International Scholars Journals

International Journal of Plant and Animal Sciences ISSN 2167-0366 Vol. 12 (1), pp. 001-008, December, 2024. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Impact of Ficus Sycomorus (Shola) Supplementation on Washera Sheep's Performance on Natural Pasture Hay

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Accepted 3 December, 2024

The purpose of the experiment was to determine how adding F. sycomorus leaves, fruit, and their mixes to sheep fed hay as a basal diet affected the animals' ability to digest the feed. Twenty intact male yearling Washera sheep with an initial body weight mean (±SD) of 17.5±0.39 kg were used in the experiment, which was conducted in Gish Abay in Sekela Woreda, West Gojjam Zone. Before the trial began, the animals received vaccinations against anthrax and pasteurellosis, were malformed, and received sprays against internal and external parasites, respectively. For fifteen days, the experimental sheep were acclimated to the treatment diets. The investigation included harness training and a 10-day digestibility testing. Based on the animals' starting body weight, the experiment was set up in five blocks using a randomized complete block design (RCBD), with four animals each block. Within a block, dietary treatments were assigned at random to one of the four treatment diets. Treatments included feeding natural pasture hay freely (un-supplemented: T1), supplementing natural hay with F. sycomorus leaf (Treatment 2: T2), F. sycomorus fruit (Treatment 4; T4), or a 1:1 blend of F. sycomorus leaf and fruit (Treatment 3; T3). On a DM basis, 300 g of supplements were provided daily. Salt and water were freely accessible. In the current investigation, the natural pasture hay had 43.6% acid detergent fiber (ADF), 73.1% neutral detergent fiber (NDF), and 8.0% crude protein (CP). Compared to the supplemented group, the sheep in the unsupplemented treatment had a greater (p<0.001) basal dry matter consumption (581.6 g/day). However, the sheep in the supplemented group (T2-T4) consumed more total DM than the sheep in the unsupplemented (control) group.The digestibility coefficients of DM, organic matter (OM), and CP were all markedly enhanced by supplementation (P<0.001). In comparison to the unsupplemented group, supplementation also improved the digestion of NDF and ADF (P<0.001). Therefore, it may be said that overall, supplementation enhanced animal performance. However, T2 is the most biologically optimal of the supplements.

Key words: Digestibility, Feed Intake, and Washera Sheep.

INTRODUCTION

Common There are an estimated 26.1 million indigenous sheep in Ethiopia, representing a diversified population (CSA, 2009). According to Solomon et al. (2007), there are roughly 14 traditional sheep communities in Ethiopia. The Amhara National Regional State's West and East Gojjam Zones, which stretch south of Lake Tana, are home to the traditional Dangla (Washera) sheep. At birth and after weaning, Washera sheep weigh roughly 2.8 and 13.8 kg, respectively. After weaning, the growth rate is on par with or even higher than that of several other native breeds. This suggests that this breed has the capacity to produce commercial mutton for both domestic and international markets (Kassahun and Solomon, 2008).

Ethiopian livestock productivity is often low despite the country's enormous population, mostly because of both technical and non-technical limitations (EARO, 2001). Animal output in the nation is hampered by a number of technical issues, including limited genetic potential, illnesses, and inadequate nutrition in terms of both quantity and quality.In most parts of the country, animal output is limited by a lack of feed, especially during the dry season (Alemayehu, 2005).Due to either insufficient supply or poor feed quality, the available feed supplies in many regions of the nation are unable to satisfy the year-round nutritional needs of livestock (Adugna, 2008). The primary sources of livestock feed in Ethiopia are agricultural wastes and natural grazing, both of which are low in protein and calories and severely restrict sheep productivity (CTA, 1991). While fodder conservation is rarely used to assist minimize seasonal feed supply variations, such feed deficits result in the loss of weight gains acquired during more favorable periods (Alemayehu, 1995). Consequently, the average carcass weight of sheep is 10 kg, the second-lowest among sub-Saharan African nations (FAO, 2004), and the yearly offtake is anticipated to be 33% (EPA, 2002).However, by deliberately supplementing animals with readily available protein and energy sources, such as multipurpose trees (MPT) or agroindustrial byproducts, these trends of occurrences can be reversed. However, the use of agro-industrial byproducts is restricted to the region in which they are generated, or their broader application is constrained by economic considerations.

