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Research Article

Dry Matter Yield and Feed Quality of Dwarf Napiergrass under Different Planting Compositions in Mixed Cropping System

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Abstract | This study aimed to identify the effect of mixed cropping between dwarf Napier grass and *Centrosema pubescens* at different planting compotitions in the dry matter (DM) yield and forage quality of dwarf napier grass i.e protein, neutral detergent fiber (NDF), acid detergent fiber (ADF), acid detergent lignin (ADL), hemicellulose and cellulose. The mixed cropping plots treatments consisted of T1 (100% dwarf napiergrass and 0% *C. pubescens*), T2 (70% dwarf napiergrass and 30% *C. pubescens*), T3 (50% dwarf napiergrass and 50% *C. pubescens*), T4 (30% dwarf napiergrass and 70% *C. pubescens*) and T5 (100% *C. pubescens* and 0% dwarf napiergrass. The results indicated that planting composition had a significant effect ($p < 0.05$) on the DM yield during the first defoliation (90 days after transplanting). The T3 treatment produced the highest DM yield at the first defoliation, with values clearly exceeding the other treatments. In contrast, no significant differences ($p > 0.05$) were observed among treatments during the second defoliation (30 days). Forage quality parameters incluuding protein, NDF, ADF, ADL, hemicellulose and cellulose showed no significant differences across planting compotisions at either defoliation stage ($p > 0.05$). Although T4 showed numerically higher values in some quality traits, this difference were not statistically meaningful. Overal, mixed cropping affected DM yield only at the first defoliation, while most quality variables remained non-significant, indicating that planting compotisition had minimal influence on the nutritional attributes of dwarf napier grass.

Keywords | *Centrosema pubescens,* Dwarf napiergrass, Dry matter yield, Mix cropping, Feed quality, Forage quality

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INTRODUCTION

Forages, particularly grasses and legumes, are the primary feed resources supporting ruminant productivity. Among these, dwarf Napier grass is widely used due to its high dry matter (DM) yield, good nutritive value, adaptability, and strong regrowth capacity under tropical conditions (Ishii *et al.*, 2016; Hasan *et al.*, 2019). However, maintaining its productivity requires adequate soil nutrient availability, and long-term reliance on inorganic fertilizers may negatively affect soil structure and increase production costs (Blanco-Canqui and Schlegel, 2013).

Mixed cropping of grasses and legumes is increasingly promoted as a sustainable strategy to enhance forage production while reducing fertilizer input. Legumes, including *Centrosema pubescens*, contribute biological nitrogen fixation, improve soil fertility, and support the growth of companion grasses (Suarna and Budiasa, 2016; Hasan *et al*., 2019). Several studies have demonstrated the benefits of grass–legume mixed systems, such as increased DM yield and enhanced forage quality (Bi *et al*., 2024; Helgadóttir, 2018). Previous findings also indicate that combining *Centrosema pubescens* with dwarf Napier grass can improve plant growth, CP content, and biomass yield (Indriani *et al*., 2019; Churriyah *et al*., 2020).

Both dwarf Napier grass and *C. pubescens* possess agronomic characteristics that support their compatibility in mixed-cropping systems. Dwarf Napier grass is adaptable, productive, and responsive to nutrient inputs (Ishii *et al*., 2005; Utamy *et al*., 2018), while *C. pubescens* exhibits strong nitrogen-fixing ability, good biomass production, and potential to enhance the protein content of mixed pastures (Koutika *et al*., 2020; Mulinge *et al*., 2017). These complementary traits make their combination promising for improving pasture productivity.

Despite the recognized advantages of mixed cropping, information on the optimal planting composition between dwarf Napier grass and *C. pubescens* remains limited. Previous studies mainly compared mixed cropping versus monoculture systems, but did not systematically evaluate different planting ratios to determine which composition maximizes DM yield and forage quality under tropical conditions. Moreover, the specific contribution of planting proportion to nutrient quality parameters, particularly NDF, ADF, ADL, hemicellulose, and cellulose has not been clearly established.

