EFFECT OF IRRIGATION FREQUENCY AND CUTTING AGE ON THE CHEMICAL COMPOSITION OF *F1 PENNISETUM PURPUREUM*

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ABSTRACT
Cultivation of improved pasture variety is a means to sustainable livestock production. During dry season most forages declined in agronomic and nutritional performance. An experiment was conducted to investigate the effect of irrigation time and cutting age on the agronomic and nutritional composition of F1 Pennisetum purpureum. The experiment was laid in a 2 x 2 x 3 factorial arrangement using Randomized completely Block Design. An already established fenced pasture plot measuring 37 × 15 m2 with 12 beds of 4 × 4 m each and with 1 m spacing between beds were cutback to 15 cm above the ground level. The treatments includes two levels of irrigation interval (48 hrs and 76 hrs; cutting age 3, 6 and 9 weeks. Data collected includes the plant height, number per tiller, tiller length, leave width, crude protein, crude fibre, ether extract, Dry matter and Ash contents. All data collected were analyzed using SAS 2000 package and significance level was determined using the same package. Plants irrigated at 48 hrs recorded the highest Leaf Width (5.08 cm) while other agronomic parameters were not significantly affected. However, an increase in weeks of age at cutting increase the agronomic performance. Nutritional compositions were affected by irrigation interval and plant harvested between weeks 3-6 recorded higher nutritional composition.
Keywords: F_1 *Penessetum pupurreum*, cutting age, irrigation frequency, Agronomic studies, chemical composition

INTRODUCTION
High significance and positive impacts of ruminant animals on the economics of a nation ranging from food production to job creation cannot be over emphasized. These significant impact derived from ruminant animals is influenced in the tropical environments by many factors with feeding alone accounting for more than 70% of such problem especially during the period of rainfall shortage. Feeding ruminant animals with adequate and quality pasture especially during the dry season is a major problem facing ruminant farmers in Nigeria, and to overcome these challenges, The introduction of forage varieties with good nutritional potentials (e.g. crude protein and digestibility) is a highly to meet livestock nutrient requirement (Maleko *et al*. 2019).
Sustainable livestock production system is highly dependent on the availability of quantity and quality feed and forage resources. Napier grass, also known as elephant, is one of the most important tropical forage crops. The F1 *P. purpurem* was obtained by crossing *P. purpureum* with a male sterile *P. typhoides* (Pantulu, 1967) and possesses many desirable characteristics, including high yield per unit area, tolerance to intermittent drought and high water use efficiency (Kabirizi *et al*., 2015) making it a forage of choice. It has the ability to withstand repeated cutting and will rapidly regenerate, producing palatable leafy shoots (Lowe *et al*. 2003). Irrespective of plant performance, dry season is always challenging to plant growth and nutritional composition. This study therefore investigates the chemical compositions of F1 *Pennisetum purpureum* as affected by irrigations frequency and cutting age.

MATERIALS AND METHODS
Experimental site
The experiment was carried out at the Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso located in the derived Savanna zone of Nigeria.
Experimental Treatment and Design
An already established fenced pasture plot measuring 37 × 15 m^2 with 12 beds of 4 × 4 m each and with 1 m spacing between beds were cutback to 15 cm the above ground level. The experiment was laid in a 2 ×2 x 3 factorial arrangements using Randomized Completely Block Design. Having two levels of irrigation interval (48 hrs and 76 hrs; two level of planting intervals 7 cm and 100 cm and

three levels of cutting frequency 3, 6 and 9 weeks interval). Urea application was done at the beginning of the irrigation period. Urea fertilizer was applied at the rate of 200 kgN/ha before the commencement of irrigation.

Irrigation frequency: all plants were allotted the same quantity of 3 litres of water at different interval on selected beds. There were 4 treatments with 3 replicates each: 75 cm/48 hours, 75 cm/96 hours, 100 cm/48 hours, 100 cm/96 hours. The plants were cutback at 3, 6, 9 weeks after initial cutback (WAC). Weeding was done manually as often as required to prevent competition.

