



THE POTENTIAL OF *Samanea saman* (JACK) MERR. PODS AS FEED FOR GOAT

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Abstract- This study was conducted to seek answers to the following objectives: (1) to determine the proximate analysis of fresh *Samanea saman* (Jack) Merr pods, (2) to determine the digestibility of nutrients of *Samanea saman* (Jack) Merr pods as fed to goats, (3) to determine the voluntary intake and nitrogen balance of goats fed *Samanea saman* (Jack) Merr pods and (4) to determine the gain in weight and feed conversion efficiency of goats fed with varying levels of *Samanea saman* (Jack) Merr pods and *Pennisetum purpureum*.

Results reveal that fresh *Samanea saman* (Jack) Merr pods contained 15.18% water, 9.45% Crude Protein, 8.34% Crude Fiber, 8.82% Crude Fat, 5.12% Ash and 53.09% Nitrogen Free Extract. Results of the digestibility of nutrients prove that *Samanea saman* (Jack) Merr pods had 69.80% Dry Matter Digestibility, 72.70% Crude Protein Digestibility, 81.28% Crude Fiber Digestibility, 83.63% Ash Digestibility, 82.38% Crude Fat Digestibility, 65.64% Nitrogen Free Extract Digestibility and a Total Digestible Nutrients of 83.21%. There was a positive nitrogen balance (+ 0.1693) of goats fed *Samanea saman* (Jack) Merr pods. However, the low voluntary intake of 4.05% of the body weight of goats fed 100% *Samanea saman* (Jack) Merr pods in the digestibility trial resulted to a negative gain in weight (-1.21 kg).

Results of the feeding trial indicate that indigenous goats fed 25% *Samanea saman* (Jack) Merr pods and 75% *Pennisetum purpureum* had the highest gain in weight while the goats fed 100% *Samanea saman* (Jack) Merr pods had the lowest gain in weight. These results prove that feeding indigenous goats with 100% *Samanea saman* (Jack) Merr pods is not advisable, instead the best combination of *Samanea saman* (Jack) Merr pods and *Pennisetum purpureum* was 25% and 75%, respectively, apart from commercial considerations.

Key words- potential feeds, *Samanea saman* (Jack) Merr pods, *Pennisetum purpureum*, proximate analysis, digestibility trial, feeding trial, indigenous goats

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Introduction

Since the early part of the new millennium, a surge in the demand for goats in many parts of the country has been observed. Raisers started purchasing stocks, breeding them, learning about ways to improve management and gradually improving farm productivity. Over time, goat production has emerged as a popular business undertaking not just for rural households but also for many affluent entrepreneurs, whose investments have become unrealistically high. There were 3,151,420 heads of goats in year 2000,

3,544,200 heads in year 2005 and in year 2010, the goat population increased to 4,203,710 heads [1].

Goat farming offers an important and integral part of small-hold agriculture in the Philippines. Goat has advantages over the other ruminant animals. It is one of the domestic animals that is easy and cheap to raise. It can be raised on land that is not suited to cattle production. Aside from this, goats mature faster and reproduce more frequently than carabao or cattle. Compared to other animals, they are easier to feed: they can accept more species of

plants than other livestock. The ability to thrive even on browse and ability to digest cellulose efficiently are distinctive feeding characteristics of goats. Goats can survive in environments in which available feed normally can not support cattle during the dry season. They can subsist on vegetation unpalatable to other ruminants.

Other special attributes of goats are their small size compared to cattle and carabaos, high efficiency of feed utilization, high fertility and short interval of gestation period. The weight of the indigenous goat at maturity reaches up to 30 kg while the other breeds like Anglo-Nubian reach up to 60 kg. It can be butchered between eight months to two years old. At this stage, the meat is tender, juicy and tastes better. Aside from meat, goats are good sources of highly nutritious milk. They also provide leather for the manufacture of hand bags and belts.

The existing local conditions in the Philippines indicate that there are less problems on the availability of feeds for goats during the rainy season because grasses are abundant and more nutritious. On the other hand, roughages found during the dry season are lignified, low in nitrogen and thus nutritionally imbalanced.

One alternative to provide supplemental nutrients to ruminants during the dry season is by feeding goats with leaves and pods of multi-purpose leguminous trees. *Samanea saman* (Jack) Merr is one of these trees. The common English names of *Samanea saman* (Jack) Merr are acacia, cow-tamarind and rain tree while the common Spanish name is saman. It grows luxuriantly throughout the Philippines. Farmers value the tree in their pastures because it provides shade to their animals and fosters the growth of nearby grasses. The tree grows up to 25 meters high with a stout trunk reaching 15 meters in diameter. A five year old tree can yield 550 kilogram leaves on a dry matter basis with an average harvestable matured pods of 200 to 250 kilograms and a wood annual yield of 25 to 30 m³ / hectare [2].