Therefore, this study was conducted to evaluate the effects of different planting compositions between dwarf Napier grass and *C. pubescens* on the DM yield and forage quality of dwarf Napier grass and to identify the most effective composition for improving productivity in mixed-cropping systems.

MATERIALS AND METHODS

Experimental design

The study was conducted at a pasture belonging to the Faculty of Animal Science, Hasanuddin University. Chemical analysis was conducted in the Animal Feed Chemistry Laboratory, Faculty of Animal Science, Hasanuddin University. The materials include dwarf napiergrass (*Penisetum purpureum* cv. Mott) and centro (*Centrosema pubescens*). This experiment used a randomized block design (RBD) applied a planting spacing of 1 m x 0.5 m with 5 different treatments and four replicates, consisting of 100% dwarf napiergrass and 0% centro as T1; 70% dwarf napiergrass and 30% centro as T2; 50% dwarf napiergrass and 50% centro as T3; 30% dwarfnapier grass and 70% centro as T4; and 100% centro and 0% dwarf napiergrass as T5, respectively.

Blocks were defined based in natural soil heterogeneity, particularly mocro-topography and moisture gradients, which are common sources of variation in pasture fields. The selection of 1 m × 0.5 m spacing was based on recommended spacing for clump-forming tropical grasses to reduce early competition and accommodate the spreading nature of legumes.

Land preparation and the transplanting of dwarf napiergrass and centro

Land preparation was carried out using a hand tractor to homogenize the soil structure and remove weeds. On the prepared pasture, a total 20 plots (each 2 m × 1.5 m) were established with a planting spacing of 1 m. The plot size was selected because it is commonly used in forage mixture studies to maintain uniformity and to allow controlled evaluation of grass–legume interactions. Before transplanting, centro seeds were sown and allowed to grow for 15 days, after which the plants were cut to a height of 20 cm. Planting of grass stem cuttings and legume seedlings followed the respective treatment compositions and was carried out in the first month, using the designated spacing.

Data collection from the established grasses and legumes was conducted at 90 and 120 days after transplanting. The 90-day first harvest was chosen to ensure full establishment and canopy formation for both species before evaluating production. The 30-day regrowth period, while shorter than typical for mixed systems, was intentionally selected to capture early regrowth dynamics and short-term competitive responses between trass and legume component. These intervals allowed assessment of both establishment yield and early regrowth performance under mixed planting conditions.

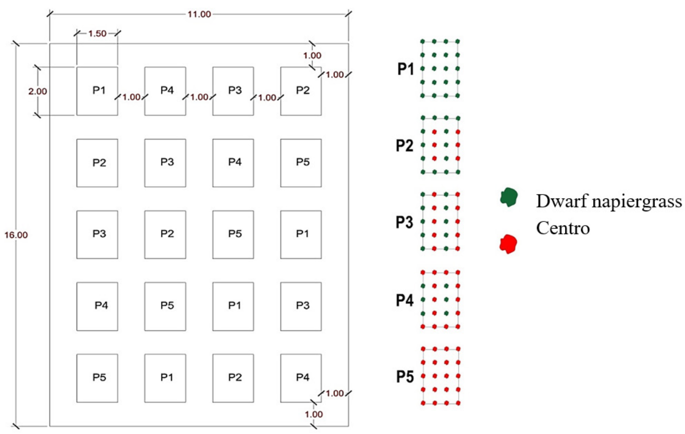

Figure 1: Schematic layout of the experimental design showing the mixed cropping system.

The schematic layout of the experiment is presented in Figure 1, and the land quality criteria are presented in Table 1.

Table 1: Pasture soil quality analysis.

Content	Sample No.	Unit	Total
pH	A1	H_2O	6.38
	A2	H_2O	6.14
Organic matter	A1	C (%)	1.98
		N (%)	0.13
		C:N Ratio (%)	15
	A2	C (%)	1.84
		N (%)	0.13
		C:N Ratio (%)	14

Source: Soil Biochemical Laboratory, Faculty of Agriculture, Hasanuddin University, 2022.

Forage production and analysis of dwarf napiergrass and centro nutrient quality

Dry matter (DM) yield was determined by oven-drying the forage samples at 70°C until constant weight.