Data Collection

Plant Height: Estimation of grass height (cm) was measured every three weeks interval using a measuring tape and the average height was taken on treatment basis. The height was measured from the apex of the plant to the base above the ground on 10 randomly selected stands per plot at every harvesting time.

Tiller Number: The tiller density of F_1 *pennisetum purpureum* was carried out by counting the number of tillers within two randomly located within the thrown 1 m^2 quadrats at every harvesting time throughout the experimental period.

Leaf Length: As the plant grows, increase in leaf length per replicate was measured at three weeks interval using a measuring tape. The measuring tape was placed at the auricle of the randomly selected leaves and stretched to the leaf apex. The average leaf length (cm) of the randomly selected leaves was recorded on treatment basis.

Leaf Width: Leaf width (cm) were measured by placing ruler across the middle of the leaf. The average leaf width of the randomly selected leaves was recorded on treatment basis.

Biomass and Dry Matter Yield: A square meter (1 m x 1 m) quadrant was thrown three times into a replicate of each treatment and total biomass yield was cut down to 15 cm above the ground level. The dry matter percentage (DMY) was estimated as DMY = dry matter (%) x fresh sample from 1 m^2, which afterwards was extrapolated in kg or tonnes per hectare.

Chemical Analysis

Forage samples were harvested at 3rd, 6th and 9th week after cutback (WAC). Harvested Subsamples were ground to pass through a 1-mm sieve screen using laboratory hammer mill and analyzed for crude protein, ether extract and ash contents (AOAC, 2002). Total Nitrogen was determined by micro-Kjeldahl method using Marham's distillation apparatus while the crude protein content were calculated by multiplying %N by factor of 6.25.

Statistical analysis

Data collected were analysed using the General linear model of SAS 2000. Significant means were separated using Duncan multiple range test of the same package.

RESULTS AND DISCUSSION

The irrigation time had no significant ($P>0.05$) effects on the agronomic performance of the forage plants in terms of plant height, number per tiller, tiller length and the forage yield, but significantly affects ($P<0.05$) the leaf width (Table 1). The agronomic performance obtained for this study is lower compared to the reports of (Teshale *et al*., 2022) who reported higher agronomic performance for hybrid varieties of *Pennisetum Purpureum*. These differences could be due to the season, location of the experiment and the treatment applied. The dry matter yield compared relatively with the report of (Getiso and Mijena, 2021). The plant height and number per tiller increased significantly with the increase in weeks. This aligned with the findings of Oyewole, (2021) who reported an increase in agronomic performance of some selected tropical grasses and legumes during the dry season. Plants irrigated at 48 hrs and harvested at 9 weeks after cutback recorded a higher values in terms of agronomic performance compared to their counterparts. These noticeable differences are likely attributed to the short period of irrigation intervals as the plant had more water for growth activities.

The crude protein obtained for this study was significantly ($P<0.05$) affected by the irrigation time and cutting age (Table 2). The crude protein were within the range of 15.749-18.900% and meet the requirement to maintain growing ruminants as recommended by (NRC, 1985) but differs slightly from the findings of Oluwafemi *et al*. (2021) who reported 8.93% crude protein for F1 hybrid. The differences obtained might be a result of the age of plants, soil and other factors. It is worthy of note that the increase in age of the plant leads to a reduction in the crude protein contents. This affirmed

Table 1: Effect of irrigation frequency and cutting age on agronomy performance of F1 *Pennisetum purpureum*.

