The study was conducted to evaluate the effects of feeding varying levels of *Ficus sycomorus* leaf forages as protein supplements to a basal diet of urea treated maize stover. Four Yankasa goats averaging one year and weighing 11.7±1.8 kg were used to measure the feed intake, digestibility and nitrogen balance. The basal diet (urea treated maize stover) was supplemented with 0 (T1), 50 (T2), 100 (T3) or and 150 (T4) g of fresh *F. sycomorus* leaves. The intake of the basal diet was significantly (P<0.05) affected by supplementation with browse foliage. T3 had significantly P<0.05 higher maize stover intake. Significant (P<0.05) increase in total dry matter intake, was observed, with T4 being highest. Dry matter digestibility DMD was significantly (P<0.05) increased with supplementation. T3 and T4 were significantly higher and statistically similar (87.09 and 83.83), followed by T2 (75.82) and least T1 (71.82). Supplementation significantly (P<0.05) increased nitrogen retention, with an increase in the level of supplementation observed in this order 9.93, 15.46, 21.62 and 25.01 g/d for T1, T2, T3 and T4, respectively. Evaluation of Nitrogen retention as a percentage of intake followed a similar pattern. *F. sycomorus* has potential as a protein supplement and could be offered at 100g/day in growing goats fed urea treated low quality basal diets.

**KEY WORDS** Ficus, goat, maize stover, urea.
energy and minerals when used either as supplements or as sole feed (Abdulrazak et al. 1997). Several browse trees and shrubs (both introduced and indigenous species) have been reported to be used as supplements. Improved animal performance has been reported with Calliandra and Sesbania as supplement to maize stover and teff straw respectively (Kaitho, 1997; Nherera et al. 1998). Wambui et al. (2006) observed that supplementation with browse foliage of Tithonia generally increased the total dry matter intake. This may be attributed to the ability of the forage supplements to provide nitrogen and energy for the cellulolytic microbes upon degradation in the rumen.

Ficus species are a part of a pan-tropical genus of trees, shrubs and vines occupying a wide variety of ecological niches and most are evergreen. The leaves and fruits of *F. thonningii*, *F. capensis* and, to a lesser extent *F. glumosa*, are rated as highly palatable to domestic animals (Audru, 1980; Le Houérou and Corra, 1980). The Ficus species are one of such browse plants with promising potential for ruminant livestock supplementary feed.

The objectives of the study were to evaluate the effects of supplementation with *Ficus sycomorus* to urea treated maize stover basal diet on voluntary feed intake, nutrient digestibility and nitrogen balance.

### MATERIALS AND METHODS

#### Location of study

The study was conducted at the Teaching and Research Farm of the Department of Animal Science, Ahmadu Bello University, Samaru-Zaria, located on altitude 11° 11’ N and longitude 07° 38’ E. It is situated at an altitude of 686 m above sea level and lies within the Northern Guinea Savannah zone. The mean relative humidity is 21 and 72% during the harmatan and rainy season respectively (Akpa et al. 2002).

#### Experimental design and animals

Four Yankasa bucks with an average body weight of 13.4 kg were used to study the feed intake, total tract digestibility and N-retention of urea treated maize stover supplemented with four levels of *Ficus sycomorus* leaves. The experiment was designed as a 4 x 4 Latin square arrangement in a completely randomized design. Each period lasted 15 days, consisting of 10 days for adaptation and a further 5 days of data collection. The diets were urea treated maize stover (basal diet), basal diet plus 0 g/d *F. sycomorus* foliage (T1), basal diet plus 50 g/d *F. sycomorus* foliage (T2), basal diet plus 100 g/d *F. sycomorus* foliage (T3) and basal diet plus 150 g/d *F. sycomorus* foliage (T4). Water and mineral salt were freely available for all animals. The animals were kept in individually digestibility cages ideal for the collection of urine and fecal samples, as described by (Osuji et al. 1993).

#### Feeding management

The leaves of *F. sycomorus* were harvested daily from trees in the Livestock Teaching and Research Farm. Fresh quantities of the leaves were offered in the morning at 8:00 AM and thereafter the urea treated maize stover was offered and urea treated maize stover was offered again at 4:00 PM.

#### Chemical analysis

Feed and fecal samples were dried in an oven at 105 °C for the determination of dry matter. Total N of feed, feces and urine was measured by the Kjeldahl procedure as outlined by the AOAC (2000). The ash content of feed and feces was determined by combustion in a furnace at 500 °C, following the procedure of AOAC (2000). Organic matter was assumed to be the result of subtracting the percentage of ash from 100. Tannin was determined by the method of Wheeler et al. (1994).

