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Nutritional Part of Sheep and Goat in Libya

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ABSTRACT

Livestock have made major contribution to human societies by providing food, shelter, fuel, and services. Sheep and goat are economically important livestock play an important socioeconomic role for small and large farmers in Libya. Small ruminant animal meat is popular for Libyan customers, and demand is particularly high during religious and cultural festivals. Small ruminants is valued for their meat, milk and manure, in addition, wool, hair and skin are becoming more attractive by modern and traditional industry. They are popular among various communities, however, in societies. Small ruminant animals play a significant role in the welfare of rural families since they provide both meat and milk as sources of energy and protein for human consumption. Small stock requires relatively little capital to acquire and to feed compared to large stock. Sheep and goat play an important role in most small-scale farming systems else where in the world.

Key Words: Sheep, Goat, Libya, Nutrition

INTRODUCTION

Nearly 100% of small ruminant animals raised in arid and semi-arid zones suffer from shortage in nutrients due to unstable environmental factors such as low rainfall level around the year. Since along time ago, most of sheep and goat flocks raised depend upon open system; grazing the native pasture. As a consequence, under this system, sheep and goat were always suffered from shortage in quality and quantity of feed. In many developing countries such as Libya, chronic feed deficits is correspond to a major restriction to the production in small ruminant animals, which put extra pressure on farmers to expand the utilization of feed resources of non-compete with human food like agro-industrial by-products, treated crop residues, olive oil cake…etc, although all these sources are still not fittingly integrated in a appropriate way in Libya. The above situation can be explained as the following; (I) the un availability of enough and stable sources of feed for the four seasons, (ii) difficulties and expenses in transport of feeding crops from production regions to flocks raising regions (south to north), and that could direct to limitation of using good quality forages such as alfalfa, (4.5 LD/17.5 kg bale plus 0.25LD transportation from south to north, east and west at where the selling price is 5.5 to 6.0 LD) and (iii) expenses and difficulties in transport of sheep and goat flocks for grazing from east, west and north to deep in the medial when rainfall is enough for giving good vegetation cover. Some problems have been developed as a cause of low in total dry matter production per hectare, and therefore, this problem reflected on grazing capacity and that as a consequence of non-fully understanding for several

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managements from the Libyan farmers point of view; such as rangeland management including grazing periods, duration of grazing period, flock size, flocks numbers, native pastures verities and their quality, distribution of watering points, and several technologies like feed blocks, ensiling, improve nitrogen level in poor quality feeds by using urea, introduced alternative feed, and using of feed additives…..etc. Feed blocks are available cheap and it can use in balanced animal ration formulation, in addition it is easy to formulate, stock up, carry supply. It can support small ruminant animals especially those received poor quality feeds, but still not popular enough in Libya compared to some Asian and African countries. It is possible to increase the nutritive value of dietary intake by making protein more available for digestion, and therefore, improve the small ruminant animal's parameters such as the nutrient utilization, diet digestibility, and growth performance, since feeding of small ruminants during the dry season is mainly based on natural rangelands. However, deficiencies of natural pastures in nitrogen, energy and mineral content reduce their utilization by ruminants, and therefore the body gain. As a result, productivity of animals dependent on natural pastures is adversely affected. It is now well established by a number of in vivo and in vitro experiments that urea, urea mixed in feed blocks with or without hay and urea plus the available forages improve the free nitrogen accessibility, and therefore the small ruminant animals performance on grazing of natural pastures in dry seasons, when fed in the accurate time, right proportion and the right way. Several multi-purposes vegetations can be grown on low levels of rainfall (100 to 200 ml/year), these can be introduced to the grazing field for small ruminant animals, which might improve the seasonal dry matter production, increase the grazing capacity, feed conversion, reduce the conventional feed (concentrates), and therefore, reduce the cost per unit of body weight gain of small ruminant animals. Natural grasses, cereal straws, crop residues, and stubbles are the main sources of roughage for small ruminant animals in Libya. In general, and simply the feeding calendar and the practice applied to almost 100% of small ruminant animals is to graze the annual pasture during the spring and autumn. Small ruminant animals fed on crop residues during winter, and therefore, grazing the stubbles and dry pasture during summer. Supplements such as protein, cereal grains and minerals are rarely offered to sheep and goats. Animals are usually unable to maintain their body weight Therefore, grazing alone may not be sufficient for optimizing live weight gain and wool production, and weight losses may and often do occur during the winter season when they are solely fed on straw. The primary limiting factors of cereal straw are their low contents of nitrogen (N), their low intake and poor digestibility (NRC, 2001). Pastures are mainly grasses which have grown naturally. Despite the differences which exist from place to place, they are low in nutritive value. This feeding calendar (traditional calendar) contains a seasonal listing of the common management activities (meeting ...) for sheep and goat production in Libya as it shows below. There is an increasing concern about the protein loss, which affected the average daily gain since the protein value of feed affected by the amount, form, quality, solubility, and amino acids composition. For optimal performance in ruminant fed on high-protein, it should be enough soluble readily-fermentable protein to support microbial growth and fermentation in rumen. Source of less fermentable protein, which can be pass directly to the abomasums (rumen un-degradable protein) most be available. Therefore, an optimal ratio of dietary protein to energy is essential for optimal rates of microbial protein syntheses and rumen fermentation.The reported literature, therefore, was written to search, study and displays the available studies, experiments and reviews done on the nutrition requirement and development of small ruminant animals in Libya, which will provide complete information and build up a back ground about this part of small ruminant animals. That, therefore, will help researchers having clear viabilities about the past and present of this matter since it is established. This study, in addition will help us recognize the factors and facilities on the ground and technical material and methods needed for establish new technology. The prioritized for the improvement of nutritional status of the small

ruminants by integrating different sources of feed, crop residuals, org-by products and org-industry by-products.

