THE EFFECT OF TIME OF INITIAL CUTTING ON FORAGE YIELD AND QUALITY OF THREE PASTURE GRASSES AT SHIKA, NIGERIA.

O.S. ONIFADE, A.M. ADAMU AND E.C. AGISHI*

National Animal Production Research Institute Shika,Ahmadu Bello University, Zaria, Nigeria

Received 18 October1996; Accepted 03 March 1998

ABSTRACT

The effect of time of cutting on yield and nutritive value of three year old pastures of signal (*Brachiaria decumbens*), green panic (*Panicum maximum* var. trichoglume) and buffel (*Cenchrus ciliaris* cv. Gayndah) grasses were studied. The pastures were harvested for hay yield on 5th November, 1977 and allowed to rest until subjection to initial cut in June, July, August or September, 1978. Immediately after the July cut, all the plots received 100kg N/ha and 40kg P2O5/ha. Regrowths from the initial cuts and the control (uninterrupted growth) were all cut on 16th November, 1978.

The dry matter (DM) yields of the grasses increased with increasing stage of maturity. Signal grass was more productive (P<0.05) (17.3t/ha) than the other grasses averaged over the cutting dates. The yields of green panic and buffel grasses were 8.3 and 11.0 t/ha respectively. The regrowth DM yields declined with a delay in the initial cut.

Except for the increases in CP (6.9%) and IVDMD (50.1%) contents of the primary growth in August, these parameters declined as the grasses aged. Deferring the initial cutting date resulted in significant (P<0.05) increases in CP and IVDMD contents of the regrowths. Percent increases as a result of cutting at the different dates over the control for DM and CP yields were 28 and 74, respectively.

Further evaluation of the three species in grazing trial is suggested.

Keywords: grass pastures, time of cut, dry matter yields, crude protein, digestibility

**Present address: Department of Biological Sciences, Benue State University, Makurdi*

INTRODUCTION

Many native and particularly introduced pasture species have been evaluated at various locations in Nigeria for yield and nutritive value (Miller and Blain Rains, 1963: Oyenuga and Olubajo, 1966; Haggar, 1969; Onayinka, 1973; Adamu et al., 1985). The yield, persistence and quality of these pastures are influenced by factors such as climate, stage of growth, soil fertility status and management practices. The effect of date and frequency of cutting on the yield and nutritive value of grasses have been carried out in several studies in the humid, high rainfall (Oyenuga, 1960; Ademosun, 1973; Onayinka, 1973) and in the drier Sudan and Guinea Savannah areas (Haggar, 1970; de Leeuw et al., 1978; Adamu et al., 1985; Akinola and Olorunju, 1990) of the country.

Signal (*Brachiaria decumbens*), green panic (Panicum maximum var. trichoglume) and buffel (*Cenchrus ciliaris* cv. Gayndah) grasses were reported to be adapted to the subhumid zone and their use as hay crops was recommended (Agishi, 1979). In this environment, hay crops are usually harvested at the beginning of the dry season (October) and the fields are left uncut until the onset of the rainy season (May). This study was undertaken to examine the effect of time of initial cutting during the growing season on the dry matter (DM) yield and aspects of nutritive value of these three introduced tropical grasses in the subhumid zone of Nigeria.

MATERIALS AND METHODS

The study was conducted at Shika (Lat. 11° 15'N, Long 7° 32'E). Rainfall data for 1977 and 1978 are presented in Table 1. The three grasses, established in 1974, constituted the main plot treatments in a split plot experiment with four replicates. Prior to this study, the paddocks were cut for hay in November 5, 1977 and the regrowths up to June, 1978 were not cutback.

Four initial cutting days (subplot) treatments: 2nd June, 4th July, 8th August and 7th September, 1978 were imposed on the main plot in 1978. The last cuts on all subplots were taken on the same date 16th November, 1978. The ages of the regrowths were 168, 136, 110 and 71 days, respectively. An uncut (control) treatment was harvested only on the 16th November, 1978. Fertilizer (100kg N and 40 kg P_2O_5/ha) was applied to all the subplots (6m x 6m) on 4th July, 1978.