Crude protein (CP) content (expressed as %) was determined using the Kjeldahl method. Crude fiber fractions were analyzed according to the method of Van Soest (1982), based on their solubility in neutral and acid detergent solutions and lignin. Cellulose and hemicellulose contents were calculated as follows:

Cellulose content= % ADF - % Lignin - % Insoluble Ash

Hemicellulose content = % NDF - % ADF

Statistical analysis

The experiment employed a randomized block design (RBD) consisting of five treatments and four replicates. Data were analyzed using SPSS version 26 (IBM Corp., Armonk, NY, USA). Duncan's Multiple Range Test (DMRT) was performed when significant treatment effects were detected. A p-value < 0.05 was considered statistically significant.

RESULT AND DISCUSSION

Dry matter yield of dwarf napiergrass

The average dry matter yield and quality of dwarf napier grass in mixed cropping system at the first and the second defoliation are presented in Table 2. The results showed that the mixed cropping treatments had a significant effect ($p < 0.05$) on fresh matter and DM yield during the first defoliation, while the second defoliation detected no significant differences. Although T3 showed numerically higher DM yield at both harvests and did not have a significant effect on T4. The reductions observed from first to second defoliation reflect normal yield decline due to shorter regrowth periods. The increased yield in T3 may be attributed to the synergistic effect of nitrogen fixation by the legume component, which supports grass growth without being suppressed by excessive grass density or limited by low grass population.

Table 2: Average fresh matter and dry matter yield of dwarf Napier grass at the first and second defoliation.

Treatments	Parameters			
	First defoliation (90 days)		Second defoliation (30 days)	
	Fresh matter (ton/ha)	Dry matter (ton/ha)	Fresh matter (ton/ha)	Dry matter (ton/ha)
T1	14.56 ± 1.2[a]	1.58 ± 0.2[a]	3.73 ± 0.8	0.46 ± 0.13
T2	14.66 ± 3.7[a]	1.64 ± 0.5[a]	5.53 ± 2.2	0.77 ± 0.32
T3	28.96 ± 5.6[b]	3.06 ± 0.4[b]	7.76 ± 0.7	0.98 ± 0.07
T4	24.56 ± 3.9[b]	2.29 ± 0.2[b]	6.53 ± 3.8	0.89 ± 0.48

Different superscript letter in the same column indicates a statistically significant difference ($p<0.05$). T1 = 100% dwarf napiergrass and 0% centro; T2 = 70% dwarf napiergrass and 30% centro; T3 = 50% dwarf napiergrass and 50% centro; and T4 = 30% dwarf napiergrass and 70% centro.

It seems that the growth and productivity of dwarf napiergrass in T3 and T4 plots were significantly influenced by the soil nutrients contributed by centro. This is consistent with the findings of (Suarna and Budiasa, 2016) who noted that legumes can contribute to the soil nutrients of the coexisting grasses. Bi *et al*. (2024) also found that the productivity of forage in mixed cropping of giant star grass and centro was increased by high forage compatibility. This was due to the introduction of legumes as soil nutrient suppliers, especially nitrogen which forms a mutual symbiosis with Rhizobium in the root nodules of legumes to fix atmospheric nitrogen. Additionally, (Helgadóttir, 2018) suggested that long-interval harvesting is necessary to achieve high productivity in both monoculture and mixed cropping systems. According to (Utamy *et al*., 2021), low density has higher DM yield in mixed cropping dwarf napiergrass and Indigofera.

Dry matter yield of centro

Means of productivity and quality of centro in mixed cropping at the first and the second defoliation were presented in the Table 3. The analysis of variance indicates that the treatment had no significant effect ($p>0.05$) on the fresh matter and DM yield of centro at the first and the second defoliation. Although the DM yield of centro appeared numerically varied among treatments, these differences were not statistically significant (Table 3).

It seems that mixed cropping involving centro and dwarf napiergrass can increase fresh weight productivity and

DM yield without competition between plants. According to (Ernawati *et al*., 2023), mixed cropping can improve dry weight compared to mono-cropping. Dahmardeh *et al.* (2009) also confirmed that larger forages yields and quality can be achieved as the composition of legumes becomes higher in mixed cropping. Furthermore, increasing the yield of centro in T4 can contribute to the nutrition of dwarf napiergrass, as reported by (Ayub *et al*., 2004). It seems that mixed cropping can positively contribute to the yields and quality of forage nutrition.