Feeding Calendar

Hay falls into several categories; grass, legume, mixed (grass and legume) and cereal grain straw (barley, oat and wheat hay). These are the more common hays plus in some regions of the country Sudan grass is common. The nutritional value of these hays is related to leaf content. The leaves of grass hay have more nutrients and are more digestible when the plant is immature and growing, and more fiber when the plant has reached full growth. Legume leaves, by contrast, do not have the same structural function and don't change much as the plant grows, but the stems become coarse and fibrous. Alfalfa is grown in many geographic regions in the country and it has been used hay for sheep and goat due to digestibility, palatability and nutrient values, which are high when the plant is young (with more leaves and less stems). Sheep and goat owners are always keeping grains and cereal stubbles for season's shortage in native pasture, however, traditionally, barley grain and wheat bran are the most common feed supplements used for feeding sheep and goat when shortage in grazing pasture, especially in the drought seasons. Paucity of appropriate vegetation leads to increase the expenses of keeping livestock and feed them in door. Under this circumstance, reductions in farmers income arrived from livestock are occurred, and that is simply due to inefficiency of feed and feeding systems followed by farmers, although sheep and goat are highly efficient in utilization of poor quality sources of feeds. Therefore, feeding calendar of small ruminant animals is not frozen attribute in Libya as long as there is flexibility in the rainfall levels around the year, and therefore, the nutrition situation need to be re-organized in form of regular feeding calendar. The feeding calendars for small ruminant animals in Libya are revealed in the following Tables (2 to 4). These calendars show a monthly listing of common feeding activities for sheep and goat. In these calendars, the periods of time are nearly the same, and not significantly differences (Table 2), but diets are different in quality and quantity in some periods, among regions and that is due to the environmental factors, availability, price and transportation. In fact there is no account for the harvesting time, stage of growth and therefore, storage time and quality, however, the feeding calendar for lambs and kids mainly depends on breeding season.This feeding calendar is not necessarily the best for the entire farmers in one region, and also not essentially followed and applied by all farmers in the same region. Enrolling these calendars is normally influenced by two factors; (i) accessibility resources of feeds, and (ii) labours availability. Feeding calendars of small ruminant animals in Libya are not well indicated and organized, therefore, most of sheep and goat's flocks in the north are not necessary followed the four seasons time calendar (Table 1), although the four seasons are within the same beginning and ending time.

Table 1. The four seasons beginning and ending in north of Libya.

	Period	
Season	Begin	End
Winter	28/Nov	28/Feb
Spring	28/Feb	28/May
Summer	28/May	28/Aug
Autumn	28/Aug	28/Nov

Feeding Calendar for Sheep and Goat in Agricultures projects.

This calendar is applied to almost all the sheep and goat projects across the country as the following; in February, sheep and goat flocks may receive concentrate or may not and that depends on the field condition, if the condition of the grazing field is good, no need to support the flocks with concentrate and the same in March, April and May. Sheep and goat normally fed on concentrates and roughages in the mooring before free grazing to make sure that the flocks not come early in the after noon to the fences and keep grazing shorter before dark. The mating season started from Jun to Aug, however, rams grazes as the rest (native pasture, crop residues and cereal straw) plus concentrate one month before mating seasons. The above calendar normally followed by the Sheep and Goat Production Projects such as Beer Al-Kanam, Bargoge, Maknosa, Rawann, and Al-Deppowat. This calendar does not support ewes during the flushing season, normally four weeks before and four weeks during meeting season, since it has been reported by Hidiroglou and Charmley, (1990) that nutrition course indeed in need in this period, for this reason, most of the projects consider grazing cereal stubble is a natural flushing regime for ewes, unless other ways, this calendar can fulfil the small ruminant animal requirements for maintenance and production around the year and cover the requirements for lambs, kids, ewe, goat and ram. It is also the cheapest way compared to the income of this feeding calendar (Table 2).

Table 2. Suitable Feeding Calendar for Small Ruminant Animals Projects in Libya

Feed category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
BS, AH, OS, RH, or SC + NP												
NP + BS + BG or Concentrate (depend on NP)												
NP only												
NP + CS + CR												
NP + OS + AH and/ or BS												
Concentrate + RH (50% : 50%) pre-grazing												
Concentrate + RH (50% : 50%) pre-grazing												

BS: Barley Straw, AH: Alfalfa Hay, OS: Oat Straw, RH: Rhodes Hay, SC: Sheep Concentrate, NP, Native Pasture, BG: barley Grain, CR: crop Residues, CS: Cereal Straw.

Southern Feeding Calendar (Non-Commercial).

There is no open grazing field for sheep and goat in the south region feeding calendar (non-commercially), therefore, most of small flocks (40 - 70 head/flock) owners fed small ruminant animals indoor (within the limit of the farm area) dry and green forage, which is normally harvested by farmers. As the consequences, grazing on annual crop residues is essential though out the seasons (Table 3). Under this feeding calendar (Table 4), the number of flocks is very large, and the majority of flocks are grown in limited irrigated area. In south region, farmers sowed legumes such as alfalfa under intensive irrigation system around the year and fed it as green on daily basis and dry when the growth rate is low. Most of the farmers started feeding green alfalfa and stock up some part of this alfalfa as hay for the cold season at when no enough growth for the vegetation although this farmers are under the irrigation system. The feeding calendar in the south region is strongly influenced by the seasonal patterns of production of alfalfa under infrequently cutting managements and so the small ruminant animal growth and health. No concentrate and grain supplementation in these

feeding calendar, as a result sheep and goat need much more longer time to reach the slaughtering weight, however, the opportunity is available to look at this calendar and introduce new techniques in the feeding materials. Every farmer under this unique circumstance generated his own unique seasonal pattern of forage production. It still pays to describe the seasonal pattern of production that it is interesting and insightful to compare this system, which not tried before by the farmers them selves.

Table 3. The two season's period of time in the south of Libya.

	Period	
Season	Begin	End
Winter	28/Nov	28/May
Summer	28/May	28/Nov

Table 4. Feeding calendar followed for small ruminant animals in Southern region (Non-commercial).

Feed category	J a n	F e b	M a r	A p r	M a y	J u n	J u l	A u g	S e p	O c t	N o v	D e c
GHA												
AH and/ or OH and BS												
CR (Grazing) + OH + AH (depends on the farmer)												

Green Harvested Alfalfa, BS: Barley Straw, AH: Alfalfa Hay, OS: Oat Straw, RH: Rhodes Hay, CR: crop Residues.

Southern Feeding Calendar (Commercial).

New generation of farmers (90% to 95%) are always looking for high income within a short period of time. High income projects such as fattening of small ruminant animals by feeding forages, which are the cheapest feed sources for both sheep and goat production. However, recently, this class of farmers started introduced and feeding bread residues mixed with shopped alfalfa or barley straw for fullest extent, for this reason farmers need to store barley straw and/or alfalfa hay for winter feeding. This ration normally reduces feed cost and therefore, increases the farmer income. The farmers are traditionally use lambs and kids after weaning since it is the right time for fattening and marketing after short period of time (2 to 3 months). The problems in this feeding calendar (Table 5) that the body condition is good but the carcass is high in fat as a result of feeding high water soluble carbohydrate. Therefore, many technologies have been used to improve feed use and animal performance at the farm level; feeding treated straw and alfalfa hay using urea and introduce feed blocks also is good and could reduce carcass fat%, which not acceptable by modern costumers. South part of Libya is the part at where high numbers of different varieties of palm trees are grown since a long time a go, which is particularly successful example, in terms of use molasses, urea, and olive oil cake mixed in multi-nutrient block technology. Same poor quality date palm are used as feed for ruminant animals (large and small) with no treatment, however, due to the high annual production from different varieties, farmers doing this activity can creative a new formulas of diets for small ruminant animal using date palm, and thereby reduce the expenses of feeding materials.

Table 5. Feeding Calendar followed for small ruminant animals in Southern Region (Non-commercial).