The pods of *Samanea saman* (Jack) Merr tree is straight, somewhat fleshy, indehiscent, 15 to 20 centimeters long and 2 centimeter wide. When the pod ripens, the pulp is sweet and sugary with a flavor like licorice that is much relished by children. In South America, the sweet pulp is cooked like a tamarind. The seeds are oblong and reddish in color. Goats can eat the leaves and pods when feeds are scarce and the fruiting season of this tree coincides with the scarcity of good quality forages. The seeds contain saponin-like alkaloid pithecolobin [1].

It was observed that ruminants are often seen under the *Samanea saman* (Jack) Merr tree eating pods that dropped during the fruiting season. This observation prompted the author to study the use of *Samanea saman* (Jack) Merr as feed for ruminants like goats. This may help solve to a certain extent the feed problem of ruminants during the dry season in the Philippines.

Methodology

Proximate Analysis

The determination of the nutrient composition of *Samanea saman* (Jack) Merr pods through the proximate analysis was conducted at the Soils and Nutrition Laboratory of the Don Mariano Marcos Memorial State University-Northern La Union Campus, Bacnotan, La Union following the standard procedures of the Association of Agricultural Chemists (2002) [2]. Since the goats can not digest the seeds of *Samanea saman* (Jack) Merr pods, these were not

included in the analysis.

Digestibility Trial

Six (6) male indigenous goats were used in the study. Each goat represented a replicate following the Randomized Complete Block Design with time as the block. Each block consisted of fifteen days adjustment period and seven days collection of samples for analysis.

The goats were dewormed with *Albendazole* two weeks prior to the start of the experiment. They were weighed for two consecutive days before confining them in their respective stall to calculate metabolic body weight. Metabolic liveweight was the basis of the feed offered to the animals using the formula $W_{(kg)}^{0.75}$.

The goats were confined in individual digestibility stalls equipped with feed boxes and water troughs constructed in manner to allow total collection of feces and urine.

The animals were fed with *Samanea saman* (Jack) Merr pods twice (8:00 AM and 3:00 PM) on a daily basis. The *Samanea saman* (Jack) Merr pods were given in whole form. Fresh water was made available at all times. In all trials, the amount of feed offered, feed refused, water consumption, urine and feces voided were recorded daily. Representative samples of feed offered, feed refused and feces were taken in all animals. Samples collected except for urine and water were oven-dried at 70^o C for at least three days to determine the dry matter content.

Feed and fecal samples were analyzed for dry matter, crude protein, crude fiber, crude fat and ash following the standard procedures of the Association of Agricultural Chemists [2]. The apparent coefficient of nutrients and voluntary intake were calculated.

Feeding Trial

Twelve growing goats of mixed sexes at 6-12 months of age were distributed over the four treatments and replicated three times following the Randomly Complete Block Design. The treatments were as follows:

A = 100% *Pennisetum purpureum*

B = 25% *Samanea saman* (Jack) Merr pods plus 75% *Pennisetum purpureum*

C = 50% *Samanea saman* (Jack) Merr pods plus 50% *Pennisetum purpureum*

D = 100% *Samanea saman* (Jack) Merr pods

The *Samanea saman* (Jack) Merr pods were gathered at the vicinity of the campus. The *Pennisetum purpureum* was gathered along the banks of the creek where the *Pennisetum purpureum* was planted. The combinations of the different levels of the *Samanea saman* (Jack) Merr pods and *Pennisetum purpureum* were computed on a dry matter basis. The *Samanea saman* (Jack) Merr pods were given in whole form and mixed to the *Pennisetum purpureum* which was cut 3 inches long. The feeds were put in the feed troughs. The *Pennisetum purpureum* and *Samanea saman* (Jack) Merr pods were placed in the feeding troughs following the levels indicated in the treatments. *Ad libitum* feeding was employed in all treatments. Feeds were offered at 8 A.M. and 3 P.M. the leftover was weighed at 7 A.M. the following day. Routines management practices were done daily. The experimental cages were cleaned everyday. Fresh and clean water was provided to the animals daily.

Results and Discussion

Proximate Analysis

Table 1 presents the proximate analysis of the fresh *Samanea saman* (Jack) Merr pods. As revealed in the table, fresh *Samanea saman* (Jack) Merr pods had dry matter content of 84.82%, crude protein of 9.45%, crude fiber of 8.34%, crude fat of 8.82% and ash of 5.12%. The *Samanea saman* (Jack) Merr pod is rich in carbohydrates as reflected in its nitrogen-free extract of 53.09%. *Samanea saman* (Jack) Merr pods are relished by livestock due to its sweet taste. The seeds are also surrounded by sticky, gummy substance. Results of the proximate analysis did not vary much from the analysis of Gerpacio [3] but lower than the crude protein content as analyzed by Flores [4].

