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## I. Introduction

Ethiopia possesses an estimate of 25.5 million sheep and 24.06 million goats (CSA, 2013) which are well adapted to the prevailing climatic and nutritional conditions and contribute significantly to the national economy (Alemayehu and Fletcher, 1995). Livestock also play important roles in the urban and per-urban areas as substantial populations are directly or indirectly dependent for their livelihood on livestock rearing or allied activities (Ayele *et al.,* 2002; Halderman, 2005).

The country's considerable potential of the livestock sector is reported to be untapped, according to the Ethiopian Revenue and Customs Authority report of 2009/2010, livestock and livestock products such as: live animals, skins and hides, meat and meat products, leather and leather products etc were Ethiopia's fifth most important export commodities next to coffee, oil seeds, gold and chat (*Catha edulis*) (Access Capital Research, 2010).

Therefore, it can be inferred that the livestock sector is important in Ethiopia for the economic development and for poverty reduction in general. Because of the potential of livestock, the present government is giving adequate emphasis to a market-led livestock development policy (MORAD, 2004). Despite large livestock population in Ethiopia, it was not possible to bridge the gap between the ever-increasing demands for livestock products (FAO, 2000).

There are various constraints affecting the livestock production in the country among which the major limiting factors include under nutrition and diseases. To mitigate the problems of feed availability and under nutrition the use of leaf meal from the perennial leguminous trees can be a viable option. Multipurpose trees provide a cheap source of protein supplement especially during the dry/lean season, when both the quantity and quality of pasture herbage is low. They are becoming particularly important in highly humid and agriculturally productive areas where the increasing human population has necessitated the cultivation of grazing land. Multipurpose trees can be integrated into the crop-livestock production systems as live fences, feed gardens, fodder banks, alley farms, wind breaks and multi-strata systems as sources of homegrown supplements for low-quality crop residues during dry season (FAO, 2010). The leaves of most of the browse plants have high crude protein content, ranging from 10 to more than 25% on dry matter basis hence they may be considered as a reliable feed resource (Okoli et al., 2003).

As indigenous multipurpose browse species *Millitia ferruiginea* is known to farmers in Ethiopia and is better adapted to the environments than its exotic counterparts. It is also important feed resource in traditional animal agro-forestry systems throughout the tropics but its potential as forage has been a subject of little research. *Millitia ferruiginea* is a nitrogen fixing leguminous tree species used as shade for coffee plantation and also for intercropping with other field

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crops especially in the Southern parts of Ethiopia, Berhanu et al,.(2012).

In addition, the feeding standards as well as the nutritional composition and quality of multipurpose trees especially *Millitia ferruginea* has not been yet studied in goats indicating the need for further study on different ruminants (Banerjee et al, 2013). In Sidama zone farmers use the leaves of *Millitiaferruginea* for feeding livestock especially during the dry season and they do so throughout the year for feeding small ruminants especially, goats. However, there is very little information regarding the effect of long term feeding of *Millitia ferruginea* leaf meal on growth, carcass and serum biochemical traits of bucks. So that, the present study was intended to bridge this gap as well as to evaluate the effect of feeding *Millitia ferruginea* on growth performance, quality measures and chemical composition of goat meat.

*Objectives*

- To determine effects of different levels of *Millitia ferruginea* leaf meal on the feed intake Aris Bale goats
- To study effects of different levels of *Millitia ferruginea* leaf meal on weight gain Aris Bale goats
- To study effects of different levels of *Millitia ferruginea* leaf meal on carcass characteristics of Aris Bale goats

## II. Materials and Methods

*a) Description of Experimental Site*

The experiment was conducted at a commercial goat farm situated at Hawassa city which is located at $7^0.06$ '032 "west latitude and $38^0.47$' 67"east longitude and at altitude of 1650 m.a.m.s.l and characterized by sandy and loam soil. The annual rain fall of the area is 674-1365 mm. the average annual minimum and maximum temperature is $12^OC$ and $27^OC$, respectively. The main rainy season extends from April to September interrupted by some dry spells in June and sometime in May to July (Adugna, 1998)