Table 3: Average fresh matter and dry matter yield of *Centrosema pubescens* at the first and second defoliation.

Treat-ments	Parameters			
	First defoliation		Second defoliation	
	Fresh matter (ton/ha)	Dry matter (ton/ha)	Fresh matter (ton/ha)	Dry matter (ton/ha)
T2	2.03 ± 0.5	0.56 ± 0.05	0.55 ± 0.16	0.15 ± 0.04
T3	1.83 ± 0.3	0.66 ± 0.1	0.46 ± 0.02	0.14 ± 0.01
T4	3.10 ± 0.4	0.86 ± 0.2	0.88 ± 0.31	0.25 ± 0.08
T5	1.50 ± 0.5	0.56 ± 0.08	0.64 ± 0.11	0.25 ± 0.02

T2 = 70% dwarf napier grass and 30% centro; T3 = 50% dwarf napier grass and 50% centro; T4 = 30% dwarf napier grass and 70% centro; and T5 = 100% centro and 0% dwarf napier grass.

The mixed cropping system used in treatments T2 and T3, which involved dwarf napiergrass and centro, resulted in a higher yield of DM yield of Centro compared to T5. This could be attributed to the low density of plant spacing for dwarf napiergrass and centro, which allowed them to utilize soil nutrients without competition. According to Utamy *et al.* (2021), soil density plays a crucial role in plant growth and can affect the number of tillers and DM, as well as the amount of solar radiation available for photosynthesis.

Crude protein of dwarf napiergrass

Means of dwarf napiergrass CP content in mixed cropping at the first and the second defoliation was presented in Table 4. It shows that the treatments did not have a significant impact on the growth of dwarf napiergrass during both the first and second defoliation ($p > 0.05$). This study's results produced a higher CP content compared to (Wang *et al*., 2024) study, which only had a CP content of 10.40% while using similar forages in a mixed cropping system. It's worth noting that the forage CP content can be affected by soil nitrogen supplies (Wolkaro and Tesfaye, 2025). Finally, it's important to keep in mind that the minimum standard for ruminant crude protein in forages should be 14% (SNI, 2009).

High CP content in T4 at the first defoliation was caused by the higher centro composition in T4 compared to the composition of dwarf napiergrass in the mixed-cropping system. Centro contributed more nitrogen to the dwarf napiergrass and eventually, dwarf napiergrass could affect the CP content. This is relevant to the finding by (Romzi *et al*., 2024) confirming that the more nitrogen supplied to the plants, the higher the crude protein content acquired. A study performed by (Liu et al., 2023) found an increasing DM and CP content in a mixed cropping system involving 80% giant star grass and 20% centro composition. In addition, Zhou *et al.* (2021) further elaborates those legumes produce organic matters for the rhizobia to supply nitrogen for the surrounding plants.

Table 4: Mean crude protein (CP) content of dwarf Napier grass at the first and second defoliation.

Treat-ments	Parameters	
	First defoliation	Second defoliation
	Crude protein (%)	Crude protein (%)
T1	9.16 ± 4.3	12.33 ± 2.0
T2	9.03 ± 5.4	11.61 ± 2.5
T3	12.04 ± 0.5	11.75 ± 3.2
T4	13.66 ± 0.4	11.85 ± 3.4

T1 = 100% dwarf napier grass and 0% centro; T2 = 70% dwarf napier grass and 30% centro; T3 = 50% dwarf napier grass and 50% centro; and T4 = 30% dwarf napier grass and 70% centro.

Crude protein of dwarf napier grass increases along with increasing centro composition. This is caused by the Centro fixing nitrogen in the soil to be absorbed by surrounding plants. According to Kabede (2021) leguminous plants provide their own N fertilizer and even contribute to the surrounding plants. according to (Churriyah *et al*., 2023) the roots of grass plants are quite good at absorbing nutrients and supporting the climate and growing environment.