Table 1- Nutrient composition of *Samanea saman* pods, fresh basis (%)

NUTRIENT	MEAN
Crude Protein	9.45
Crude Fiber	8.34
Crude Fat	8.82
Ash	5.12
Nitrogen Free Extract	53.09
	100%

Digestibility

Voluntary Intake

Animals eat to satisfy nutrient requirements and to fill the capacity of their stomach. Based on a dry matter basis, the feed requirement for metabolic purposes of goats on a per day basis is computed as LW(kg) 0.75 or to satisfy the nutrient requirements, the intake should be not less than 15% of the body weight.

As shown in Table 2, the voluntary intake was very low among goats fed 100% *Samanea saman* (Jack) Merr pod (4.05% of body weight) during the digestibility trial which resulted in a negative gain in weight of the experimental goats. The low voluntary intake might have been due to the presence of anti-nutritional factors like tannins and albuminoids. Saponin-like alkaloid pithecolobin has been isolated from the bark and seeds[5]. The inherent characteristics of the *Samanea saman* (Jack) Merr pods like the hard seeds affected its acceptability. The seeds were also indigestible to goats. The feeding habits of goats to eat a variety of feed and a browser materials might have also affected their voluntary intake.

Table 2- Voluntary intake of goats fed with 100% *Samanea saman* pods during the digestibility trial.

PARAMETERS	MEAN
Body Weight	22.51
DM voluntary intake	0.91
Voluntary intake (% body weight)	4.05
Gain in weight	53.09

Nutrient Digestibilities

Table 3 shows the digestibilities of the nutrients of *Samanea saman* pods. As revealed in the table, the total digestible nutrients of *Samanea saman* was 83.21%. *Samanea saman* pods had 89.80% dry matter, 72.70% crude protein, 81.28 crude fiber, 83.63 % ash, 82.38 crude fat and 65.64% NFE digestibility values. The presence of hard coated seeds of *Samanea saman* (Jack) Merr

might have affected the digestibility of nutrients. As stated by Lesseps and Chipanda it is necessary to crush the seeds since most of the protein in the pods are found in the seeds.

The nitrogen balance of goats fed 10% *Samanea saman* (Jack) Merr pods was positive as indicated in Table 4. The mean nitrogen balance was (+) 0.1639. A positive nitrogen balance indicates a positive effect of the feed ingredient to the animal, which implies that *Samanea saman* (Jack) Merr pods could supply nitrogen to goats. In ruminants, protein sources are the feed intake, microorganism in the digestive tract and the linings of the digestive tract.

Table 3- Nutrient digestibility of *Samanea saman* pods. (Recheck values)

PARAMETERS	MEAN
Dry Matter	69.8
Crude Protein	72.7
Crude Fiber	81.28
Ash	83.63
Crude Fat	82.38
Nitrogen Free Extract	65.64
Total Digestible Nutrients	83.21

Table 4- Nitrogen balance of goats fed 100% *Samanea saman* pods during the digestibility trial.

REPLICATE	MEAN
1	0.1178
2	0.1626
3	0.0982
4	0.1324
5	0.1963
6	0.2163
MEAN	0.1539

Feeding Trial

Weight

Table 5 presents the results of the feeding trial that was conducted to determine the best combination of *Samanea saman* (Jack) Merr pods and *Pennisetum purpureum* as feed for goats.

Table 5- Weight of goats as affected by different level of *Samanea saman* pods and *Pennisetum purpureum* (kg)

TREATMENT	INITIAL WT.	FINAL WT.	GAIN IN WT.
A- 100% <i>Pennisetum purpureum</i>	22.77	26.5	3.73 ^a
B- 25% <i>Samanea saman</i> plus 75% <i>Pennisetum purpureum</i>	22.93	27.5	4.57 ^a
C- 50% <i>Samanea saman</i> plus 50% <i>Pennisetum purpureum</i>	17.5	20.07	2.57 ^b
D- 100% <i>Samanea saman</i> pods	19.43	21.1	1.67 ^b

*Means followed by the same letter are comparable at 5% level, LSD.