		PH(cm)	NT	TL((cm)	LW(cm)	FY (t DMha^{-1})
Irrigation frequency						
48hrs		62.913	33.917	17.897	2.726^{b}	373.977
96hrs		59.069	32.731	14.437	5.087^{a}	379.306
SEM		2.944	2.860	2.221	0.621	36.072
Cutting Age						
3wks		53.261^{b}	34.125	14.467^{b}	1.964^{b}	262.583^{c}
6wks		53.254^{c}	39.042	11.263^{c}	1.556^{c}	306.708^{b}
9wks		76.458^{a}	26.805	22.772^{a}	8.189^{a}	520.632^{a}
SEM		3.605	3.503	2.720	0.761	44.180
Interaction of Irrigation Frequency and Cutting Age						
48hrs	3wks	46.606b	36.833	16.692	1.662^{b}	319.667^{c}
	6wks	53.800b	36.500	12.650	1.536^{c}	346.250^{b}
	9wks	85.333a	28.417	24.350	4.979^{a}	456.014^{a}
	SEM	5.098	4.954	3.847	1.076	62.479
96hrs	3wks	56.917b	31.417	12.242	2.267^{b}	205.500^{c}
	6wks	52.708b	41.583	9.875	1.577^{c}	267.167^{b}
	9wks	67.583a	25.194	21.193	11.398^{a}	665.250^{a}
	SEM	5.098	4.954	3.847	1.076	62.479

^{abcc} *means within the same row with different superscripts are significantly different. (p<0.05)*
PH- plant height, NT-average number per tiller, TL-tiller length, LW- leaf width, FY-forage yield

Table 2: Effect of irrigation frequency and cutting age on proximate composition of F1 *Pennisetum purpureum*

		CP	CF	EE	DM	ASH
Irrigation frequency						
48hrs		18.900^{a}	22.317^{a}	4.625^{b}	89.300^{a}	14.500
96hrs		16.122^{b}	24.206^{b}	3.275^{a}	86.400^{b}	12.050
SEM		0.144	0.375	0.166	0.461	0.896
Cutting age						
	3wks	18.723^{a}	19.037^{c}	3.537^{a}	92.413^{a}	13.813^{a}
	6wks	16.563^{b}	25.802^{b}	4.288^{b}	87.163^{b}	9.500^{b}
	9wks	15.749^{c}	27.944^{a}	3.950^{c}	83.975^{c}	6.513^{c}
	SEM	0.176	0.460	0.204	0.564	1.098
Interaction of irrigation frequency and cutting age						
48hrs	3wks	17.628^{a}	19.875	4.325^{a}	92.950^{a}	13.350
	6wks	17.255^{b}	23.100	4.600^{b}	87.650^{b}	9.600
	9wks	16.485^{c}	25.975	4.050^{c}	87.300^{c}	9.550
	SEM	0.249	0.650	0.288	0.798	1.552
96hrs	3wks	18.817^{a}	20.200	2.350^{a}	91.875^{a}	12.275
	6wks	17.870^{b}	24.505	4.475^{b}	86.675^{b}	9.400
	9wks	16.012^{c}	25.912	3.850^{c}	80.650^{c}	3.475
	SEM	0.249	0.650	0.288	0.798	1.552

^{abcc} *means within the same row with different superscripts are significantly different. (p<0.05)*
CP- Crude protein, CF- crude fibre, EE- ether extract, DM- Dry matter, SEM- sum of error means

the previous findings that the older a plant, the lower the protein content. This is also observed with other nutritional composition for this study. The crude fibre content obtain for this study ranged from 14 to 42% and fell below the range recommended for proper rumen environments, but agreed with the report of Oyewole (2021) though lower compared to the report of Olufemi *et al*. (2021) for hybrid of *P. purpureum*. However, as the plant increase in age, the fibre content increased significantly. The Dry matter content obtained for this study agrees with the report of Olufemi *et al*. (2021). The ash content

is an indication of the available mineral in a feed sample. The ash content obtained also agreed with the reports of these authors (Olufemi *et al*., 2021; Ajayi *et al*., 2007). In conclusion, F_1 *Pennisetum Purpureum* irrigated at 48 hrs interval and harvested between 6 to 9weeks gave better agronomic performance. However, forages harvest between 3 to 6 weeks had better nutritional composition.

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