There is a relationship between the crude protein of dwarf napiergrass and increasing centro composition. It's interesting to learn that this is due to the nitrogen-fixing properties of Centro, which is then absorbed by nearby plants. It's also fascinating to hear about the self-fertilizing properties of leguminous plants and their contribution to the surrounding environment. Additionally, the fact that grass plant roots are adept at absorbing nutrients and supporting the climate is noteworthy and shows the importance of understanding the intricacies of plant growth.

Legumes are able to fix atmospheric N_2 in a varied quantity depending on its bacteria species, cultivar, and strain (Satyanarayana *et al*., 2018). Mahmud et al. (2020) explained that the biological nitrogen fixation ability in converting N_2 into organic N is a tremendously substantial. It is able to maintain necessary N and re-supply the lost N amounted to 100kg ha^{-1} $year^{-1}$.

Based on the information provided, it seems that legumes are able to convert atmospheric N_2 into organic N through biological N fixation. This process is highly dependent on the specific bacteria species, cultivar, and strain involved. According to research, this ability is incredibly important in maintaining necessary N levels and re-supplying any lost N, with an average of 100kg ha^{-1} $year^{-1}$.

At the first defoliation, the highest CP content from T4 treatment, while at the second defoliation, the highest CP content was observed in T1. It's interesting to note that the means of dwarf napiergrass CP content observed in this study was higher compared to the study performed by Utamy *et al.* (2020) in a monoculture system accounting for 10.15%. However, an experiment conducted by Zailan *et al.* (2016) was able to achieve a higher CP content of 16% with a harvesting age of 180 days.

Based on the research findings, it seems that the harvesting of 180 days was a result of the extra soil nutrients needed by centro to grow after the defoliation of grasses and legumes in T4. Additionally, the short-term defoliation prevented centro from fixing N for the grasses, which meant that the plant's organs required even more soil nutrients. These observations align with Mulatshih's explanation in 2003 that short-term defoliation can lead to a greater need for soil nutrients.

It seems that the CP content of T1 was the highest at the second defoliation due to the fact that dwarf napiergrass still had energy reserves to grow and produce a high concentration of CP. This is likely influenced by various factors such as maturity, soil condition, and climate, as stated by (Wijitaphan *et al.*, 2009). It appears that the plant's growing point and energy reserve were sufficient to encourage forage re-growth after defoliation. Immature plants tend to have high protein content, low cellulose, and high digestibility. However, as plants age, their NDF and lignin content increases while CP decreases, leading to decreased digestibility, according to (Utamy *et al.*, 2021).

Chemical composition of dwarf napiergrass

Means of dwarf napiergrass chemical composition in mixed cropping system at the first and the second defoliation was presented in Table 5. The results shows that no significant effect (p>0.05) occurred neither on NDF, ADF, nor ADL of dwarf napiergrass at the first and the second defoliation.

The analysis of variance showed that there was no significant effect on the NDF, ADF, or ADL of dwarf napiergrass during the first and second defoliation. The ADF content was found to be the lowest in T3 during the first defoliation and in T1 during the second defoliation. Interestingly, the ADF level observed in this study was lower than that reported by other studies, such as Budiman *et al.* (2012) and Utamy *et al.* (2021). Indriani *et al.* (2019) also found a lower ADF level in dwarf napiergrass mixed with centro. It is worth noting that Evitayani *et al.* (2004) confirmed that the ADF content of grasses in tropical areas is around 34.6%, while the NDF content accounted for 64.3%.

Table 5: Mean NDF, ADF, and ADL contents of dwarf Napier grass at the first and second defoliation.