This necessitates looking for substitute feed sources that could be added to animals' diets to enhance their performance. Due to their increased nutrient content and abundance in many agro-ecological settings, multi-purpose trees (MPT) are one of the options that should be used. The leaf and fruit of F. sycomorus are one possible source in the research region in this respect. According to Orwa et al. (2009), F. sycomorus is MPT and a member of the Ethiopian-native Moraceae family. Amhara National Regional State offers it. Sheep, goats, and cattle have been found to eat F. sycomorus (Teferi et al., 2008). With a relatively high nutritional value of roughly 14–17.95% crude protein (CP) and 12 MJ/kg net energy on a DM basis, F. sycomorus leaves are highly sought-after fodder in overpopulated semi-arid regions where the trees naturally occur (Nkafamiya, 2010; Devendra, 1990).

Compared to other tree species, F. sycomorus leaves and petioles have higher levels of apparent digestibility and are well-liked by West African dwarf lambs (Anugwa and Okori, 1987). In Nigeria, it is actively encouraged to feed lambs Ficus fodder.The plant produces round, multicolored fruits with a noticeable opening that may shatter at one end. The fruits range in diameter from 2.8 to 5 cm. In the semi-arid northern Kenyan riverine forest, Makishima (2005) discovered that F. sycomorus is the most plentiful fruit source for frugivorous animals. Chimpanzees are known to rely on Ficus species as backup food sources when fruit is scarce (Fruichi et al., 2001). In Africa, ficus fruits are accessible three to five times a year (Kinnaird, 1992).

Sheep in the Sekela District, where this study was carried out, graze on natural pasture, fallow land, and crop leftovers; however, the nutrients provided by these feed sources are not enough to meet the animals' needs for development, maintenance, and production. During the dry season, local farmers occasionally buy protein supplements like cotton seed meal and subpar roughage, but they are not properly used. Additionally, because the tree grows around the farm, the animals eat the fruit and falling leaves of F. sycomorus.

Land dwelling and on the region that is deteriorating.In actuality, during the dry season, small ruminants can obtain a lot of nutrients from the leaves and fruit of trees. However, there hasn't been much research done in the study area on the systematic evaluation of the value of F. sycomorus fruit and leaves for sheep.Therefore, the purpose of the current study was to assess how supplementing Washera sheep fed natural pasture hay with F. sycomorus leaves, fruit, and their combinations affected their intake, digestibility, body weight increase, and carcass characteristics. to evaluate the financial impact of adding F. sycomorus as a supplement.

MATERIALS AND METHODS

Study Sites

Sekela Woreda in the West Gojjam Administrative Zone of North-Western Ethiopia is where this study was carried out. The property is 466 kilometers northwest of Addis Ababa and ranges in elevation from 2013 to 3257 meters above sea level. The region received 1738 mm of rain on average every year, with a bimodal distribution from February to April and June to September. According to Worldclim (2009), the average annual minimum temperature was 8°C, while the average annual maximum temperature was 21˚C. Degraded farmlands and an undulating terrain characterize Sekela. Growing eucalyptus trees around farmlands and homesteads was a widespread practice in the Woreda, where mixed crop-livestock production was the predominant farming style. For many individuals in the Woreda, animal production is essential to their safety and survival. The Sekela Agricultural and Rural Development Office (SARDO, 2009) reports that households own an average of 0.75 hectares of land.

Feed Preparation

At the conclusion of the rainy season, leaves of F. sycomorus were collected from communal areas, local farmers' yards, and riverbanks near Gish Abay by climbing the tree and cutting its branches. The amount of sunshine that promotes drying and optimal leaf growth, which increases biomass, was used to identify the best time to harvest. Additionally, F. sycomorus fruit was harvested from the indigenous tree fruit in the vicinity of Gish Abay. Following the red ripening of the tree fruit, the fruits were collected beneath the tree plant. With the aid of man, fruit fell. The fruit and leaves were allowed to air dry in the shade. After lopping, the twigs separated, removing the petiole from the F. sycomorus leaf. After partially crushing the dried leaf, the fruit was gathered, placed in sacks, and kept in a well-ventilated shade area until it was time to use it at room temperature. Sufficient amounts of the experimental diets were kept on hand for use throughout the duration of the trial. Natural pasture hay, which was bought from nearby farmers, served as the base feed. Following harvest, the hay was sent to the research locations, kept in a shaded area to preserve its quality, and utilized as a base diet for the duration of the experiment. To reduce the amount of selective feeding by the sheep, the hay was hand chopped to a size of roughly 1-6 cm.