Feed category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SC+BG + HA and /or BS mix with bread residues												

BS: Barley Straw, AH: Alfalfa Hay, SC: Sheep Concentrate, BG: barley Grain.

Feeding Calendar for Open Field.

This feeding calendar (Table 6) is described as the cheapest feeding calendar in the country, when the rainfall in El-Hamada EL-Hamrra is over 200ml /annually and that due to the non-payment grazing field except the transportation (500 LD/200head) one way form north to El-Hamada EL-Hamrra. The widely and huge grazing field of El-Hamada EL-Hamrra proved that it was enough for a large numbers of sheep and goats flocks. The species of grasses are presented in large number which gave an opportunity for sheep and goat to select and increase the intake. Sheep and goat flocks are in continuous grazing movement, and that depends on the (i) plants density, (i) number of animals per flock, and (i) number of flocks. These factors are strongly influence on the flocks movement speed in the grazing field. The majority flocks owners are normally move back to the closes production systems, and feed forages and concentrate until next season, when the native pasture is not enough for the four seasons or keep grazing the dry native pasture with feeding sheep concentrate and/ or barley grain in the after-noon (150 to 200 g/head/day).

Table 6. Feeding Calendar for Open Field

Feed category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NP (if over 200 ml rainfall)												
NP + BG and /or sc)												

SC: Sheep Concentrate, NP: Native Pasture, BG: barley Grain.

Feeding Calendar for Rented Grazing Lands.

The economic benefit of this calendar is keeping sheep and goat grazing for a long time in circulating system. Normally, the owners (2 to 3 owners) rent the same land and united the flocks for grazing together. The owners are also sowed barley around every grazing circle and not grazed until the end of grazing native pasture seasons. The successful of this feeding calendar is depends on; (i) rent of grazing land, which depends on the rainfall, (ii) destination, (iii) total area of the grazing land, and (v) the landscape of the grazing field. Normally the owners of the grazing land increase rent when the condition is good enough to attractive too many of them. No hand feeding supplementation in this feeding calendar (Table 7).

Table 7. Feeding Calendar for Rented Grazing Lands

Feed category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NP (if over 200 ml rainfall)												
NP + SB												

NP: Native Pasture, SB: Sowed Barley.

The disadvantages of these feeding calendars are not gave enough attention to (i) dry ewes and goats to early lactation, (ii) ewes and goats in early pregnancy, (iii) nursing lambs and kids, and (v) no especial managements for feeding lambs and kids. All livestock must have access to sufficient fresh, clean water on daily basis with water available all the time not at a long distance from the field. Usually sudden changes accrued in these calendars such as changes in type of quantity and quality of feeds, especially for theses sheep and goats received feed from the troughs. Keeping sheep and goats in the same flock did not strongly affects the grazing field since goats are usually select grasses over clover, consume only the best part of wide range of grasses, prefer browse of plants including shrubs and trees over grazing, grazing the top of pasture canopy before grazing close to the soil level, and that due to the un ability of goats in digestion of cell wall as a result of staying feed in their rumen for short time as reported by Luginbuhl *et al*., (2002). Deeply study these calendars could help in creative the right and the suitable solutions in the critical time for nutrition problems such as slow and low growth rate, and reproduction problems; low fertility %, low lambing and kidding %, low weaning weight, mortality % at when it is essential. In addition to the above; the feeding calendars contradictory by too many problems such as; (i) no applied for the vaccination in the time, when it is necessary, (ii) no minerals blocks available, (iii) no body condition score, (v) no available record (nutrition, breeding, and management), (iv) no veterinarian visit across the year, (iiv) no marketable around the year, and no stable price for the small ruminant animals around the year, therefore, no appropriate income.

Sheep and Goats Production System in Libya.

Sheep and goat production systems world wide are strongly influenced by environmental factors, social policy and economic. Total population of small ruminant animals are affected by; climatic and topographic, geographical location, purposes and goals, availability of feed resources, the expenses of feeding animal, and the expenses of healthy care, marketing (supply and demand). As a consequence, production system found to be strongly affects by the type of production and type of production influenced by the feeding calendar.

Classification of production system in Libya.

Small ruminant animals have historical and traditionally been raised in Mediterranean. Despite the sheep and goat population, Libya is an importing country of sheep and goat production, and that due to traditional methods of production systems, which based mostly on grazing.

Open Production System

This is the most value and conmen small ruminant animal production system in Libya since a long time ago. One recurring cause of nutrition problems in small ruminants is unexpected change in the amount, ratios, and ingredients of rations during the close production system, More over, by nature, goats and sheep are herbivorous range animals that consume a wide variety of forages and browse, as a results, small ruminants have relatively fast metabolisms compared to larger ruminant, and therefore, they tend to eat more. The digestive systems of small ruminants are sensitive and require time to adapt to changes in rations, fortunately, the native pasture grazed by small ruminant animal in open production system is not widely varied in the quality and not change sharply from field to other, therefore, sheep and goat seldom have susceptible to metabolic diseases in the open grazing production system. The open production system has too many advantages compared to the rest such as (i) sheep and goat are in natural facing shortage in feed and water, (ii) genetically, livestock are more adapted to high temperature and dry weather, (iii) sheep and goat are more efficient in utilization the native pasture low in quality and water, (v) high resistance to diseases (metabolic diseases), and (iv) flocks move over greater distances between locations. Therefore, select parents from these sheep and goat production system and used then for improve sheep and goat genetic materials may be worth to think about it.

Intensive Production System.

This system is more common in north and south at where the irrigated and crop-production is found, it is not different from transhumant System. This production system depends on feeding and / or grazing forages and crop residues with supplementation of barley grain and concentrate during winter and autumn to sheep and goat flocks with more concentrate on lambs and kids. Large scale commercial production system, expanded production commercial systems, and large-scale commercial enterprises all can be recognized under the Intensive production system

Mixed Production System.

This system is more common in spring and early summer. The grazing area is limited for cretin number of flocks of small ruminant animals. Usually relatives gathering together and send them flocks for grazing highlighting some body whom get enough experience look after these flocks during these seasons. These flocks normally not exceeded 20 to 40 each.

Nomadic Production System.

This production system is well known since a long time ago by Libyan owners inherited generation after generation from them parents. This system well fit with the geographic of the east region (green mount). The sheep and goat flocks are normally stay and grazing in the local regions and that when winter is good. The animals grazed started from morning until after noon, and when come back to the fence, they receive bread and barley mixed together. When the field is not good enough for grazing, as a consequence, owners applied the same system in region where enough vegetation and /or crop residues, normally between Marage and Daran and that with supplementation of barley and bread. Flocks return back home when winter rain falls and pasture starts to grow in the steppe.

Main Feed Resources in Libya.

