2012).Suggest that goat colostrums can be a good suitable for human colostrums for feeding human infant.

Table(4-4): Effect of party order on colostrums chemical composition of human during the first three days after parturition.

Variable	2	3	Sl
Moisture%	84.644±242[a]	85.144± 242[a]	NS
Protein%	3.7778 ±.346[a]	3.7667 ±.346[a]	NS
Fat%	4.2778 ±.217[a]	4.4111 ±.217[a]	NS
Lactose%	6.1889±.088[a]	5.7967±.088[a]	NS
Ash%	1.0933±.092[a]	0.8700±.092[a]	NS
S.N.F%	11.078±.329[a]	10.444±.329[a]	NS
T.S%	15.356±.558[a]	14.411±.558[a]	NS
Acidity	.276±.008[a]	.299±.008[a]	*
pH	5.822±.050[a]	5.944±.050[a]	NS

The data in table(4-4) Quality the impact of two different parities on human colostrums chemical and Physical composition.

Theresults verified non significant impact on the studied component with exception of acidity of human colostrums was significant and increased third parity.

Human in their third parity record the highest mean moisture than second parity(85.144± 242[a] and84.644±242[a])respectively.

Highest lactose was evident in the second parity than third parity (6.1889±.088[a] --- 5.7967±.088[a%]

Human in their third and second parities recorded highest fat (4.4111 ±.217[a] and 4.2778 ±.217[a%]) respectively

Human in their second and thirdparities recorded highest ash (1.0933±.092[a] % and 0.8700±.092%) respectively.

Variation in colostrums composition of human on their parities arise from a varity factors including; breed differences, parities order, age of the human type of nutrition, season of the year and health .Yagilet at.,(1994).

The discrepancy between the present values and other quoted from different studies may be justifiable when these factors are considered.

Table (4-5) Effect of parity order on colostrums chemical composition of goats during the first three days after parturition.

Variable	2	3	SL
Moisture %	80.431±.242[a]	79.081±.242[a]	NS
Protein %	8.414±.346[a]	9.686±.346[a]	NS
Fat %	6.356±.217[a]	6.433±.217[a]	NS
Lactose %	3.522±.088[a]	3.539±.088[a]	NS
Ash %	1.276±.092[a]	1.257±.092[a]	NS
S.N.F %	13.213±.329[a]	14.486±.329[a]	NS
T.S %	19.569±.558[a]	19.919±.558[a]	NS
Acidity	.328±.008[b]	.343±.008[a]	*
pH	5.878±.050[a]	5.889±.050[a]	NS

The data in table (4-5) explain quality the impact of two different parities on goat colostrums chemical and Physical composition.

The results in this table recorded non significant on the studied component with exception of acidity which was reduced in second parity compared to third parity(.328±.008). The lower fat concentration was recorded for the second

parity(6.356±.217%). The total solid were highest at the third parity than second parity .While the lactose equaled in the two parities.

The results of this study indicates physical and chemical nutrient proportion in human and goat's colostrum with the presence of some similar enzymes (chitotriodase) found in both Spp. As reported by many researchers (Musumeci et al., (2005); Arguello et al.,(2008); Hernandez-Castellano et al.,(2011); Moreno-Indiase et al.,(2012).

Such similarities might encourage the suggestion that goat colostrums can be a better substitute for deficient human colostrums for feeding human infants.

From the other side, The meager information's obtained about human colostrum limited the serious discussion for further elaboration in this study.

Chapter Five

5.1 Conclusion:

Colostrums basic composition at parturition contains: higherfat, protein, S.N.F and TS compare to normal milk .Lactose and moisture initiated with low levels then increased gradually during sample period.

ALL investigated chemical component tend to decrease in colostral days in two species except for moisture, lactose and pH (physical component) showed an increased trend.

The colostral days cannot be defined exactly because of the wide individual variability and effect of management of colostrums composition. The chemical characteristics of colostrums were greatly affected by colostral days and slightly by lactation number.Moisture and lactose in human colostrum were highest than goat'scolostrums

For human ;colostrumssecretion might start 12-18 hrs after parturition. Also literature review of human colostrum is quite meager.

Recommendations:

Further comparative studies on human and goat's immunoglobulin is needto clarity the good reasons for goat colostrums as suitable substitute for feeding of human infant.

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