Animals and Management

We bought twenty intact male Washera yearlings from the Gish Abay local market. The animals spent fifteen days in confinement. All sheep were ear-tagged for identification purposes during this time, sprayed with acaricides (diazzinole) for external parasites, and given injections of Ivermectin solution for internal parasites. Additionally, according to the veterinarian's prescription, they received vaccinations against common infectious diseases in the region, including pasteurellosis, anthrax, and sheep pox. At the start of the acclimatization phase, the animals' initial body weights were measured twice in a row following an overnight fast (17.5+0.39; Mean+SD). Based on these initial BWs, the animals were divided into five blocks of four each. Before the real trial started, the sheep were acclimated to the experimental meals for a further two weeks.

A bucket and bamboo feed bins were provided in the corral where the experimental sheep were housed individually. Every day, the pens were cleaned before the feed for the day was given.

Ad libitum intake of measured amounts of natural pasture hay was permitted, with a 25% rejection rate. The feed offer was modified. Equal doses of supplements were given to the supplemented sheep twice a day at 8:00 and 16:00. Throughout the day, the animals had unrestricted access to water and salt block. Hay was provided with locally sourced bamboo feed bins, and the fruit and leaf were offered with plastic sheets tied to bamboo sticks above the cage and above the feed bins to catch any falling fruit or leaves.

Experimental Design and Treatments

This experiment employed a completely randomized block design as its experimental design. The animals' initial weights were calculated by averaging two subsequent weigh-ins following an overnight fast. Sheep were divided into five groups according to their starting body weight, and each treatment was given to five animals at random. Within a block, dietary treatments were assigned at random to one of the four treatment diets. Feeding natural pasture hay ad libitum (un-supplemented: T1), supplementing natural pasture hay with F. sycomorus leaf (Treatment 2: T2), F. sycomorus fruit (Treatment 4; T4), or a 1:1 blend of F. sycomorus leaf and fruit (Treatment 3; T3) were the treatments. On a DM basis, 300 g of supplements were provided daily.

Digestion Trial

After two weeks of adaption, a ten-day digestion testing was carried out. After three days of getting used to carrying fecal collection bags (harness), the feces collection was carried out for seven days. The digestibility trial involved every experimental animal. Every morning, before the animal was fed for the day, its excrement were gathered and weighed. Each sheep's daily excrement was mixed thoroughly, and 20% was sampled. It was then placed in an airtight plastic container and frozen at -20 °C until the digestibility test was over. Following the collection period, each animal's daily frozen fecal samples were combined, carefully mixed, and subsampled for analysis.

The fecal samples were shipped in an ice box to the Poly Food Science Laboratory at Bahir Dar University. There, they were dried at 60˚C for 72 hours to maintain a constant weight and pulverized to fit through a 1mm sieve. While awaiting chemical analysis, the ground samples were kept in an airtight container. For analysis, the dehydrated samples were brought to the Nutritional Laboratory at Haramaya University. The apparent digestibility co-efficient (DC) of nutrients were estimated following the equation suggested by Ranjhan (2001):

DC= Total amount of nutrients in feed – nutrients in feces

Total amount of nutrients in feed

By multiplying the feed's OM content by its digestibility coefficient, the digestible organic matter content of treatment feeds was calculated. However, the McDonald et al. equation was used to determine the estimated metabolizable energy intake of sheep from treatment meals. (2002) as: ME (MJ/KgDM) = 0.016×DOMD, Where DOMD = is gram digestible organic matter per kilogram dry matter

Feeding intake

Intake of food was measured. Throughout the study period, the experimental sheep's daily feed intake was measured and documented, along with the corresponding refusals. Based on the kind of feed, representative samples of feed offers per batch and refusals per animal were gathered, stored, and pooled over the course of the experiment before being subsampled for chemical analysis. The difference between the amounts of feed offered and rejected was used to determine each sheep's daily feed consumption. The substitution rate was computed by dividing the amount of supplement provided by the difference between the un-supplemented and supplemented groups' basal diet intake (Ponnampalam et al., 2004).