Small ruminant production, specifically for meat markets is one of the fastest growing agricultural production systems. This growth has created opportunities for producers, especially the small-scale farmer looking for a profitable alternative enterprise to integrate into their existing production system, and that was due to (i) the availability of feed resources around the year, (ii) the production or the average daily gain can cover feed, health, and transportation expenses in spite the unstable price of feed. Data demonstrated in (Table 8) showed the main feeds resources suitable for small ruminant animals corresponding to each region for four seasons. This table showed how easily to start-up with low capital as a cost, which creates an opportunity for development of a small ruminant production system by a small-scale farmer with limited resources. Start-up cost for a sheep and goat producer is considerably low for the following reasons, (i) sheep and goat required small land, and (ii) sheep and goats can do well on low quality forage diets and do not need expensive structures. An added-value to sheep and goat production is that they can be used for grazing and vegetation because of their ability to consume many types of forages and their apparent resistance to many toxins in some plants that are not utilized by grazing cattle. However, the feed resources did not show any feed additives, alternatives, any technological process of feed, org and /or in-org-by-products, although the utilization of some of them on very small farming system.

Table 8. Main Feed Resources for Sheep and Goat in Libya.

	Seasons			
Regions	Winter	Spring	Summer	Outmen
East	BG, C and/or LLNP	NP + LLNP	BG, DNP and C	CR + BG or C
North	AH, BS and C	NP and/ C or BG	CR and /or DNP	C or BG + LLNP and/or HLNP
West	BG,C + AH or OH	NP, BG	CR or NP	NP, C + BS
South	Summer		Winter	
	AH, OH, BS and /or GHA		GHA, OH, BS, AH + CR, OH and/ or AH	

Where, C; concentrate, LLNP; low land native pasture, DNP; dry native pasture, HLNP; high land native pasture.

The ingredients of the most common sources of feed stuffs for sheep and goat in Libya shows in (Table 8). These are the most available vegetations plus the LLNP (low land natural pasture) and HLNP (high) grazed by sheep and goats.

Table 9. Shows the feeds sources and the ingredients according to the Feed Stuff Analysis libratory in the Animal Production Department.

Item	DM%	OM%	CP%	CF%	EE%	Ash
Green Alfalfa	16.7	97.43	3.72	3.48	0.64	2.57
Oat	88.2	92.55	4.29	33.7	1.51	7.45
Wheat Straw	85.3	92.6	4.27	33.5	1.5	7.4
Barley Straw	-----	92.6	3.2	35.5	1.6	7.4
Alfalfa (Bale)	92.6	88.8	19.3		4.02	11.2
Oat straw	96.8	93.9	3.89	35.3	0.7	6.1
Sea Weed	89.7	92.5	3.2	36.7	0.9	7.5
Date	93.4	98.5	5.5	10.8	4.4	1.5
Pulp	93	96.3	6.1	6.7	4.1	3.7
Kernel	95.5	97.8	3.9	16.4	3.7	2.2
Barley (Grain)	91.7	95.3	8.34	4.6	2..51	4.7
Olive Oil Cake	77	96	7.2	42.5	11	4
Wheat Brain	89.4	94.7	17.3		4.3	6.3
Olive oil leaves	95.57	93.87	10.04	19.9	2.3	6.13

The results reported in this table were from Animal Production Department Feedstuffs Analysis libratory, and Veterinary Centre Feedstuffs Analysis Libratory.

This table is clearly indicated that the cost of the feeding materials for sheep and goat are correlated with the quality not the quantity. When looking for legumes hay compared to straws, figures tells that legumes are nearly three times more expensive than straws. That also could be due to the facility, fertilizers, labour and other expenses. For the cactus, Libyan farmers have been feeding cactus for camels more often than sheep and goats, and it is well known in the north.

Table 10. Ordinary feeds, and costs in LD.

Item	Price (LD)	weight (kg/unit)	Transportation/unit	selling price
Alfalfa Hay (from south)	4.5	17.5 kg	0.25LD	6
Barley Straw (from north)	2.25	6 - 8 kg	0.25 LD	3
Oat Hay (north and south)	4	7 kg	0.25 LD	4.5
Barley Straw (from south)	1.75	6 - 8 kg	0.5 LD	3
Wheat Straw	1.5	6 kg	0.25 LD	3
Alfalfa Hay (from north)	4	17.5 kg	0.25 LD	5.5
BG (50 kg)	27 LD	50 kg	0.5 LD	30 LD
Concentrate (sheep (50kg)	17.5 LD	50 kg	0.5 LD	30 LD
Concentrate goat (50kg)	17.5 LD	50 kg	0.5 LD	30 LD
Olive oil cake (1000 kg)	70 t0 150 LD	1000 kg	Depends on destination	----------
Cactus	Unknown	----------	----------	----------
Dry Bread	5 LD	12 to 17 kg	Depends on destination	----------
LLNP rent/ha	100 to 200 LD	Ha	----------	----------
HLNP rent /ha	100 to 200 LD	Ha	----------	----------
Green alfalfa () حزمة	0.5 LD	3 to 5 kg	0.2 LD	1.0 LD

Prices of ruminant animal's feeds were collected from the most popular livestock markets across the country during 2009.

Review of Literature.

Researches and technologies have been adapted to improve feed quality for animal feeding for different categories of production systems. In small ruminant in particularly successful examples in terms of *in vivo* and *in vitro* study were achieved. These studies were reported in the literatures. All most all the researches in this literature are based on the locally available feed resources. The livestock sector, with partial of small ruminant animal plays an important role in social economic of rural area. It is primarily raised in a traditional system contributes to meat, milk, wool and skin. Local goat and Barbary sheep are using feed efficiently and providing good quality meat. Harsh climate regions, a number of local plants, bushes or agro-industrial by- products are used for livestock feeding as alternative feed mixed with concentrate as a based diet, however, the main and the major nature resources supporting the livestock production in Libya is rangelands. Although alternative feeds can provide some of these nutrients, they can vary in value and price as a result of limitation in this factor. All feed ingredients are imported and a large proportion of forage is spent for this purpose as low cost and necessary as filling feed for ruminant animals. Therefore, alternative sources of feeds suitable for ruminant animal, which produced locally are been investigated together with current researches efforts to improve the dry matter intake and the average daily gain. The nutrition strategies for livestock in Libya is always concentrate on what available locally, and how it can be used intensively and efficiently, since the total area suitable for agriculture is only 1.3% out of the total area of range land, which is only 14.82 million hectare and that out of 166.500 million hectare of the total Libyan area. Sheep and goats cover about 58% and 14.5%, respectively from red meat out of 69,000 ton (100%). However, in order to cover the total requirement from red meat (38 kg/person/year), as a result, Libya import about 500,000 ton/year of meat (red, white, fish, and poultry) according to ACSAD, (2005). This review displayed publication in official journals, books, and Master degree thesis. All these studies and others were approached to develop and improve the production and reproduction performance in small ruminant animal to meet specific requirements of both farmers (families) and market (consumers), and that in low rainfall regions.