As presented in Table 5, goats fed with 25% *Samanea saman* (Jack) Merr pods plus 75% *Pennisetum purpureum* had the heaviest gain in weight which was comparable to goats fed with 100% *Pennisetum purpureum* but significantly different to the other treatments. The goats fed with 100% *Samanea saman* (Jack) Merr obtained the lowest gain in weight that was comparable to the gain in weight of goats fed 50% *Samanea saman* (Jack) Merr pods and 50% *Pennisetum purpureum*.

The results could be due to the inherent characteristics of the

Samanea saman (Jack) Merr pod that is characterized with a licorie taste and hard indigestible seeds. The presence of anti-nutritional factors as tannins and albuminoids had also affected the digestibility of nutrients. This implies that the best level of *Samanea saman* (Jack) Merr pods and *Pennisetum purpureum* was 25% and 75%, respectively.

Feed Consumption and Feed Conversion Efficiency

Table 6 presents the feed consumption and feed conversion efficiency of goats fed with varying levels of *Samanea saman* (Jack) Merr and *Pennisetum purpureum*. Goats fed with 100% *Pennisetum purpureum* had highest feed consumption that was comparable to the feed consumption of goats assigned to the other treatments except those fed with 100% *Samanea saman* (Jack) Merr pods.

The low feed consumption of goats fed 100% *Samanea saman* (Jack) Merr pods could be due to selective feeding habits of goats wherein these animals prefer a variety of feeds. The presence of anti-nutritional factors in *Samanea saman* (Jack) Merr species [5] also affected the consumption and feed conversion efficiency of goats. Some *Samanea saman* species contain albuminoid substances and tannins which might depress feed intake and/or utilization of feed components.

Goats fed with 25% *Samanea saman* (Jack) Merr pods plus 75% *Pennisetum purpureum* required the least amount of feeds to convert a kilogram gain in weight while the goats fed with 50% *Samanea saman* (Jack) Merr pods plus 50% *Pennisetum purpureum* had the highest feed conversion efficiency. The goats fed with 100% *Samanea saman* (Jack) Merr pods had the least amount of feeds consumed though the feed conversion efficiency was not the best.

Table 6- Feed consumption and feed conversion efficiency of goats as affected by different levels of *Samanea saman* pods and *Pennisetum purpureum*

TREATMENT	FEED CONSUMPTION	FEED CONVERSION EFFICIENCY
A- 100% <i>Pennisetum purpureum</i>	327.91 ^a	87.97
B- 25% <i>Samanea saman</i> pods plus 75% <i>Pennisetum purpureum</i>	267.58 ^a	58.55
C- 50% <i>Samanea saman</i> pods plus 50% <i>Pennisetum purpureum</i>	247.70 ^a	96.38
D- 100% <i>Samanea saman</i> pods	105.26 ^b	63.02

**Means followed by the same letter are not significantly different at 0.05% level

Summary, Conclusions and Recommendations

The assessment of the feeding value of *Samanea saman* (Jack) Merr pods as feed for goats was carried out with the following objectives.

- To determine the proximate analysis of *Samanea saman* (Jack) Merr pods.
- To determine the total digestible nutrients of *Samanea saman* (Jack) Merr pods as fed to goats.
- To determine the voluntary intake and nitrogen balance of *Samanea saman* (Jack) Merr pods as fed to goats and,
- To determine the gain in weight, feed consumption and feed conversion efficiency of goats fed with varying levels of *Samanea saman* (Jack) Merr pods and *Pennisetum purpureum*

through the feeding trial.

- To seek an answer to the objectives, proximate analysis, digestibility and feeding trials were conducted. Results reveal that the *Samanea saman* (Jack) Merr pods had a 84.82% dry matter content. *Samanea saman* (Jack) Merr pods had crude protein of 9.45%, crude fiber of 8.34%, crude fat of 8.82%, ash of 5.12% and nitrogen free extract of 53.09%.

The voluntary intake of goats fed *Samanea saman* (Jack) Merr pods was low (4.05% of the goat's body weight) which resulted to negative gain in weight during the one week digestibility trial. The total digestible nutrient content of *Samanea saman* (Jack) Merr pods was 83.21%. The nitrogen balance was (+) 0.1539.

Results of the feeding trial revealed that the goats fed 100% *Pennisetum purpureum* and 25% *Samanea saman* (Jack) Merr pods in combination with 75% *Pennisetum purpureum* obtained comparable gain in weight while goats fed 100% *Samanea saman* (Jack) Merr pods had the lowest gain in weight. The feed conversion efficiency was best in goats fed with 25% *Samanea saman* (Jack) Merr pods in combination with 75% *Pennisetum purpureum*.

Based on the results of the study, the best level of *Samanea saman* (Jack) Merr pods as feed for goats in combination with *Pennisetum purpureum* should not be more than 50%.

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