Treat-ments	Parameters					
	First defoliation			Second defoliation		
	ADF (%)	NDF (%)	ADL (%)	ADF (%)	NDF (%)	ADL (%)
T1	37.90 ± 2.3	65.10 ± 2.3	5.68 ± 1.6	30.87 ± 1.5	66.20 ± 1.5	4.72 ± 1.0
T2	40.29 ± 5.4	70.75 ± 1.9	8.52 ± 1.0	33.53 ± 2.8	67.01± 4.1	4.17 ± 0.8
T3	37.25 ± 3.0	68.13 ± 6.3	4.76 ± 1.0	33.46 ± 0.5	71.20 ± 10.3	5.09 ± 0.1
T4	39.50 ± 3.7	61.23 ± 2.3	6.64 ± 0.9	31.30 ± 1.2	65.71 ± 0.8	4.69 ± 1.8

T1 = 100% dwarf napier grass and 0% centro; T2 = 70% dwarf napier grass and 30% centro; T3 = 50% dwarf napier grass and 50% centro; and T4 = 30% dwarf napier grass and 70% centro.

NDF and ADF content in the forages may be the inhibiting factors of ruminal digestibility. Forage NDF and ADF content negatively correlate with nutrient digestibility and the amount of metabolized energy (Stergiadis *et al.*, 2015). Low forage ADF content indicates a better feed quality as confirmed by (Kilic and Gulecyuz, 2017) that low ADF and NDF may increase the forage quality.

NDF fraction is composed of hemicellulose, cellulose, and lignin structure. Based on this information, an increase in forage lignin may lead to a decrease in hemicellulose. It was also pointed out by Wahyono *et al.* (2017) that there are bonds between lignin-cellulose and lignin-hemicellulose in forages. These bonds are said to hinder feed degradation in the rumen. Additionally, Van Soest (1982) confirmed that NDF is made up of fibrous cellular walls that contain lignin, cellulose, and hemicellulose, as well as some other bound proteins by the fibers.

It is important to consider the ADF and NDF content in the feed for ruminants. Studies have shown that a lower fraction of NDF and ADF can lead to higher feed digestibility, enabling the livestock to gain full benefits from their feed. The NRC recommends a minimum NDF and ADF content of at least 21% NDF and 19% ADF in feed. Zhou *et al.* (2022) suggest that the suggested percentage of ADF and NDF content that will be provided to the ruminants was 25–45% ADF from forages' DM. It is also worth noting that ADL content in different tropical grass species ranges from 3.50–4.94 %.

It's important to consider the ADL content in the feed when it comes to feed digestibility. Research has shown that the lignocellulose bond can inhibit the utilization of foodstuff in the ration, which can ultimately reduce feed nutritional value. To optimize feed for ruminants, it's recommended to have a tolerable lignin content of 7%. This is because lignin contains phenolic compounds that can bind cellulose and prevent ruminants from digesting it.

Table 6: Mean cellulose and hemicellulose content of dwarf Napier grass at the first and second defoliation.

Treatments	Parameters			
	First defoliation		Second defoliation	
	Cellulose (%)	Hemicellulose (%)	Cellulose (%)	Hemicellulose (%)
T1	30.37 ± 3.3	27.19 ± 1.4	24.36 ± 2.0	35.33 ± 0.58
T2	29.73 ± 3.0	30.45 ± 3.1	27.61 ± 1.5	33.48 ± 6.73
T3	30.73 ± 1.8	30.87 ± 8.4	26.48 ± 1.2	37.73 ± 10.0
T4	30.86 ± 4.1	21.73 ± 5.6	24.84 ± 1.2	34.40 ± 1.90

T1 = 100% dwarf napier grass and 0% centro; T2 = 70% dwarf napier grass and 30% centro; T3 = 50% dwarf napier grass and 50% centro; and T4 = 30% dwarf napier grass and 70% centro.

The analysis of variance (Table 6) shows that there was no significant effect identified from the cellulose and hemicellulose of dwarf napiergrass at the first and second defoliation. The highest means of cellulose content were found in T4 and T2 during the first and second defoliation, respectively. This suggests that cellulose may serve as an alternative energy source for ruminants as ruminal microbes degrade it into energy sources. Wei *et al*. (2022) confirmed this by stating that ruminants have ruminal microbes, including bacteria, protozoa, and fungi, that help digest crude fiber such as cellulose and hemicellulose. Additionally, Park (2024) reported that these microbes could aid the ruminants in achieving optimal digestion.