Improvements of Feed Quality for Small Ruminant Animals.

Urea and Halfa Hay.

Livestock production in developing countries is largely dependent on fibrous feeds – mainly crop residues and low quality pasture, which are deficient in nitrogen, minerals and vitamins. True protein supplements are expensive ingredients in diets for sheep and goat. Therefore, partial substitution of a true protein supplement with a NPN source can significantly reduce feeding cost. Urea is the most commonly used NPN source in ruminant animal diets due to availability and low cost. Urea dissolves quickly in water and is rapidly hydrolyzed to ammonia because of rumen microbial (unease) activity. According to early studies, and because NPN levels required to reduce diet costs and to maximize performance and microbial efficiency, therefore, urea can be effectively utilized when dietary inclusion is limited to one-third of supplemental N or 1% of dietary DM (Reid, 1953; Chalupa, 1968). In contrast, other studies (Rennó *et al*., 2005; Magalhães *et al.*, 2006) have demonstrated that intake and performance were not affected when high urea levels (1.95% of dietary DM, approximately 46% of total N as NPN, from urea/ammonium sulphate) were added in the diet or when supplemental true protein was replaced with urea. However, few experiments have been designed to identify the amount of dietary NPN needed for maximum small ruminant animal performance. Utilization of the correct levels of dietary NPN required for optimum nitrogen

use by rumen microbes would allow adequate performance, thereby improving feed efficiency and reducing feed costs and N losses to the environment. The finding obtained and reported by Abubaker and Makke. (1986), showed that feeding 15% of olive oil cake to male and female Barbary sheep aged 4 to 5 months, when the olive oil cake was mixed with oat hay, sheep concentrate and treated by urea. Urea was used for iso-nitrogenous to make all rations have 14% crude protein as in the control diet. The average daily gain reported was (141.9 g/h/d) for male, and (117.5g/h/d) for female in ration with 15% olive oil cake compared to 25%, 50% of olive oil cake. Feeding olive oil cake treated by urea could substitute considerable amount of concentrate and reduce the cost of the average daily gain in sheep especially young sheep. The carcass specification of animals received olive oil cake had more subcutaneous peritoneal fat, fat under the skin, around the kidney and the heart, and that it could be as a result of the high percentage of oleic acid (65% to 68%), and linoleic acid (5% to 15%), however, if these unsaturated fatty acid escape the bio-hydrogenation occurred in rumen, could be give an explanation to the observation. Halfa hay (*Stipa tenacissima*) has been grazed and fed as a filling feed for ruminant animals in arid and semiarid regions, although it is high in crude fiber (46.27%), low in crude protein (5.4%) (Ben salem *et al*., 1994, and Gnin, 2005). Salem and Fyez, (2008) treated halfa hay and barley straw using 4% urea. This treatment improved the CP% in both associated with reduction in CF%, EE%, and HC%, however, the WSC was improved in treated barley compared with treated halfa (Table 11). On the other hand, treated barley loss too much ash compared to non-treated, the other way around in halfa.

Table 11. The quality of feeding material in Salem and Fyez, (2008).

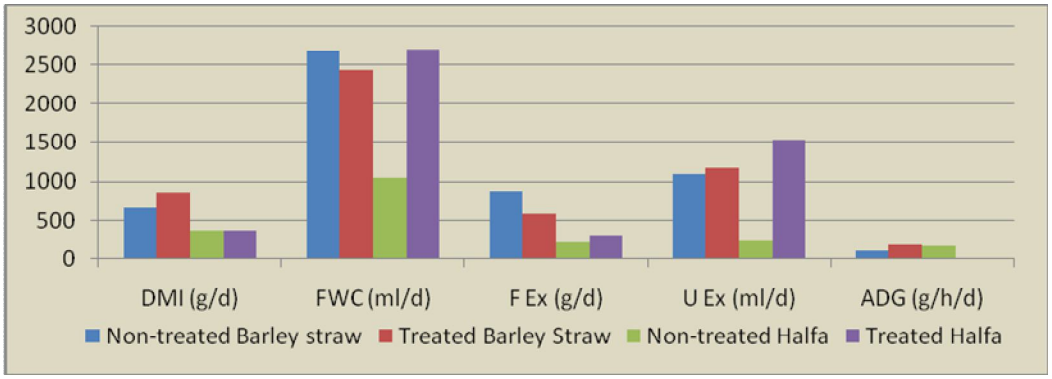
Item	DM%	CP%	CF%	EE%	HC	ADF	NDF	Ash	NFE
Non-treated Barley straw	91	4	46.17	1.25	26.41	71	44.6	8.3	40.31
Treated Barley Straw	82	7.91	40.62	1	24.09	72.2	48.1	4.7	45.81
Non-treated Halfa	92	5.4	46.27	1.32	29.97	80.4	50.4	2.5	44.51
Treated Halfa	86	6.27	45.2	1	29.47	82.2	52.7	3.7	43.86

The digestion coefficient of treated barley was much improved compared to non-treated; however, treated halfa was not improved in all the ingredients, and therefore the DMI was also not improved compared to both treated and non-treated barley straw. The differences among these two hays fed to 30 lamb aged between 6 and 8 months, weight average of 30 kg, for 60 days plus 10 days adaptation period. The result reported in Table (12), showed that the digestion co-efficient of DMI, CP, CF and TDN was at maximum in group offered non-treated halfa and that compared to the rest. Although DMI of treated and non-treated halfa were not differences, the water consumption, feces excretion, and urea excretion was the lowest in group fed on non-treated halfa (Figure 1). The conclusion of this study is; utilization halfa worth to study when mixed with legumes hay and that might reduce the cost of DMI and therefore, sheep productions especially meat.

Table 12. shows the digestion co-efficient of DMI, CP, CF and TDN in Salem and Fyez, (2008).

	Dig Co-Eff			
Item	DMD	CPD	CFD	TDN
Non-treated Barley straw	54.22	50.12	45.97	47
Treated Barley Straw	68.59	69.19	73.24	69
Non-treated Halfa	76.68	78.69	79.71	77
Treated Halfa	65.29	69.15	59.58	65

Figure 1. Animals preformances in Salem and Fyez, (2008).



FWC; free water consumption, F Ex; Feces excretion, U Ex; Urea excretion.

Tayer and Rafege (2008) fed 18 male Barbary sheep aged between 7 and 8 months, with average body weight of 39.750, on olive oil cake silage at three different levels; 0%, 20%, and 30% (Table.13) for 6 weeks. The results reported in (Table 14) showed the average of DMI (g/h/day of olive oil cake silage) was 208.02, 407.o2 and 524.04 for 0%, 20% and 30% of olive oil cake silage, respectively. The changes occurred in the animal body weight does not show any significant changes not in the initial weight; 39.92, 39.83, 39.50 kg/h nor in the final weight; 46.92, 47.58, and 46.88 kg/head in group fed on diet contain 0%, 20%, and 30% of olive oil cake silage, respectively. However, the palatability was found to be higher in group offered ration contain of 30% olive oil cake silage, and that compared to the rest.