*b) Feed Preparation*

The study included twenty yearling bucks purchased from Tulla local market which is sub city of Hawassa. Fresh leaves of mature *Millitia ferruginea* trees were collected; the leaves were trimmed from the twigs and collected and spread on a plastic sheet. This was followed by shade drying for five days and then air dried leaves was then transported to the experimental site in plastic bags. Grass and wheat bran was purchased from a nearby private farms and markets shops, respectively. The purchased bucks were quarantined for a fortnight and then provided with appropriate antihelmenthic preparations and albendazole. The bucks were ear tagged in before adjusting the animals in to each treatments and blocks and after took weight of bucks in two consecutive days at the beginning of offering experimental feed. Then the animals were blocked according to their body weight and then randomly assigned to each treatment groups. Thus The bucks were provided with 100 g of concentrate comprising of 33 g of maize , 67g of wheat bran and 2 g of salt irrespective of the treatments, the bucks were also provided with 2 grams of common salt per day irrespective of the treatment throughout the experimental period. Hay was provided adlibitum (~15% refusal). The treatments are 0, 2, 4, and 6% MLM for T1, T2, T3 and T4 respectively.

*c) Experimental design and treatments*

The experiment was designed in a completely Randomized Block design (CRBD).The experimental animals were blocked into five blocks of five animals based on initial live weight, which were determined by two consecutive weightings after overnight fasting. The experimental treatments were then randomly assigned to each animal in a block giving five animals per treatment.

*d) Feeding Trial*

The growth trial lasted for the 105 days after the animals had adapted themselves to the environment. The feed was offered twice a day and prior to offering the feed the residual feed was collected back if any. The amount of hay was so offered and at the end of the day refusal feed was left back were collected. The amount of leaf meal was adjusted every fortnight to ensure that the required amount is provided in the diet since it is adjusted based on body weight to dry matter basis. Sample of the hay offered and refused were collected daily. The bucks were weighed at two weeks interval. The bucks were weighed in the morning hours after overnight fasting. Daily weight gain (ADG) was calculated as the difference between final live weight and initial live weight divided by the number of feeding days. Feed conversion efficiency (FCE) was calculated by dividing ADG by daily total DM intake.

*e) Carcass Analysis*

After completion of 105 days feeding trial, in four treatments totally 17 goats were deprived of feed and water for 12 hours. The slaughtering was carried out according to the method suggested by (Banerjee 2005). Pre slaughter weights were recorded and then the animals were slaughtered by severing the jugular vein and the carotid artery with a knife. The blood sample was taken using sterilized test tube for serum biochemistry. After the blood was poured the weight was measured to identify amount of blood and at the time when blood flow ceased, the skin was flayed and weighed with legs below the fetlock joints, and the head was cut and separated from the rest of the carcass and weighed. The alimentary canal consisting of esophagus, small and large intestine were weighed together without

contents. The weight of offal such as head with tongue, skin and feet and internal organs namely liver, heart, lungs, kidneys, spleen, reproductive organs and, were also recorded. The weight of neck, foreleg, hind leg, and thorax, lumber were measured. The cross sectional area of rib-eye muscle between the 12th and 13th rib were traced on transparency paper from the right and left side and measured by using a planimeter ( Portable area meter, model LI 3000A) , then the average the two cross sectional areas was taken for each bucks. Dressing percentage was computed as proportions of hot carcass weight to slaughter weight and empty body weight.

The total fat in meat sample was assessed using Soxhlet apparatus and according to the methods suggested by AOAC, (2000). 1 gram of oven dried meat sample was weighed on a digital balance and then folded in a filter paper. The sample was then being placed in a soxhlet apparatus and was refluxed using petroleum benzene (boiling point 60-80° C). The sample was refluxed for 30-40 times when it is expected that all the fat from the sample was transferred to the petroleum ether. The samples was then transferred to desiccators and allowed to cool overnight.

*f) Chemical analysis of the Feed and Meat*

The chemical analysis of the experimental feeds, i.e., hay, what bran, maize and *Militia ferruiginea,* and the mixtures of the latter three were done after taking the representative samples. Samples of feed offered, refusals dried in an oven to a constant weight at 60°C for 48 hours to determine the nutrient content. Partially dried samples of feeds were ground using laboratory mill to pass through 1mm screen size and the analysis was done at ACA animal nutrition laboratory. Dry matter was determined after oven drying of sub samples of partially dried samples at 105°Cto a constant weight. The OM, ash, and nitrogen (N) were analyzed according to the procedures of AOAC, (1990). The nitrogen content of feed and meat sample was analyzed by using Kjedahal method. The nitrogen content of feed and meat sample was analyzed by using Kjedahal method. Neutral detergent fiber and ADF were analyzed according to the procedures of Van Soest *et al.* (1991).