The content of cellulose in plants is an indicator of good feed degradation. This is supported by the research of Hemati *et al*. (2022) that hemicellulose is a type of polysaccharide that has a better degradation level compared to cellulose and lignin. Howard *et al*. (2003) explained that hemicellulose is a type of polysaccharide found on the cell wall of plants and is soluble in alkaline and blended with cellulose. According to Lynd *et al*. (2002) the cellulose content found on the cellular wall of plants makes up 35–50% of the plant's dry weight.

In this study, the highest hemicellulose content during the first and second defoliation was found in T3. The hemicellulose and cellulose content obtained in this study was higher compared to the study conducted by Zailan *et al*. (2018), where hemicellulose content achieved only 30.16% and 31.50% for cellulose content. Dampanaboina et al. (2021) reported that cellulose and hemicellulose content in immature plants may account for 40% of the DM and will increase as they mature.

Van Soest (1982) further elaborated that carbohydrates in plants are divided into two categories: those with cell walls (cellulose, hemicellulose, and lignin) and those in the cell nucleus commonly known as soluble carbohydrates (starch, pectin, and simple sugar). These carbohydrates serve as the energy source for ruminal microbe growth (Zhang *et al*., 2021).

Solubility of dwarf napiergrass and centro

Means of dwarf napiergrass and centro soluble protein in mixed cropping was presented in Table 7. The study findings exhibited that no statistically significant differences ($p > 0.05$) attributable to the planting composition. The values obtained were relatively uniform, reinforcing the finding that the biochemical composition of dwarf Napier grass was stable across the different mixed cropping ratios tested. However, in determining the planting composition of a mixture of mini elephant grass and *C. pubescens*, research suggests the use of the T3 treatment, consisting of 50% dwarf napiergrass and 50% *C. pubescens*, as it produces relatively high soluble protein contents (0.99% in dwarf napiergrass and 1.08% in *C. pubescens*) (Hong and Trang, 2022).

Table 7: Mean soluble protein content of dwarf Napier grass and centro.

Treatments	Parameters	
	Dwarf Napiergrass	Centrosema pubescens
	Soluble protein (%)	Soluble protein (%)
T1	1.12	-
T2	0.82	1.68
T3	0.99	1.08
T4	0.97	1.21
T5	-	0.97

T1 = 100% dwarf napier grass and 0% centro; T2 = 70% dwarf napier grass and 30% centro; T3 = 50% dwarf napier grass and 50% centro; and T4 = 30% dwarf napier grass and 70% centro

CONCLUSION

The study demonstrated that differences in planting composition of dwarf napiergrass and centro resulted in a significant effect only on dry mattter (DM) yield at the first defoliation, with the 50% dwarf napier grass and 50% centro combination (T3) producing highest yield during this initial growth phase. However, no significant differences were found among the tratments for DM yield at the second defoliation for any measured nutrient quality parameters. Future research with longer regrowth intervals or multiple harvest cycles is recommended to better understand potential longer-term interactions between dwarf napiergrass and centro in mixed cropping systems.

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NOVELTY STATEMENT

This study provides a systematic evaluation of different planting composition ratios between dwarf Napier grass (Pennisetum purpureum cv. Mott) and Centrosema pubescens in a mixed cropping system under tropical conditions. Unlike previous studies that mainly compared monoculture versus mixed cropping, this research uniquely identifies the optimal grass–legume proportion by quantifying dry matter yield and detailed fiber fractions (NDF, ADF, ADL, hemicellulose, and cellulose) across successive defoliation stages. The findings offer practical evidence that a 50:50 planting composition maximizes early dry matter production without compromising forage quality, thereby contributing to more efficient and sustainable forage management strategies

AUTHORS CONTRIBUTION

ANC, RFU, AMD, DMR, and KK, conceived and designed the experiment. ANC, PAR, DMR, and KK performed the experimental procedures. RFU and ANC, supervised and coordinated the research and provided clinical data. Statistical analysis was conducted by AMD, ANC and RR. The initial draft of the manuscript was prepared by ANC, AMD and RR. All authors critically reviewed and approved the final version of the manuscript.

Generative AI and AI-assisted technology statement

The authors declare that no Generative AI was used in the creation of this manuscript.

Conflict of interest

The authors have declared no conflict of interest.

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