Table 13. Composition and ingredients of the rations offered in this experiment Tayer and Rafege (2008).

Items	Control	20% OOCS	30% OOCS
Alfalfa hay	20	20	20
Barley straw	30	10	0
OOC silage	0	20	30
Yellow corn	7	7	7
Soy bean	12.5	12.5	12.5
Barley grain	17	17	17
Alfalfa meal	5	5	5
Wheat Brain	8	8	8
NaCl	0.4	0.4	0.4
Minerals and vitamins	0.1	0.1	0.1
Total	100	100	100
Ingredients			
ME M cal/kg	2.3	2.38	2.4
CP%	14	14.5	14.7
EE%	2.37	5	6.3
CF%	18.12	17.21	18.4
Ash%	5	4.9	4.8
Ca%	0.5	0.5	0.5
P%	0.3	0.3	0.31

Table 14. Lambs performance during 6 weeks of trial fed on 0%, 20% and 30% of olive oil cake silages Tayer and Rafege (2008).

Items	Control	20% OOCS	30% OOCS
OOCS intake (g/h/d)	208.o2	407.02	524.04
DMI (g/h/d)	1507.12	1793.28	1830.14
ADG (g/h/d)	166.67	184.52	175.51
OOCS intake (g/h/d)	208.o2	407.02	524.04
Dig Cef (%) of DM	65.5	62.75	61.6
Dig Cef (%) of CP	74.63	75.45	76.75
Dig Cef (%) of EE	69.73	72.76	86.37
Dig Cef (%) of CF	40.95	34.32	23.35
Dig Cef (%) of NFE	75.06	73.98	69.52
TDN (%)	59.12	55.02	50.57

It is concluded that feeding olive oil cake silage is possible at 20% since it gives good final weight compared to the rest. Feeding olive oil cake silage to Barbary sheep found to improve the palatability by increase the DMI (g/h/d), however, the ADG (g/h/d) was the best in lambs in group 2 (20% olive oil cake silage), moreover, the digestion coefficient was the highest in

group 3; 30% olive oil cake silage. The maximum percent of TDN was in group fed on 0% olive oil cake silage, and could be as a result of the maximum digestion coefficient in the nitrogen free extract. Therefore, feeding olive oil cake silage to Barbary lambs improve the ADG (g/h/d) and that as a result of good improvement of palatability because of adding of olive oil cake silage. Evaluation of the dissolved olive oil cake as ruminant animal diet especially small ruminant animals is worth to investigated, therefore, Tayer *et al*., (1987) studied the effects of dissolved olive oil cake on the total digestible nutrient (TDN), when fed to twelve male Barbary sheep, aged between 7 and 8 months. Four group of 3 male each; control, treatment 1, treatment 2, and treatment 3 offered 0%, 15%, 30, and 45% of dissolved olive oil cake, respectively, (Table 15). The ordinary diet offered on daily basis for each group was 15.83%, 14.78%, 16.97% and 15.66% of crud portion, respectively. The results showed that the control group fed on 0% dissolved olive oil cake had the maximum TDN % (85.52%), while treatment 1, 2, and 3 were 81.3, 73.3, and 68.73 percent of TDN, respectively.

Table 15. Treatments and ingredients in Tayer *et al*., (1987).

Ingredients	T1 0%	T2 15%	T3 30%	T4 45%
DOOC	0	15	30	45
Corn	50	48	40	30
Barley	31.4	20.4	15.4	12.4
Soy bean oil meal	18	16	14	12
Vitamin and Minerals	0.05	0.05	0.05	0.05
Limestone	0.5	0.5	0.5	0.5
Salt	0.05	0.05	0.05	0.05
Total	100	100	100	100
Analysis				
CP%	15.88	14.78	16.97	15.66
EE%	2.2	4.35	5.98	3.8
CF%	3.78	1.16	16.04	18.26
Ash	4.05	5.27	5.9	6.81

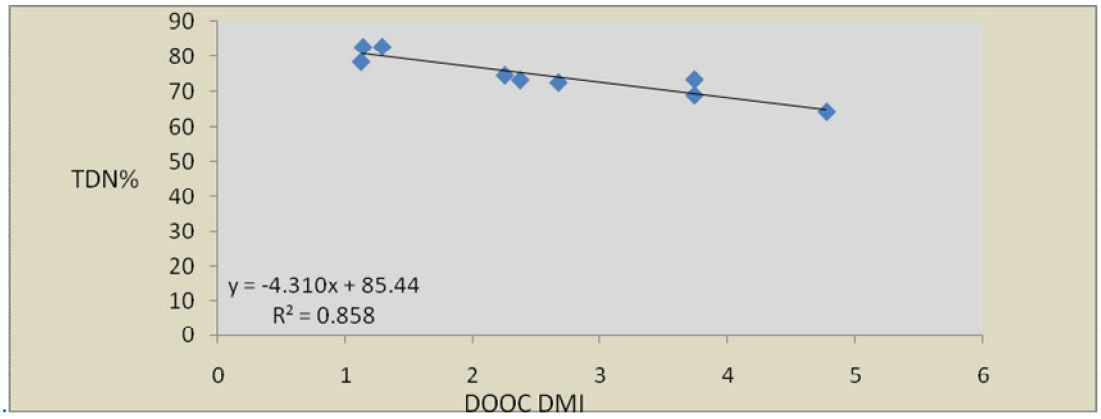
Although DOOC was found to be higher in CP% lower in CF%, and EE% compared to the UDOOC.

Table 16. Approximate analysis of UDOOC, and DOOC.

Nutrient	CP%	EE%	CF%	Ash%	NFE %
UDOOC	9.8	16.0	22.3	2.1	49.8
DOOC	12.8	6.0	17.9	6.8	50.9

The correlation between the TDN and the DOOC intake on DMB was reported in Figure (2), this relation was found to be negative, which means that as the DOOC increase, the TDN decreased dramatically, which means feeding DOOC effects negatively in TDN %. This reduction was as a result of the reduction occurred in both barley and corn (WSC %). The result reported in this study tells that the best rate of DOOC was 15% in both TDN and DMI since the DMI was the minimum. In group 2 reductions of 11% and 2% in barley and corn on DMB, respectively, compared to the control, which made this treatment more t attractable to be used.

Figure 2. The correlation between TDN and DOOC DMI on DMB.



The Nutritive Value of Olive Leaves.