The meat moisture content was analysed according to the method suggested by AOAC, (1990) 2gms sample with 3 replication of was placed in Petri dishes and was oven dried at 70°C overnight, The sample was placed in desecrator overnight to obtain a constant reading. The difference of oven dried sample and original sample was indicate the moisture percentage The meat ash analysis was conducted according to the method suggested by AOAC, (2000).Two samples with 2 replication of was wrapped in a What man No 42 filter paper, which was then dried in a hot air oven at 125 °C overnight, till a constant weight was achieved. The sample was weighed to determine the loss in moisture. The crucibles along with the ash were weighed on an electronic balance. The total fat in meat sample was assessed using the methods suggested by AOAC, (2000). One gram of dried in 70°C over night meat sample was weighed on a digital balance and then folded in a filter paper. The sample was then placed in a soxhlet apparatus and was refluxed using petroleum benzene (boiling point 60-80° C). The sample was refluxed for 30-40 times when it is expected that all the fat from the sample was transferred to the petroleum ether. The sample was then transferred to desiccators and allowed to cool overnight. Then the sample was reweighed .The protein content was determined according to the methods suggested by (Kjedahal method).

*Statistical Analysis*

The data was analyzed statistically using SPSS V19 for Windows. The data was analyzed using descriptive statistics, mean, standard deviation. The means were compared using Duncan's multiple range tests while the growth of the bucks was assessed using repeated measure ANOVA. The sensory evaluation was assessed using non parametric tests (chi square). The values were considered significant $P<0.05$.

Model

$$Y_{ij} = \mu_i + b_j + e_{ij}$$

$Y_{ij}$ =the overall effect

$\mu$= overall means

$b_j$= effect of treatment

$e_{ij}$= error

## III. Results

*a) The Chemical Composition of feed ingredients and nutrients used for Arsi Bale goats fed natural grass hay supplemented with Graded Level of Millettia ferruginea leaf meal.*

The results from Table 2 indicate that the average dry matter of content of MLM, maize and hay were more or less similar while the values for wheat bran were lower than the above mentioned ingredients. The results pertaining to the ash% indicated that the value was highest for hay and the lowest for maize with the values of wheat bran and MLM being intermediate of the two. The results pertaining to the crude protein content indicated that the value was highest for MLM while it was lowest for maize; the crude protein value had a wide range between the ingredients. The results also indicated that the ether extract value was highest for maize while it was lowest for the hay. The neutral detergent fiber (NDF) was highest for MLM closely followed by hay and the lowest value was assessed for the wheat bran, while the values for acid detergent fiber (ADF) indicated that the value was lowest in maize while it was highest in MLM.

*Table 2 :* Chemical composition of feeds ingredients used in the study

| Chemical of feed composition (%) | *Millitiaferruiginea* leaf meal(MLM) | Wheat bran | Maize | Hay |
|---|---|---|---|---|
| DM | 93.23 | 91.58 | 93.07 | 94.53 |
| Ash | 3.21 | 2.83 | 1.04 | 8.68 |
| CP | 19.25 | 12.19 | 5.30 | 5.33 |
| EE | 2.88 | 3.21 | 4.02 | 2.25 |
| NDF | 69.53 | 47.44 | 57.74 | 65.99 |
| ADF | 32.07 | 13.45 | 5.5 | 17.28 |

*DM (dry matter), OM (organic matter), CP (crude protein), EE (ether extract), NDF (neutral detergent fiber) and ADF (acid detergent fiber); T1= hay adlib + wheat bran +maize, T2=2% MLM+hay adlib + wheat bran +maize, T3=4% MLM+hay adlib + wheat bran +maize, T4=6%MLM+ hay adlib + wheat bran +maize.*

b) *Daily Feed Intake of Arsi Bale goats fed natural grass hay supplemented with Graded Level of Millettia ferruginea leaf meal*

The daily feed intake of the experimental animals is presented in Table 3. The result indicated that the DM, OM, CP, NDF and ADF intake was highest for the bucks reared on T4 diet.