Chemical Analysis

In accordance with AOAC's (1990) protocol, representative (composite) feed offer, rejection, and fecal samples obtained during the digestibility trial were ground to fit through a 1 mm sieve screen size and examined for DM and ash. Each ingredient's acid detergent fiber (ADF), NDF, and ADL components were identified using Van Soest and Robertson's (1985) methods. Using a nitrogen factor of 6.25, N was multiplied to estimate the crude protein.

Statistical Analysis

The general linear model approach in SAS software (V9) was used to perform an analysis of variance (ANOVA) on digestible feed intake and digestibility (SAS, 2002). Correlation analysis was used to examine the relationship between digestibility and nutrient intake. Treatment means were separated using least significant difference (LSD). The model employed was: Yij= + ti + bj+ eij,

Where; Yij= Response variable

= Overall mean

ti = Treatment effect

bj = Block effect (initial body weight) eij= Random error

RESULTS

Chemical Composition of the Experimental Feeds

Table 1 below lists the chemical makeup of the feedstuff employed in this investigation. The leaf of F. sycomorus had a CP content of 17.9% in the current experiment. In this investigation, the leaf of F. sycomorus has the following DM-based contents: 64.6%, 52.5%, 17.4%, 93.2%, and 11.9% for NDF, ADF, ADL, and DM. However, in the present investigation, the fruit of F. sycomorus had a CP content of 11.8%. With a greater NDF and ADF composition, the hay provided to the experimental animals in this study had a CP content of 7.9%.

Feed Intake

Table 2 shows the average daily intakes of DM, OM, CP, NDF, and ADF for Washera sheep that were fed a natural pasture hay base diet supplemented with F. sycomorus leaves, fruit, and their mixes. Sheep on the T1 diet had a higher basal feed DM intake ($P>0.05$) than sheep in the supplemented group (T2-T4). Sheep in T2 consumed more dry matter from the basic diet than sheep in T3 or T4 among the supplemented group ($p<0.05$). The decreased baseline DM consumption seen for sheep in T4 and T3 compared to sheep in T2 may be explained by variations in the nitrogen content of the various supplements, even though the supplemented group received an identical amount of the supplements (300 g/day). Due to variations in the crude protein content of the various supplement types, the total DM intake was higher ($P<0.001$) in the order T2>T3>T4.

The unsupplemented group's average daily CP intake was considerably lower than that of the supplemented sheep ($P<0.001$). This might be explained by the basal feed's comparatively low CP content. Sheep in the supplemented group (T2-T4) had considerably greater intakes of CP, OM, NDF, and ADF than the unsupplemented group (T1) in the current study ($P<0.001$). This might be because the supplementation that increased feed intake improved the condition of the rumen. Additionally, the supplemented group's estimated metabolizable energy intake (EME) was considerably higher ($P<0.001$) than that of the unsupplemented sheep. Sheep in the supplemented group consumed more total DM as a percentage of body weight than those in the unsupplemented group. Sheep in T2 exhibited the highest DMI among the supplements, indicated as a percentage of body weight, followed by those in T3 and T4. In the current experiment, the rate of replacement was higher, and there was a significant difference between the dietary treatments (P<0.001).

Dry Matter and Nutrients Digestibility

Table 3 below shows the nutrient digestion coefficient for sheep fed hay only and those supplemented with F. sycomorus leaves, fruit, and their mixture.

In comparison to the unsupplemented, the current supplementation technique generally improved (P<0.05) the digestibility of feed DM, OM, CP, NDF, and ADF. The comparatively low CP composition and greater fiber fraction in the basal feed may be the cause of the poorer digestion coefficients for the animals in the unsupplemented group. However, T2's apparent digestibility coefficient of DM and OM was substantially greater (P<0.01) than T3's and T4's among the supplemented group. T2 had the highest digestibility coefficient of CP (P < 0.001), followed by T3 and T4.

Correlation between Intake, Digestibility and Body Weight

Table 4 below shows the association coefficient between body weight and carcass properties, digestibility, and nutritional consumption. CP consumption, DM, OM, and CP digestibility were all favorably connected (P<0.001) with total DM intake. All other nutrient consumption rose in tandem with the overall DM intake. One possible explanation is that supplementing affects the microorganisms' ability to ferment, which increases the absorption of DM.