#### Statistical analysis

All data collected on feed intake, nutrient digestibilities and nitrogen balance were calculated and subjected to statistical analysis of variance (ANOVA) using (SAS, 2001) procedure. Treatment means were significantly different. The Duncan Multiple Range Test (Duncan, 1955) was used to compare the treatment means.

### RESULTS AND DISCUSSION

#### Chemical composition

The chemical composition of both untreated and urea treated maize stover indicated that urea treatment increased the CP of the maize stover from 8.75% in the untreated to 14.38% after urea treatment as presented in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>UMS</th>
<th>TMS</th>
<th>FS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic matter</td>
<td>81.79</td>
<td>79.50</td>
<td>85.23</td>
</tr>
<tr>
<td>Crude protein</td>
<td>8.75</td>
<td>14.38</td>
<td>11.38</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>18.84</td>
<td>18.46</td>
<td>16.26</td>
</tr>
<tr>
<td>Ash</td>
<td>15.73</td>
<td>15.84</td>
<td>12.35</td>
</tr>
<tr>
<td>Tannin mg/100g</td>
<td>-</td>
<td>-</td>
<td>1.48</td>
</tr>
</tbody>
</table>

UMS: untreated maize stover; TMS: treated maize stover; FS: *Ficus sycomorus*.

This is in line with the pioneer works of Saadullah et al. (1981) who reported that crude protein content of rice straw increased from 2.9 percent in untreated straw to 5.9 percent. Abdu (1998) with sorghum stover and Lufadeju (1989) with Gamba grass (*Androgan gayanus*) treated with urea...
and both reported an increase in crude protein content of the crop residues. The high crude fiber of the treated and untreated maize stover (18) observed in this study is in agreement with Abdu (1998), who observed similar increases in sorghum stover and attributed it to the high cell-wall constituents usually present in cereal crop residues.

The CP contents of Ficus sycomorus in this study (11.38%) are however lower than the 14.90% reported by (Njidda, 2010). The differences observed in this study concurred with Ibrahim et al. (1988) who reported that environmental differences influence the chemical composition and digestibility of forages grown in different areas and harvested at the same age of maturity. They attributed the variation in the CP to differences in soil and environmental factors. The F. sycomorus had high ash content (12.35%). This is similar to that found in Morus alba (Nguyen and Le Duc, 2003) and probably an indication of high concentrations of minerals as reported by Kwabiah et al. (2003).

High crude fiber was recorded in the F. sycomorus (16%). This is in agreement with (Anbarasu et al. 2004), that browse leaves all have a high CF value, as this is one of the characteristics of most browse leaves which could be attributed to the high cell-wall constituents usually present in leaf meal.

Voluntary feed intake

The result of voluntary feed intake (VFI) is presented in Table 2. The result showed that T3 had significantly (P<0.05) higher stover intake (170.85 g/d), while there was no difference in stover intakes between T1, T2 and T4 (149.58, 157.50 and 158.3 g/d respectively). The increase in stover intake may be as a result of the supplementation with the Ficus sycomorus at moderate levels, because the supplementation of ligno-cellulosic residues with variable amounts of concentrate modifies the intake and the animal performance, depending on several factors, such as the kind of forage (Lamb and Edie, 1979; Bocquier et al. 1987).

There was a significant (P<0.05) increase in the total dry matter intake of T1, T2, T3 and T4 progressively with increase in the level of F. sycomorus (149.58, 207.50, 270.85 and 308.35g/d respectively). This could be as a result of the progressive increase in the level of Ficus sycomorus fed to the bucks (0, 50, 100, and 150 respectively), which is supported by previous work where Wambui et al. (2006) observed that supplementation with browse foliage of Tithonia generally increased the total dry matter intake.

**Table 2**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Levels of F. sycomorus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1 (0)</td>
</tr>
<tr>
<td>F. sycomorus intake (g/d)</td>
<td>0</td>
</tr>
<tr>
<td>Stover intake (g/d)</td>
<td>149.58c</td>
</tr>
<tr>
<td>Total feed intake (g/d)</td>
<td>149.58c</td>
</tr>
</tbody>
</table>

The means within the same row with at least one common letter, do not have significant difference (P>0.01).