TABLE 1: RAINFALL (mm) FOR SHIKA IN 1977 AND 1978

Month	1977	1978
January	-	-
February	-	-
March	-	2.3
April	-	90.8
May	64.0	164.2
June	102.7	188.1
July	85.5	159.3
August	232.4	358.3
September	286.9	182.9
October	-	32.2
November	-	-
December	-	-
Total	**771.5**	**1178.1**

Fresh forage yields were recorded from four, 60cm x 60cm quadrats per subplot. Subsamples were oven-dried at 70°C for 48h to determine DM yields. The dried herbage was ground to pass through a 1 - mm sieve and analysed for crude protein (CP) according to the standard Kjedahl method (AOAC,, 1980).

In vitro dry matter digestibility was measured by the method of Tilley and Terry (1963). The donor Bunaji x Friesian bull was fed Digitaria hay. The Digestible Dry Matter (DDM) yield for initial cut and the regrowths were obtained from the products of their DM yield and IVDMD/100.

ANOVA was carried out and treatment means compared according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

Dry matter yields

Yields from the initial cuts increased up to September and thereafter declined. The increases however, were only significant ($P<0.05$) between the first (June) and the other cutting dates (Table 2). The increase in primary growths recorded in August after fertilizer application in July was highest in green panic (222%) (Table 2). Buffel and signal grasses

TABLE 2: THE EFFECT OF DATE OF FIRST CUT ON DM YIELD kg/ha) OF BUFFEL, GREEN PANIC AND SIGNAL GRASSES

Species	Harvesting Date June	July	August	Sept	Nov.[1]	Mean
a) First cut						
Buffel	2312	4565	7291	11356	9738	7052
Green Panic	925	2693	5981	7803	8235	5127
Signal	2437	10082	11129	16379	10585	10124
Mean	**1891**	**5780**	**8134**	**11846**	**9519**	
b) Regrowth (Cut in Nov.)						
Buffel	6497	6199	2596	3150		4611
Green Panic	6028	7120	993	1633		3944
Signal	12028	13238	2597	1408		7318
Mean	**8184**	**8519**	**2062**	**2064**		
c) Total DM yield (a+b)						
Buffel	**8809**	10764	9897	14505		10992
Green Panic	6953	9813	6974	9436		8294
Signal	144465	23320	13726	17787		17325
Mean	**10076**	**14633**	**10196**	**13910**		
1 = Control plot						
			(a)	(b)		(c)
SE (species means)			=3561	383		5621
Se (date means)			=4597	442		245
Se (species x date means)			=7969	785		6604

TABLE 3: THE EFFECT OF DATE OF FIRST CUT ON THE CP CONTENT (%) OF BUFFEL, GREEN PANIC AND SIGNAL GRASSES

Harvesting date Species	June	July	August	Sept.	Nov.[1]	mean
a) First cut						
Buffel	5.93	4.10	6.90	5.13	3.85	5.10
Green Panic	6.95	5.20	9.45	5.20	4.30	6.22
Signal	4.80	3.90	6.50	3.85	2.18	4.25
Mean	**5.93**	**4.10**	**6.90**	**5.13**	**3.85**	**5.10**
b) Regrowth:-Cut in Nov.						
Buffel	3.24	3.67	5.11	5.27		4.32
Green Panic	4.28	4.32	6.86	7.07		5.63
Signal	2.78	2.41	3.30	4.83		3.33
Means	3.43	3.47	5.09	5.73		
1 = Control plot						
				(a)		(b)
SE (species means)				= 0.11		0.03
SE (date means)				= 0.09		0.04
SE (species x date means)				= 0.20		0.07

appeared to have utilized the added nitrogen when moisture was highest in August. Signal grass was most productive over the cutting date than Gayndah buffel and green panic. This is in agreement with previous findings in this environment (de Leeuw *et al.*, 1978) and elsewhere (Crowder et al., 1970 and Winter, 1976).

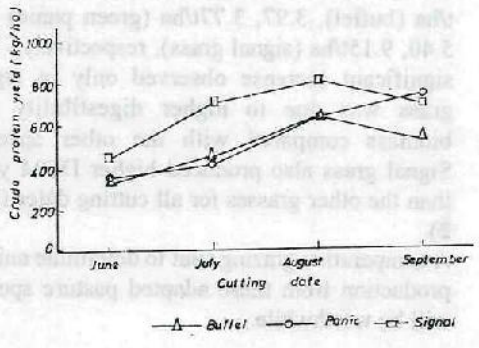

Fig.1. Effect of cutting date on total crude protein yield (kg/ha) of buffel, green panic and signal grasses

The study showed that higher (P<0.05) DM yields of regrowths were obtained by cutting earlier than later in the season (Table 2). This could be ascribed to the non limiting factors such as moisture and nutrients which enhanced growth between June and July. The low yield of the regrowth from green panic in August cannot be explained.