CP consumption, DM, OM, and CP digestibility were all favorably connected (P<0.001) with total DM intake. All other nutrient consumption rose in tandem with the overall DM intake. One possible explanation is that supplementing affects the microorganisms' ability to ferment, which increases the absorption of DM.

Intake of crude protein is also positively (P<0.001) correlated with OM and CP digestibility. This link indicates that the primary contributor for sheep was the increase in DM and CP intake.

DISCUSSION

Chemical Composition of the Experimental Feeds

Table 1 below lists the chemical makeup of the feedstuff employed in this investigation. The leaf of F. sycomorus had a CP content of 17.9% in the current experiment. Nkafamiya et al. (2010) also found a similar result (17.95%). However, with F. sycomorus leaf, Njidda and Ikhimioya (2010) and Lorenzo (2002) reported 14.9 and 22.1% CP, respectively. In this investigation, the leaf of F. sycomorus has the following DM-based contents: 64.6%, 52.5%, 17.4%, 93.2%, and 11.9% for NDF, ADF, ADL, and DM. According to Njidda and Ikhimioya (2010), the NDF and ADF composition results were greater than 54.8% and 33.4%, respectively. Regarding the CP composition of F. sycomorus leaves, however, there is inconsistency in the literature. According to Nkafamiya et al. (2010), 17.95%. The reported DM content of the leaf of F. sycomorus was greater than the 85.9% found by Nkafamiya et al. (2010) but lower than the 95.6% recorded by Njidda and Ikhimioya (2010). The current study's ash content of F. sycomorus leaves is lower than the 18% reported by Njidda and Ikhimioya (2010) but greater than the 9.5% reported by Nkafamiya et al. (2010). Furthermore, the ash content of F. sycomorus leaves was higher than that of the plant's fruit and organic pasture hay. However, the fruit of F. sycomorus in the present study had a greater CP level than the 6.9–9.5% reported by Lorenzo (2002) and Makishima (2005).According to Chanda and Bhaid (1987) and Divakaran et al. (1985), the chemical constituents that differ between the current findings and the literature may be caused by variations in the harvesting season, harvesting stage, species growth pattern within the genus, genetic potential, bioclimatic conditions, and cropping systems.

With a greater NDF and ADF composition, the hay provided to the experimental animals in this study had a CP content of 7.9%. The CP content of the hay found in this study was expected to meet the animals' maintenance needs, despite being greater than the 4.2% and 3.7% reported by Mulu et al. (2008) and Asnakew (2005), respectively, and lower than the 10.9% reported by Yihalem (2004). As a result, the hay used in this study was classified as having a high CP content and being of good quality. According to Van Soest (1982), ruminants require a CP value between 7 and 7.5% to meet their maintenance needs.

Feed Intake

Sheep on the T1 diet had a higher basal feed DM intake (P>0.05) than sheep in the supplemented group (T2-T4). Sheep in T2 consumed more dry matter from the basic diet than sheep in T3 or T4 among the supplemented group (p<0.05). The decreased baseline DM consumption seen for sheep in T4 and T3 compared to sheep in T2 may be explained by variations in the nitrogen content of the various supplements, even though the supplemented group received an identical amount of the supplements (300 g/day). As a result, the overall dry matter intake has suffered. According to Topps (1997), supplementation levels above 30–40% of the total DM provided decrease basal feed consumption.

Due to variations in the crude protein content of the various supplement types, the total DM intake was higher (P<0.001) in the order T2>T3>T4. Because supplementation may have produced a favorable rumen environment that led to improved fermentation of the basal roughage and consequently greater microbial protein synthesis, the supplemented sheep consumed higher total DM (Osuji et al., 1995). The increase in the intake of vital nutrients like energy, vitamins, minerals, and especially nitrogen may have contributed to the beneficial effects of supplementation on feed consumption. Additionally, compared to natural pasture hay, the supplements may have a lower gut fill, which could explain the greater total DM intake in the supplemented group. The present investigation found that supplementation increased total DM intake, which was consistent with the findings of Hirut (2008) and Wondwosen (2008).

The unsupplemented group's average daily CP intake was considerably lower than that of the supplemented sheep (P<0.001). This might be explained by the basal feed's comparatively low CP content. Nonetheless, the basal diet's CP content was marginally more than small ruminants' maintenance needs (Minson, 1990; Gatenby, 2002).