Olive tree leaves have been grazed and fed to the small ruminant animals since a long time ago. Effects of olive leaves on growth, digestibility, and feed conversation until recently were not reported, when researchers started looking for alternative feed as a result of the expenses of protein sources. Salem and Nezar, (2008) used thirty local Barbary lambs, average weight of 33.55 Kg for 70 days plus 10 days adaptation period. The lambs were randomly allocated to three treatments of 10 lambs/group as the following; untreated barley straw (BS), urea treated barley straw (UTB) (4%), and olive oil tree leaves (OL). All groups were fed the roughage source (*ad libitum*) plus 400g/head/day concentrate (25% Soybean meal + 75% Corn) twice daily. Tested feed ingredients offered in this study showed in Table (17).

Table 17. Tested feeds and ingredients in Salem and Nezar, (2008).

Items	DM%	OM	CP	CF	WSC	EE	Ash	NDF	ADF	HC	C + L	CC
BS %	9o.7	92.6	3.2	36	43	1.6	7.4	71.02	44.6	26.4	37.21	28.98
TBS%	80	91.5	7.2	31	33	2.1	8.5	72.15	48.06	24.1	39.56	27.85
OL%	94.8	91.7	6.4	26	50	4.7	8.3	57.41	40.26	17.2	31.98	42.59
TOL%	88.5	90.2	12	22	42	3.9	9.8	40.17	27	13.2	17.2	59.83

Where; CL: cellulose and lignin, CC: cell content.

The average daily intake, OMI, CPI, ADG, and feed conversion (Table. 18) in group offered OL. Feed conversion was found to be the best in TBS and OL compared with BS. Therefore, treated barley straw effect positive in improving crud protein content, and OL could be considered as good roughage sources for sheep, although group fed on OL gained much more than BS and TBS groups, however, the total DMI in OL group was much higher than the rest.

Table 18. Animals performance in Salem and Nezar, (2008).

Items	DMI (g/h/d)	OMI (g/h/d)	CPI (g/h/d)	ADG (g/h/d)	FC (kg feed/kg gain)
BS	521.03	482.48	16.67	65.08	12.53

TBS	620.02	567.32	44.64	113.81	8.89
OL	839.59	769.32	53.31	149.13	8.93

The other experiment was conducted in order to study the digestibility of DM, OM, CP, CF, and the pH was measured in rumen liquor. Twelve lambs were randomly distributed into groups of 3lambs each and kept in digestion box for 15 days (10 days adaptation period and 5 sampling days). Lambs were fed on barley straw, treated barley straw using 4% urea, olive leaves, and treated olive leaves using 4% urea. All group offered 400 g of yellow corn on daily basis. Samples of DMI, FWI, feces, urine, and rumen liquor were collected for 5 sampling days. Results reported in Table (19) showed the best of DMD, OMD, CFD, and CPD was found to be in group fed on treated olive leaves (TOL) by 4% urea. However, this improvement in lambs performance reported in group offered TOL could be due to the treatment by urea and as a result the optimum pH, which improves the rumen microorganisms activities in digestion of DM, OM, CF, and CP.

Table 19. Animals performances in Salem and Nezar, (2008).

Item	Ph	D of OM	D of MD	D of CF	D of CP
BS	7.15	48.59	42.56	42.7	41.88
TBS	6.7	58.11	56.42	62.1	65.45
OL	7.3	61.69	59.28	58.92	64.32
TOL	7.06	65.25	63.02	71.26	74.45

D; Digestibility

The value of the olive leaves from the chemical analysis (Table.20), digestibility, and sheep performance, was studied by Abubaker and El-Dahmane, (2007) offered olive leaves to twelve Barbary sheep with an average of body weight of 55.29 kg/head for 21 days (14 day and 7 day, adaptation period and sampling period, respectively). The experiential units were distributed to three groups of 4 animals, group 1, was offered 1 kg sheep concentrate and 1 kg shopped barley straw, group 2, offered 1 kg sheep concentrate and 500g of shopped olive oil leaves and 500 g of shopped barley straw, and group 3 fed on 1 kg sheep concentrate and 750 g of shopped olive oil leaves, and 250 g of shopped barley straw.

Table 20. Composition of diets offered to the experiential units in Abubaker and El-Dahmane, (2007)

Treatments	DMI (g/h/d)	DM%	OM%	CP%	EE%	CF%	Ash	NFE
A	1611.5	92.76	94.05	16.8	1.5	4.7	5.2	71.8
B	1854.5	95.57	93.86	10.04	2.3	19.9	7.95	59.76
C	1912.6	97.43	88.5	4.9	0.57	35.2	10.23	49.1

Table 21. The digestion coefficient of crude protein, crude fiber, dry matter, ether extract, nitrogen free extract, NDF, ADF and TDN Abubaker and El-Dahmane, (2007).

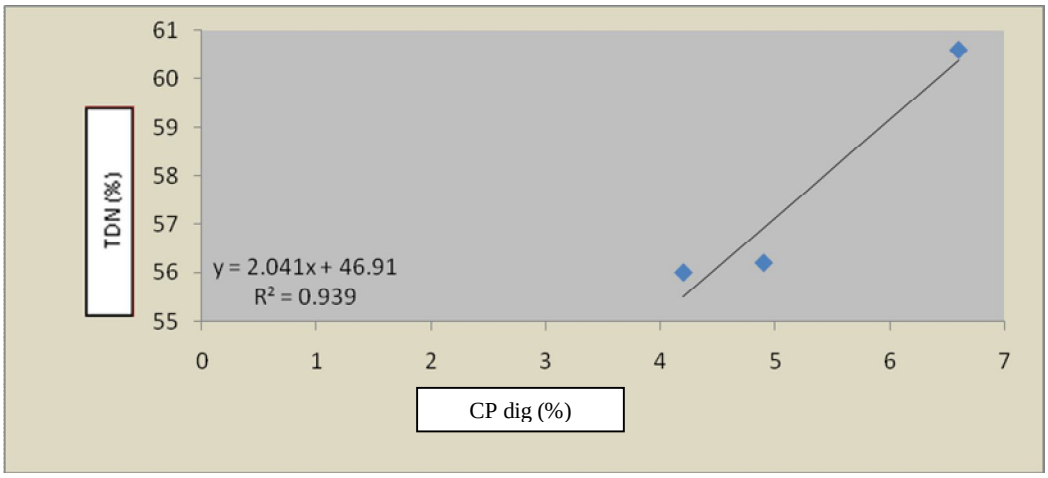
Digestibility Coefficient	100% BS	50% OL + 50 BS	75% OL + 25% BS
crude protein	60.2	45.9	39.7
crude fiber	47.3	37.5	35.4
Dry matter	63.9	59.2	58.1
Ether extract	55.5	49.8	57.9
Nitrogen free extract	71.5	70.1	71.2
NDF	50.1	42.1	47.6

ADF	34.4	24.4	16.7
TDN	60.6	56.2	56.0

BS; barley straw, OL; olive leaves, NDF; neutral detergent fiber, ADF; acid detergent fiber, TDN; total digestible nutrients.

The correlation between the degradable crud protein (Dig CP%) and TDN was found to be positive and the high TDN and ADG (g/h/d) could be due to this not to the DMI (g/h/d) since the minimum DMI was found in group 1 as showed in figure (3).