The total yield from green panic was less than half of the yield from signal grass (Table 2). The yields, averaged over species, obtained from cutting in June and August were significantly lower (P<0.05) than in July and September.

The mean of total DM yields (12,186kg/ha) resulting from cutting at the various dates was 28% higher (P<0.05) than the control. This supports the concept of cutting and/or grazing of some grasses during the growing season (for a specified time) in order to stimulate tillering and higher production at the end of the season (Bogdan, 1977).

Crude protein content.

Except for the increases in August, CP contents (Table 3), tended to decline as the grasses matured (Bredon and Horrell, 1961; Haggar, 1970 and Adamu *et al.* 1985). The CP contents of the regrowths were higher (P<0.05) when the first cut was taken later in the growing season (August and September) possibly in response to the added N and P fertilizers in July. Signal grass contained significantly lower (P<0.01) CP than the other grasses over the cutting dates. Perhaps, a higher level of N could have increased the CP of the grasses. The total CP yields of the cut and the control (uncut) were: 537 and 365kg/ha (buffel), 481 and 367kg/ha (green panic) and 668 and 239kg/ha (signal grass) respectively - thus an

TABLE 4: THE EFFECT OF DATE OF FIRST CUT ON IN VITRO DRY MATTER DIGESTIBILITY (%) OF BUFFEL, GREEN PANIC AND SIGNAL GRASSES.

Species	Harvesting date June	July	August	Sept	Nov.[1]	Mean
a) First cut						
Buffel	52.20	47.20	53.70	43.45	45.75	48.46
Green Panic	50.85	34.45	42.30	53.75	43.35	44.94
Signal	52.15	54.30	54.30	53.25	50.95	52.95
Mean	51.73	45.28	50.07	50.15	46.68	
b) Regrowth: Cut in November						
Buffel	42.40	40.35	47.15	54.85		47.19
Green Panic	42.75	44.60	46.75	55.45		47.14
Signal	45.30	47.05	54.40	60.25		51.75
Mean	43.48	44.00	49.43	56.85		
1 = Control plot						
				(a)		(b)
SE (species means)				= 1.40		1.35
SE (date means)				= 1.81		1.56
SE (species x date means)				= 3.14		2.70

increase in yield by 74% as a result of cutting the grass species. The highest DM yield of signal grass favoured the higher total CP yield over time (Fig. 1) though it had the least CP content (Henzell, 1963).

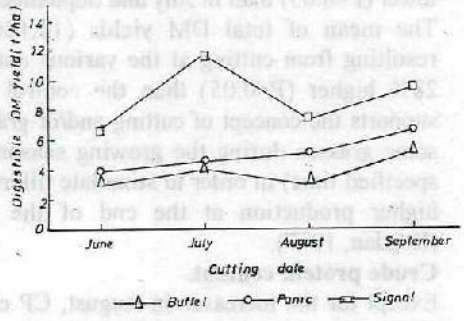

Fig. 2. Effect of cutting date on total digestible dry matter yeild (t/ha) of buffel, green panic and signal grasses.

In-vitro dry matter digestibility (IVDMD). The initial IVDMD value (Table 4) of the grasses declined (P<0.05) up to July with age of first cut (Reid *et al.*, 1973); Johnson and Pezo, 1975; Adamu *et al.*, 1985). Green panic was significantly (P<0.05) less digestible than the other grasses over the cutting dates. Deferring the date of first cut led to significant increases in the regrowth IVDMD. Regrowth of signal grass was the most digestible. The initial IVDMD value, however, was below the range (70 - 85%) recorded for most tropical grasses (Reid et al., 1973). The stage of growth and time and level of N application could be partly ascribed to the low values. The mean total digestible dry matter (DDM) yields recorded for the uncut and cut treatments were: 4.48, 4.58 t/ha (buffel), 3.97, 3.77t/ha (green panic) and 5.40, 9.15t/ha (signal grass), respectively. The significant increase observed only in signal grass was due to higher digestibility and biomass compared with the other species. Signal grass also produced higher DDM yield than the other grasses for all cutting dates (Fig. 2).

A comparative grazing trial to determine animal production from these adapted pasture species will be worthwhile.

ACKNOWLEDGEMENTS

The authors would like to thank the Director, NAPRI for the provisions of fund and facilities for the conduct of this study.