Sheep in the supplemented group (T2-T4) had considerably greater intakes of CP, OM, NDF, and ADF than the unsupplemented group (T1) in the current study (P<0.001). This might be because the supplementation that increased feed intake improved the condition of the rumen. According to Adugna and Sundstol (2000), the supplemented group's higher intake may have resulted from improved digestion and greater nitrogen availability to rumen bacteria. However, among the supplemented group, it was higher for sheep in T2, T3, and T4. The leaf of F. sycomorus has a higher CP (17.9%) than to F. sycomorus fruit (11.8%) may have caused the intakes of sheep in T2 and T3 to be higher. Dietary protein supplementation is known to increase intake by increasing the supply of nitrogen to the rumen microbes or by decreasing the retention time of poor quality feed after supplementing microorganisms with concentrates and stimulating their function in the rumen (Kempton et al., 1979). Additionally, the supplemented group's estimated metabolizable energy intake (EME) was considerably higher (P<0.001) than that of the unsupplemented sheep. With a higher level of F. sycomorus leaf, as previously proposed, the energy intake rose in the order of T2>T3>T4 (Montaldo, 1972).

In the current experiment, the rate of replacement was higher, and there was a significant difference between the dietary treatments (P<0.001). Animals that eat forage with low to medium digestibility frequently have poor substitution rates. Doyle et al. (1988) proposed that the replacement rate—the rate at which the amount of hay consumed decreases as the amount of supplements consumed increases—is a direct indicator of how the supplement affects the fractional rates of digestion and outflow from the rumen. Compared to supplement feeds that ferment more slowly, those with a faster rate of fermentation replace the basal roughage to a lesser degree (Nsahalai and Ummuna, 1996).

Dry Matter and Nutrients Digestibility

In comparison to the unsupplemented, the current supplementation technique generally improved (P<0.05) the digestibility of feed DM, OM, CP, NDF, and ADF. The comparatively low CP composition and greater fiber fraction in the basal feed may be the cause of the poorer digestion coefficients for the animals in the unsupplemented group. However, T2's apparent digestibility coefficient of DM and OM was substantially greater (P<0.01) than T3's and T4's among the supplemented group. T2 had the highest digestibility coefficient of CP (P < 0.001), followed by T3 and T4. The results are consistent with those of McDonald et al. (2002), who found that improved CP digestibility is linked to higher CP intake. The digestibility of OM and NDF does not alter statistically significantly (p<0.05) between T3 and T4. The supplemented group in this study had DM digestibility that was comparable to the 75.8–80% observed by Tegbe et al. (2005) in West African dwarf goats fed a basal diet of Panicum maximum supplemented with leaves and concentrate from M. indica, F. thonningii, and G. sepium. Tree and shrub species also differed greatly in dry matter digestibility (DMD), which is correlated with nutritional composition. Ahn et al. (1989) have demonstrated that drying MPT leaf reduces tannin content, which increases protein digestibility from 64 to 84%. Anugwa and Okori (1987) also reported that fresh Ficus leaf and petioles were well received by West African dwarf lambs and resulted in higher levels of apparent digestibility than the other tree species, ranging from 70.1% for crude fiber (CF) to 81.8% for crude protein. The lower amount of dietary CP and higher fiber fraction in the unsupplemented sheep compared to the supplemented sheep may be the cause of the decreased digestibility of DM and ADF. A reduced CP concentration in feed has an impact on rumen fermentation and microbial development, according to Bonsi et al. (1995). According to Banamana et al. (1990), adding CP in the diet improved the digestibility of OM, ADF, and CP, which is consistent with the current investigation. Thus, adding F. sycomorus leaves, fruit, and their mixture to low-quality meals increases their digestibility.

Correlation between Intake, Digestibility, Body Weight and Carcass Parameters

Intake of crude protein is also positively (P<0.001) correlated with OM and CP digestibility. According to Solomon et al. (2003), this correlation showed that higher CP intake led to higher CP digestibility, which was positively correlated with ADG. Additionally, there was a positive correlation (P<0.001) between digestibility and OM's digestibility. It is possible to infer from these association data that the majority of the indicators can be impacted by DM and CP consumption.