Figure 3. The correlation between CP digestibility and TDN in Abubaker and El-Dahmane, (2007)



Bushwereb and Rabeie, (1978) study the digestibility of three different rations; A: barley straw, straw molasses and urea at 30% of the protein requirement /head/day, B: barley straw and molasses, and C; concentrate, barley straw and molasses. The crud protein % in each ration was adjusted to 11%. These three different rations were fed to three groups of three Barbary lambs at an average body weight of 37.3 kg/head for 51 days. No significant difference was reported in the digestibility of protein, fat, dry matter, total digestible nutrients, digestible energy, and body weight gain (g/head/day). However, ration B was highly significant in crude fiber digestibility compared to ration A and C, which concluded that urea can be used at 30% of the total protein required by small ruminant animal. The protein intake (PI) (g/h/d), TDN% and ADG (g/h/d) reported in Table (22).

Table 22 . Effects of feeding urea on lamb's performance in Bushwereb and Rabeie, (1978).

Groups	TDN%	ADG (g/h/d)	PI (g/h/d)
A	49.2	83.28	24.11
B	63.9	107.14	26.557
C	49	107.14	32.24

Table 23. Lambs performances in Bushwereb and Rabeie, (1978).

Groups	DC of DM	DC of CP	DC of EE	DC of CF	DC of NFE
A	54.1	41.8	12.8	67.3	93.6
B	62.1	41	34.9	77.3	91.4
C	55.6	39.7	44.9	66	95.3

The activities in Libya in making FBs started in 1997 in association with Mashreq and Maghreb project (M & M) reported by Nefzaoui *et al*., (1997), and that after participation of technicians in a training course on alternative feed sources held in Tunisia 1996. It has been reported that, there were three tries in making FBs in Libya by using urea, molasses, ground barley, wheat bran, olive oil cake, salt and limestone in three different proportions of these components. Support the small ruminant animals such as sheep using FBs might gave good indicter on sheep performance, and could applied on small and large skill. Abubaker and Ali, (2008). Study the effects of three different FBs in its chemical composition (DM%, OM%, CP%, CF%, and NFE) (Table. 24) on sheep performance compared to the control group grazed on barley residual, and that by using 4o male Barbary lambs 6 to 8 months of age, with an average of body weight 45 kg/head. The experiment was curried out for 10 weeks. Adaptation period was not included in measuring of the initial weight.

Table 24. FBs composition as reported in Abubaker and Ali, (2008).

FB	OM%	DM%	CP%	CF%	NFE%
FB 1	86.9	66.4	13.7	20.5	40.2
FB 2	82.2	47.2	12.1	10.0	39.9
FB 3	83.6	49.9	12.8	12.25	35.1
Barley residual	84.5	94.0	5.66	30.70	49.44
Barley straw	88.5	94	4.9	42	44.1

Table 25. Initial weight and final weight as reported in Abubaker and Ali, (2008).

Group	Initial weight (kg)	Final weight (kg)	Total gain (kg/h)	ADG (g/head/day)
Barley Straw	41.02	55.87	14.85	0.212
FB 1+ BR	40.92	53.17	12.25	0.175
FB 2 + BR	41.98	54.95	12.97	0.185
FB 3 + BR	41.44	60.67	19.23	0.275

The result proved that lambs fed on FBs 3 and barley straw gain more than lambs in group 1, 2, and 4. This could be due to the average of dry matter intake (670 g/head/day) compared to 473, 427, and 611, in control, FBs1 and FBs2, respectively.

The Important of Seaweed.

Although it's expensive to deal with some feed sources such as seaweeds, but it could offered to small ruminant animal as filling feed. It is available around the year in large mass. Tayer and Addal, (2007) fed 16 male (3 to 4 months of age) of local goats on seaweeds in order to study the DMI, ADG, rate and feed conversion ratio, compared to barley straw, and barley straw mixed with seaweed in 6 weeks trail. The diet offered was as in Table (26)

Table 26. Diet composition offered according to Tayer and Addal, (2007).

Groups	Animal number	Concentrate %	FF type and (%)	% of FF
A	4	60%	100% BS	40%
B	4	60%	50% BS + 50 SW	40%
C	4	60%	25% BS + 75% SW	40%
D	4	60%	100% SW	40%

FF; forages fed, BS; barley straw, SW; sea weed.

Table 27. The average daily gain though out the 45 days Trial.

Groups	IW (kg/head)	FW (kg/head)	ADG (g/head/day)	ADMI (g/head/day)	FC (g Feed/g gain)
A	11.960	14.475	59	360	6.44
B	12.187	14.025	41	358	8.754
C	12.262	14.775	56	350	6.271
D	12.387	14.900	56	334	5.980

IW; Initial weight, FW; Final weight, ADG; average daily gain, ADMI; average dry matter intake, FC; feed conversion.

From the above, results reported the important of seaweed as a filling feed, when offered with 50% mixed with barley straw. The results reported in this study are economically important since the seaweed is easy to find and collect all around the year, cheap, and eatable from the ruminant animal. Treated seaweed by using urea and molasses could improve the appetite and palatability in ration of small ruminant; Abubaker *et al*., (1993) using two groups of 8 local goats aged from 9 to 12 months, in order to study the local goats performance; when wished seaweed treated by 5% urea and non-wished seaweed mixed with 5% molasses to defined more precisely the important of seaweed straw from the quality point of view. The result showed an improvement in treated seaweed straw dry matter intake compared to Abubaker *et al*., (1992) Abubaker *et al*., (1992) studied effects of feeding of non-washed and washed seaweed on dry matter intake using three groups of 6 kids each. Kids were 5 and 8 months of age, with an average body weight of 16.5 kg/head. The control group was offered barley straw and sheep concentrate, non-washed seaweed and sheep concentrate was offered for treatment 1, and washed seaweed and sheep concentrate was offered to treatment 2 for 54 days. The final results reported was feeding seaweed washed or non-washed appeared to be not influenced on the average daily gain in local goat kids.

Recommendation

It is highly recommended to work on the native pasture from the quality point of view, since there was no study in this matter found in the literature. High percentages of flocks owners are native pasture depending, therefore, researches should concentrate in particulars on this field.Cactus is become more important due to the low water requirement, appetite, palatability, and therefore, the quality especially in arid and_semi-arid zones. The product of this plant become more effectible on animal production as a result of proposes this plant (animal feed, human food, agricultural adaptation). The Libyan land is suitable for this plant and it can give high yield easily, therefore, concentration on this plant, novel verities of posture, organic by-products most occur in different directions. Providing enough and good quality water is essential for good livestock production. Water is vital for organ functions such as digestion, waste removal and the absorption of nutrients. Understanding daily small ruminant animal watering is key needs especially in the field. However, researches on water points distribution was not available under the Libyan environmental condition.

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