The results indicated that while the DMI and OMI was similar in bucks receiving T1 and T2 diets there was variation in crude protein (CP) intake which increased ($P<0.05$) with increasing levels of MLM

*Table 3 :* Average feed intake (g) of Arsi Bale goats fed natural grass hay supplemented with Graded Level of *Millettia ferruginea* leaf meal

| | Treatments | | | | SE | Sig |
|---|---|---|---|---|---|---|
| | T1 | T2 | T3 | T4 | | |
| Intake ( grams) | 527 $^{d}$ | 556 $^{c}$ | 598 $^{b}$ | 638$^{a}$ | 1.00 | *** |
| DM | 513$^{c}$ | 524$^{c}$ | 560$^{b}$ | 601$^{a}$ | 1.00 | *** |
| OM | 471 $^{c}$ | 484$^{c}$ | 517$^{b}$ | 560$^{a}$ | 1.00 | ** |
| CP | 39.4$^{d}$ | 42.2$^{c}$ | 50.2$^{b}$ | 55.9$^{a}$ | 1.00 | *** |
| EE | 12.1 $^{b}$ | 12.1$^{b}$ | 12.6$^{a}$ | 12.8$^{a}$ | .98 | ** |
| NDF | 285$^{c}$ | 297$^{b}$ | 290$^{b}$ | 329$^{a}$ | 1.00 | *** |
| ADF | 84.6 $^{c}$ | 84.6$^{c}$ | 101$^{b}$ | 123$^{a}$ | 1.00 | *** |

*$^{a\ b\ c}$ values across the columns differ significantly ($P<0.05$) DM (dry matter in gram),OM (organic matter),CP (crude protein), EE ( ether extract),NDF (neutral detergent fiber) and ADF (acid detergent fiber) ) T1= hay adlib + wheat bran +maize, T2=2% MLM+hay adlib + wheat bran + maize, T3=4% MLM + hay adlib + wheat bran +maize, T4=6% MLM+hay adlib + wheat bran + maize,*

c) *Weight gain of the bucks of Arsi Bale goats fed natural grass hay supplemented with Graded Levels of Millettia ferruginea leaf meal*

The initial and final body weight and daily live weight change of the experimental goats fed on the different treatment feeds are presented in Table 4 and Figure 1.

The results indicated that there was no significant difference between treatments in all the parameters studied.

*Table 4 :* Growth performance Arsi bale goats fed natural grass hay supplemented with graded level of *Millitia ferruginea* leaf meal

| Week | T1 | T2 | T3 | T4 | SE |
|---|---|---|---|---|---|
| Initial weight (kg) | 10.28 | 10.26 | 10.24 | 10.32 | Ns |
| Final weight(kg) | 13.53 | 13.92 | 14.06 | 13.50 | Ns |
| ADG(g) | 30.95 | 34.86 | 38.2 | 30.28 | Ns |
| Feed conversion efficiency | 0.06 | 0.07 | 0.07 | 0.05 | Ns |

*T1= hay adlib + wheat bran +maize, T2=2%MLM+hay adlib + wheat bran +maize, T3=4%MLM +hay adlib+ wheat bran+maize, T4=6%MLM+hay adlib + wheat bran +maize,*