Nutrient digestibility

Nutrient digestibilities are presented in Table 3 and 4. Dry matter digestibility (DMD) was significantly (P<0.05) different across treatments. T3 and T4 were significantly higher and statistically similar (87.09 and 83.83), followed by T2 (75.82) and least T1 (71.82). The digestibility of CP followed similar pattern. Organic matter digestibility (OMD) produced a significant (P<0.05) increase with an increase in the level of F. sycomorus offered. Similar results have been reported by Kusmartono (2002), who found that supplementing rice straw (crop residue) together with nitrogen sources such as urea in the form of soft-cake molasses-urea block (MUB) and/or Gliricidia leaves, increased feed intake of rice straw as well as improving its digestibility both in sheep and steers. The result of nutrient digestibility reported in this study are higher compared to the values when jackfruit wastes alone were used to supplement rice straw as reported earlier by Kusmartono (2002). These may be attributed to the urea treatment of the maize stover, in addition to the supplementation, as treatment alone has been found to increase digestibility of urea treated sorghum stover (Abdu, 1998).

**Table 3**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Levels of F. sycomorus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1 (0)</td>
</tr>
<tr>
<td>Apparent digestibility (%)</td>
<td>71.82c</td>
</tr>
<tr>
<td>Organic matter</td>
<td>69.36c</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>83.64c</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>31.68c</td>
</tr>
</tbody>
</table>

The means within the same row with at least one common letter, do not have significant difference (P>0.01).
Nitrogen balance

The nitrogen balance showed a significant (P<0.05) difference in total N intake across dietary treatments, as presented in Table 4. T3 had significantly (P<0.05) higher N intake (35.94 g/d), followed by T4, T2 and T1 (30.84, 28.33 and 21.50 g/d respectively) in control treatment consuming urea treated maize stover. The increase in N intake is a result of the increasing level of F. sycomorus offered, while the lower intake in T4 when compared with T3 may be as a result of increase in tannin intake associated with the increased level of F. sycomorus.

The fecal N and urinary N output recorded a significant (P<0.05) increase in the level of F. sycomorus offered. T4 had high fecal N (9.26 g/d), while T1 control had lower (P<0.05) increase in the level of F. sycomorus offered, while T4 had high N output (9.26 g/d), while T1 control had lower (P<0.05) increase in the level of F. sycomorus offered. The increase in the fecal N output in T4 could be due to the tannin as similar results have been found in goats using Wattle tannin extract.

N retention is considered as the most common index of the protein nutrition status of ruminants. N retention was significantly (P<0.05) different. As level of F. sycomorus increased, N retention increased from 0 to 100 g and deceased at 150 g. This is in agreement with Barry et al. (1986) and Reed et al. (1990) as cited by Merkel et al. (1996), all of whom suggested that Nitrogen retention decreases with inclusion of tannins in the diet because of the tannin-protein complex formed.

CONCLUSION

From the result of this study, it can be concluded that F. sycomorus has potential as a protein supplement offered at 100 g/d in growing goats fed urea treated low quality basal diets, to improve intake, nutrient digestibility and nitrogen balance.

REFERENCES


Kusmartono U.B. (2002). Effects of supplementing jackfruit (Artocarpus heterophyllus L) wastes with urea or leaves of Gliricidia sepium on feed intake and digestibility in sheep and steers. Livestock Research for Rural Development. (14)

Table 4: Nitrogen balance in Yankasa bucks fed urea treated maize stover supplemented with varying levels of Ficus sycomorus leaves

<table>
<thead>
<tr>
<th>Parameters</th>
<th>T1 (0)</th>
<th>T2 (50)</th>
<th>T3 (100)</th>
<th>T4 (150)</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>N balance, g/d</td>
<td>21.50a</td>
<td>28.33a</td>
<td>35.94a</td>
<td>30.84a</td>
<td>0.86</td>
</tr>
<tr>
<td>N intake (g)</td>
<td>7.34</td>
<td>7.50</td>
<td>8.95b</td>
<td>9.26c</td>
<td>1.08</td>
</tr>
<tr>
<td>Fecal N output (g)</td>
<td>4.23c</td>
<td>5.37c</td>
<td>5.06c</td>
<td>5.87a</td>
<td>0.29</td>
</tr>
<tr>
<td>Urinary N output (g)</td>
<td>11.58</td>
<td>12.87a</td>
<td>14.33a</td>
<td>14.82a</td>
<td>0.98</td>
</tr>
<tr>
<td>Total N output (g)</td>
<td>9.93c</td>
<td>15.46a</td>
<td>21.62a</td>
<td>17.02a</td>
<td>1.21</td>
</tr>
<tr>
<td>Nitrogen retention</td>
<td>46.19</td>
<td>54.57a</td>
<td>60.02a</td>
<td>55.19b</td>
<td>2.04</td>
</tr>
<tr>
<td>As % of intake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The means within the same row with at least one common letter, do not have significant difference (P>0.01).