CONCLUSION

This study confirmed that giving intact male yearling Washera sheep natural pasture hay alone (T1) or natural pasture hay supplemented with either F. sycomorus leaves (T2), a leaf and fruit mixture (T3), or fruit (T4) enhanced the animals' performance when compared to the unsupplemented (T1) condition. Sheep that were supplemented with 300g of FSL, FSF, and their mixture (FSL: FSL) performed better overall than those that were not. T2 supplementation for sheep is a feeding method that is both economically and biologically optimal.

RECOMMENDATIONS

The use of F. sycomorus leaves and fruits as a supplement to increase sheep productivity is both cost-effective and biologically favorable due to the scarcity of pasture/grazing land, the high cost of agroindustrial byproducts, and growing competition with other livestock. Smallholder farmers are encouraged to supplement sheep with F. sycomorus leaf in order to take use of the animals' genetic potential, as this practice produced the best performance parameters in sheep and the highest income.

ACKNOWLEDGEMENTS

The authors would like to thank the Sekela Agricultural and Rural DevelopmentOffice for providing the farm facilities to run the experiment. The Federal Government of Ethiopia, through the Ethiopian Ministry of Education, is duly acknowledged for fully financing of this experiment. The advisor Yoseph Mekasha (Dr. Ass. Proff) is highly appreciated. Our appreciation also goes to my parents Ato Kassa Zewdie Ayana and W/o Yeneworke Addimassie Yeshanehi.

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Table 1: Chemical composition of feed stuff

Feed offer							
Feed type	**%DM**						
	DM	**Ash**	**OM**	**CP**	**NDF**	**ADF**	**ADL**
Hay	93.2	8.4	92.6	8.0	73.1	54.6	16.3
FSL	93.2	11.9	88.2	17.9	64.6	52.5	17.4
FSF	92.3	5.7	94.3	11.8	35.2	32.7	14.4
1FSL:1FSF	92.7	8.8	91.3	14.9	49.9	42.6	15.9
Refusal							
Hay (T1)	93.4	10.8	89.2	3.8	80.0	59. 2	16.8
Hay (T2)	93.5	9.3	90.7	4.8	81.3	55.9	16.3
Hay (T3)	93.4	8.9	91.1	5.1	78.7	58.3	17.8
Hay (T4)	93.5	8.7	91.3	4.8	81.4	60.0	17.3

ADF = acid detergent fiber; ADL =acid-detergent lignin; CP =crude protein; DM = dry matter; FSL= *F. sycomorus* Leaf; NDF= neutral detergent fiber; OM =organic matter; FSF=F. sycomorus Fruit.

Table 3: Digestibility coefficients of nutrients in Washera sheep fed natural pasture hay alone and supplemented with *F. sycomorus* leaf, fruit and their mixtures.

Digestibility coefficients	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
DM	0.57^{c}	0.77^{a}	0.74^{b}	0.73^{b}	0.017
OM	0.57^{c}	0.75^{a}	0.74^{ab}	0.73^{b}	0.079
CP	0.63^{d}	0.87^{a}	0.83^{b}	0.78^{c}	0.021
NDF	0.56^{d}	0.70^{a}	0.67^{b}	0.62^{c}	0.013
ADF	0.55^{c}	0.70^{a}	0.66^{b}	0.61^{b}	0.052

$^{a-c}$Means with different superscripts in row are ignificantly different; ADF = acid detergent fiber ; CP = crude protein; DM = dry matter; FSL = *F. sycomorus* Leaf; NDF = neutral detergent fiber; OM= organic matter; SEM = standard error of mean; FSF = *F. sycomorus* Fruit ; T_1= natural pasture hay; T_2 = hay + 300g FSL DM;T_3 = hay + 300 g 1 FSL:1g FSF DM mix; T_4 = hay + 300 g FSF DM.

Table 5: Correlations between feed intakes and digestibility of Washera sheep fed natural pasture hay alone and supplemented with *F. sycomorus* leaf, fruit and their mixtures

Variables	**TDMI**	**TCPI**	**DMD**	**OMD**	**CPD**
TDMI	1.0				
TCPI	0.99^{***}	1.0			
DMD	0.88^{***}	0.91^{***}	1.0		
OMD	0.88^{***}	0.92^{***}	0.98^{***}	1.0	
CPD	0.94^{***}	0.94^{***}	0.93^{***}	0.92^{***}	1.0