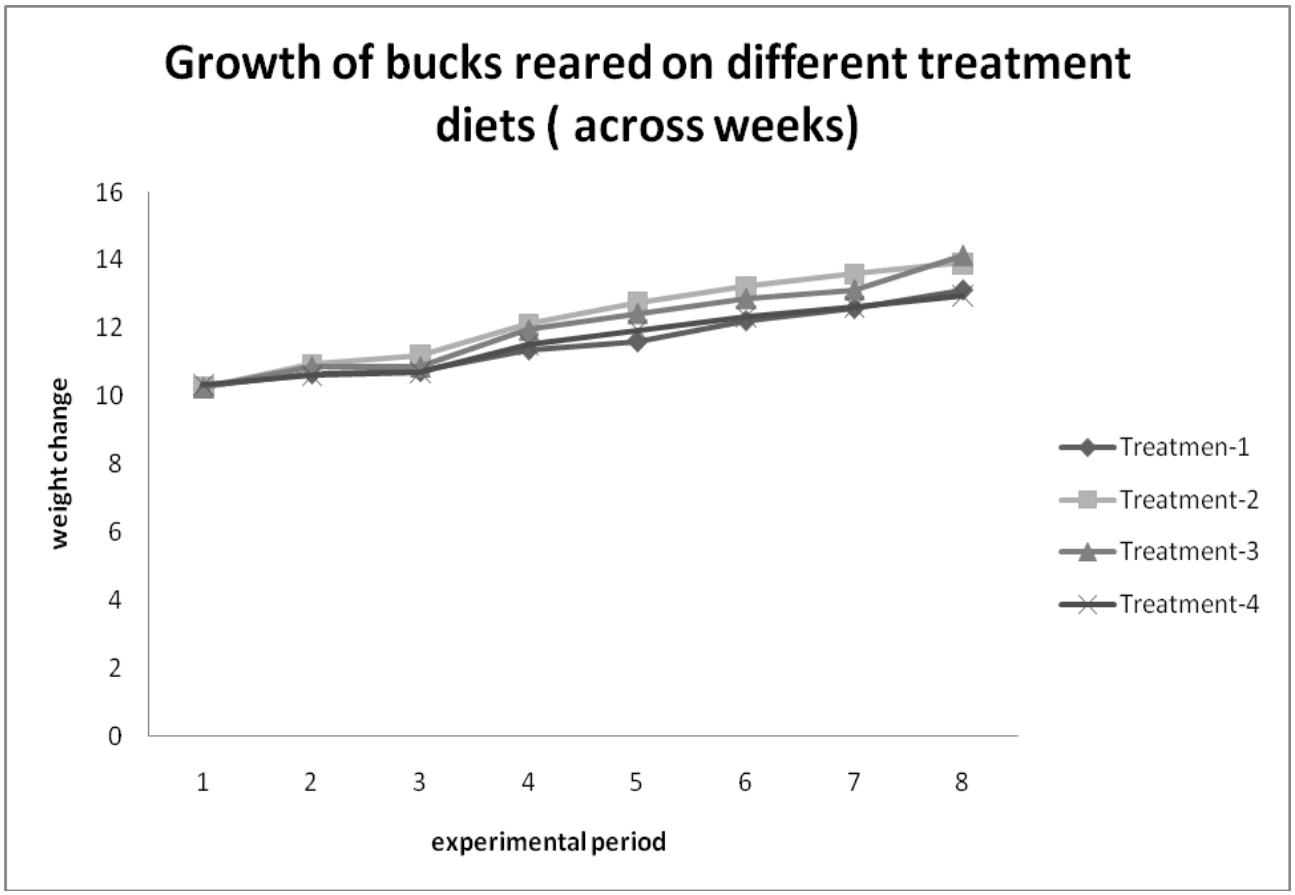


*Figure 1 :* Growth performance of bucks reared on different treatment diets across (across periods).

## IV. Discussion

a) *Chemical Compositions feed ingredients and nutrients used for Arsi Bale goats fed natural grass hay supplemented with graded levels of Millettia ferruginea leaf meal*

The results as presented in Table 3 indicated that the dry matter (DM) content of *Millitia ferruginea* leaf meal (MLM) is higher than the values reported by Gidado *et al*. (2013) for browse species but lower than the values reported by Banerjee *et al*. (2013) for the *Millitia ferruginea* leaf meal. The difference may be attributed to the effect of season in which the leaves were plucked for the different experiments while in former the leaves were harvested in the dry season while in the present study it was harvested during the rainy season. The result also indicates that the values of NDF and ADF as obtained in the present study are higher than those reported by Banerjee *et al*. (2013). However, the percentage of CP and ash in the present study are slightly lower than those reported by Banerjee *et al*. (2013). The differences may be attributed to the age of the leaves plucked from the tree or because of geographical location. The observations are in accordance to the results of Kakengi *et al*. (2007) who also reported that there was variation in the nutrient contents of *Moringa olifera* leaf meal due to maturity and geographical location.

The NDF values for MLM as observed in the present study are higher than the threshold level of 60% beyond which the feed intake of the ruminants may be affected (Meissner et al., 1991) As reported by Jonathan *et al*. (2003) high crude fiber in feed affects the digestibility of polysaccharide. Similar to this finding Alemu *et al* , (2014) fed pasture hay for Washara rams supplemented with *Millitia ferruginea* leaf hay and observed absence of difference in apparent crude protein digestibility among the supplemented groups.