REFERENCES

ADAMU, A.M., J.O. AKINOLA and J. PIOTROWSKI (1985). Yield, nutrient composition and invitro dry matter

digestibility of tropical forages in relation to stage of growth. J. Anim. Prod, 12: 88 - 96.

ADEMOSUN, A.A., (1973). Nutritive evaluation of Nigerian forages. IV. The effect of stage of maturity on the nutritive value of Panicum maximum. Nig. Agric. J. 10: 170 - 177.

AGISHI, E.C. (1979). Forage species introduction into Northern Nigeria - reommended forage species, NAPRI Ann. Rep. 1979 p. 75 - 76.

AKINOLA, J.O. and OLORUNJU, S.A.S. (1990). Changes in herbage yield and quality of indigenous and introduced forages with age. J. Anim. Prod. Res: 10: 1 - 20.

A.O.A.C. (1980). Official methods of Analysis of the Association of Official Agricultural Chemists, Washington, D.C. 1980.

BLAIR RAINS, A. (1963). Grassland research in Northern Nigeria, 1952 - 1962. Samaru Misc. Paper No. 1. 69pp.

BOGDAN, A.V. (1977). Tropical Pasture and Folder Plants, Long man Inc., New York. 475p.

BRENDON, R.M. and HORRELL, C.R. (1961). The chemical composition and nutritive value of some common grasses in Uganda - 1. General pattern of behaviour of grasses. Trop. Agric. (Trin.) 38: 297 - 304.

CROWDER, L.V. CHAVERRA, H. and LOTERO, J. (1970). Productive improved grasses in Colombia. Proc. XI. Int. Grassl. Cong. Surfers Paradise, Australia p. 147 - 149.

HAGGAR, R.J. (1969). Improved pastures in the Northern States of Nigeria. Proc. 1st Livest. Conf. Zaria. 86 - 92.

HAGGAR, R. J. (1970). Seasonal production of *Andropogon gayanus*. 1. Seasonal changes in yield components and chemical composition. J. Agric. Sci., Camb., 74: 487 - 494.

HENZELL, E.F. (1963). Nitrogen fertilizer response of pasture grasses in south-eastern Queensland. Aust. J. Exp. Agric. Anim. Husb. 3: 290 - 299.

JOHNSON, W.L. and PEZO, D. (1975). Cell wall fractions and invitro digestibility of Peruvian feedstuffs. J. Animal Sci. 41: 185 - 197.

KOWAL, J. and KNABE, D.T. (1972). An agroclimatological Atlas of the Northern States of Nigeria Ahmadu Bello University Press, A.B.U. Zaria, Nigeria. 119pp.

LEEUW, P.N. DE, KERA, B.S. OKEAGUM, M.U. and AGISHI, E.C. (1978). An evaluation of the nutritive values of nine grasses. NAPRI Ann. Rep. 1978, p. 79 - 80.

MILLER, T.B. and BLAIR RAINS, A.B., (1963). The nutritive value and agronomic aspects of some fodders in Northern Nigeria. J., Brit.n Grassl. Soc. 18: 158 - 167.

ONAYINKA, E.A.O. (1973). Hints on establishment and management of sown pastures in Western Nigeria. Research Bulletin, Univ. of Ife, I.A.R. and T. No. 3.20pp.

OYENUGA, V.A. (1960). Effect of stage of growth and frequency of cutting on the yield and chemical composition of some Nigeria fodder grasses. Panicum maximum Jacq. J. Agric. Sci. 55: 339 - 501.

OYENUGA, V.A. and OLUBAJO, F. O. (1966). Productivity and nutritive value of tropical pastures at Ibadan. Proc. 10th Int. Grassl. Congr. P 962.

STEEL, R.G.D. and TORRIE, J.H. (1980). Principles and Procedures of statistics: A Biometrical Approach. 2nd Edn. MCGraw-Hill Book Co. New York.

REID, R.L., POST, A.J., OLSEN F.J. and MUGERWA, J.S. (1973). Studies on the nutritional quality of grasses and legumes in Uganda. 1. Application of invitro digestibility techniques to species and stage of growth effects. Trop. Agric. (Trin.) 50: 1 - 15.

TILLEY, J.M.A. and TERRY, R.A. (1963). A two stage technique for the in vitro digestion of forage crops. J. Brit. Grassl. Soc. 18; 104 - 111.

WINTER, W.H. (1976). Preliminary evaluation of twelve grasses with legumes in Northern Cape York Pennisula. Trop. Grassl. 10: 15 - 20.