The result also indicates that the average value for ash for wheat bran is in accordance with the values reported by Awet *et al*. (2007). The average values for the ash (%) of maize is similar to those reported by Nurfeta *et al* . (2012). The study also indicates that the values pertaining to the ash (%) for hay are similar to the findings of Tolera (2008).

The low CP content of the MLM as was observed in the study may be attributed to the maturity of the leaves itself. Accordingly when the leaves becomes mature the crude protein declines which is similar to the results reported by Banerjee *et al*. (2013). The CP content of the wheat bran is similar to the observations of Nurfeta *et al*. (2012), however higher

values were reported by Tolera (2008). The results also indicate that the average CP content of maize as was observed in the study are more or less in consonance with the findings of Tolera (2008), while that of hay was similar to those reported by Getachew (2005) and Sebsebe (2000).

The results pertaining to the NDF content of the wheat bran as was assessed in the study was higher than the result reported by Awet (2007), but similar with the findings of Stanton *et al*. (2010) while the NDF content for the hay are similar to those reported by Sebsebe *et al*. (2007), however, higher values for the NDF have also been reported by Tolera (2008). The NDF content of maize in the present study was lower than the values observed by Nurfeta *et al*. (2012). The NDF value for hay was similar to those reported by Nurfeta *et al*. (2012). The results pertaining to ADF values for wheat bran as were observed in the present study are in accordance with the findings of Abebe (2006) while that of maize is similar with the observations of Nurfeta *et al*. (2012). The results also indicate that the ADF values of hay are more or less similar to those reported by Nurfeta *et al*. (2012) while that of the wheat bran is within the lower range of values as reported by Nurfeta *et al*. (2012).

b) *Daily Feed Intake of Arsi Bale goats fed natural grass hay supplemented with Graded Level of Millettia ferruginea leaf meal*

There was a tendency of increasing DM intake with increasing levels of MLM which is attributed to the increase in the amount of supplementation. The results also indicated that enhancement of the total intake in the treatments enhance the intake of all the nutrients which are in close accordance with the findings of Hirut, (2008) who also reported that the dry matter intake improves linearly with the levels of supplementation provided.

The improvement in feed intake of the bucks reared on MLM supplementation may be attributed to higher crude protein content in the leaf meal thereby improving the palatability of the feed. This enables increased rate of digesta fermentation, hence increase feed intake and digesta passage rate go hand in hand. The findings are in accordance with the findings of Rehrahie*et al. (*2003) and Van Soest, (1994).The result is also in accordance with the observations of Nurfeta *et al*. (2009). In addition, the current findings are also in accordance with the observation of Banerjee *et al*. (2013) who also reported an increase in the intake of DM, OM, CP, NDF and ADF values with increased levels of MLM in the diet. The higher nitrogen content of MLM when compared to the other supplemented diets might be because the tree is leguminous and hence can effectively utilize the atmospheric nitrogen. The high protein content in the leaf meal indicates that it can serve as a cheap protein substitute especially during the dry season when there is fodder scarcity; similar results have also been reported by (Kassa, 2013).

c) *Weight Gain of Arsi Bale goats fed natural grass hay supplemented with Graded Level of Millettia ferruginea leaf meal*

The numerically low weight gain at higher inclusion levels of the leaf meal (T4 ) is in accordance with the findings of Banerjee *et al*. (2013). It may be attributed to the presence of condensed tannins in the MLM (4.13% as leucocyanidin equivalent) as was reported by of Banerjee *et al*. (2013). However, Alemu *et al.* (2013) reported that the level of condensed tannins in leaves of Millitia ferruginealeaf hay was 3.52%. A study by Cooper and Owen-Smith (1985), indicated that the threshold levels of tannins in small ruminants is 2% while it is 5% for large ruminants. However, the highest growth though not significant were observed in the bucks reared on T3 diet may be attributed to the low tanning content in the diet (when compared to T4 diet) and is similar with the findings of Makkar (2003) Several studies (Barry and Duncan, 1984; ; Barry 1985; Barry *et al*., 1986; Waghor*et al*., 1994); Pritchard *et al.*, 1988, 1992) indicated low feed conversion efficiency of rams receiving higher levels (>5%) of condensed tannins, while at lower levels (<5%) the presence of condensed tannin is beneficial for the animals. Studies (Van Soest 1982, Barry and Duncan, 1984: Waghorn *et al*. 1990) reported that higher levels of tannins impair the rumen function thereby affecting the digestibility. Condensed tannins have negative effect on N utilization by protecting from microbial digestion (Dicko and Sikena., 1992) thereby affecting nutrient availability. However, as reported by Krebs *et al*. (2007) and Majid *et al*. (2011) at a lower level the tannins may have a beneficial role by impairing the growth of the gastrointestinal parasites and thereby improving the feed efficiency. It also helps in protecting the crude protein which is thereafter available for digestion in the lower part of the intestine. The present findings are also in accordance with the reports of Banerjee et al. (2013) who also reported that at higher levels of inclusion of MLM there was depression of growth in rams, however, at lower levels there were improvement in growth as compared to those reared on control diet. Contrary to this study Alemu *et al*.(2014) reported significant difference in growth performance among washara sheep supplemented with *millitia ferruginea* leaf meal .

d) *Carcass Characteristics of Arsi Bale goats fed natural grass hay supplemented with Graded Level of Millettia ferruginea leaf meal*

The difference in the carcass traits can be attributed to the differences in weights of the visceral organs and also the edible and the carcass as a whole. The difference in neck weight may be attributed to the difference in weight of the muscles around the region.

The differences in dressing percentage between the treatments is not consistent with findings of Banerjee *et al*. (2013) who reported lack of significant differences in dressing percentage of rams reared on different levels of MLM. The dressing percentage of the Arsi Bale bucks (irrespective of the treatments as assessed in the study are in close agreement with the observations of Samuel *et al*. (2013) who had fed cassava leaf meal as a supplement to urea treated teff straw (*Eragorostis te*f). The lack of significant differences in all other carcass trait is in accordance with the findings of Banerjee *et al*. (2013). In contrast to the present finding Banerjee *et al*.(2013) who reported significant difference in feed conversion efficiency of rams read under hay as basal diet supplemented with graded level MLM. Similar to the current finding, Alemu *et al.* (2014), reported that no significant difference in the rib eye area in Washara sheep reared on pasture/natural grass supplemented with *Millitia ferruginea* hay. Studies by Alemu *et al.* (2014), reported significant differences in some edible carcass parts like liver, heart kidney small intestine, kidney fat and abdominal fat of Washara sheep fed on pasture grass supplemented with *Millitia ferruginea* leaf mea, however no differences in the carcass parameters were observed in the present study the findings are similar to those reported by Banerjee *et al* .( 2013) .No significant differences among the treatments in rib eye area, the average values are higher than those reported by Tesfay *et al*., (2008) for Arsi Bale goats. The values as assessed in the study are in close accordance with the observations of Schoenian (2009).

The lack of significant difference in non edible parts of the carcass agree with the result of Temeem *et al.,* (2012) who found similarity in the non edible offal's like skin, lung, spleen, head, blood and pancreas in Nubian, Desert and Swiss Nubian goat breeds vis-a-vis the native Sudan ecotype goats when fed with diets with different levels of energy and protein. The findings are also in accordance with the findings of Ukanwoko *et al.* (2012) who reported that the levels of supplementation with cassava leaf meal did not influence (significantly) on the non edible parts like weight of skin, feet, full gut, empty gut, kidney, heart, spleen lungs and testicles. The results are also in accordance with the findings of Banerjee *et al*. (2013) who reported no significant difference in non edible parts of carcass with supplementation of graded level MLM. In same way Alemu *et al*. (2014) reported no significant difference of non edible like head, skin, feet, and testicles in by feeding on pasture hay with supplementation of *millitia ferruginea* leaf hay. However, the same author reported some variation in non edible carcass like spleen and penis.

## V. Conclusions and Recommendation

*a) Conclusions*

It can be concluded from the results that *Millettia ferruginea* leaf meal can be used for feeding the goats, but basically as a filler diet and in spite of difference in crude protein levels across the treatments there was no significant differences across the treatments. There were no significant changes in weight gain across the treatment groups. Significant differences were observed in unevicerated carcass weights, dressing percentages

*b) Recommendation*

Studies are needed to be carried out to study the effect of feeding the supplements for a longer duration may be 3-5 months growth trail. Studies too need to be conducted for assessing the effect of *Millettia ferruginea* supplementation on growing does and also on spent animals for assessing their response on growth. Studies need to be conducted by incorporating the young tender leaves as a feed supplement. as tender leaves are expected to have higher levels of protein.

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