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NUTRITIVE EVALUATION OF TWO FLOOD GRASSES IN WHITE NILE – SUDAN

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ABSTRACT: *Flood grasses (Echinochloa stagnina and Echinochloa pyramidalis) were evaluated as animal feed in term of chemical composition and in vitro digestibility. Crude protein (CP) content was significantly (P < 0.05) higher in Echinochloa stagnina (9.7%) than in Echinochloa pyramidalis (6.5%). Acid-detergent fibre (ADF) (51.6%), Nitrogen-free extractive (NFE) (31.4), Neutral-detergent fibre (NDF) (69.8) and Ether extract (EE) (0.69) in Echinochloa stagnina were lower than in Echinochloa pyramidalis (55.7%, 35%, 73%, 0.95%) for ADF, NFE, NDF and EE respectively. Sodium (Na) content (0.7%) was significantly (P > 0.05) higher in Echinochloa pyramidalis than in Echinochloa stagnina (0.3%) and Calcium (Ca), Phosphorus (P), Potassium (K) and Magnesium (Mg) were (0.30% and 0.40), (0.60% and 0.60%), (1.60% and 1.70%) and (0.20% and 0.40%) in Echinochloa stagnina and Echinochloa pyramidalis respectively. In vitro dry matter digestibility (IVDMD) of Echinochloa stagnina (63%) was significantly (P > 0.05) higher than in Echinochloa pyramidalis (56%) as well as the values of Digestible acid-detergent fibre (DADF) (69.8%: 54%), Digestible neutral-detergent fibre (DNDF) (71%: 58.5%), and Digestible crude fibre (DCF) (38.3%: 33%). From obtained results it can be concluded that the two species of Echinochloa contribute most of livestock nutrients requirement. Further research required to improve their nutritional value, digestibility and feed intake.*

Key words: *Flood grass, Echinochloa stagnina, Echinochloa pyramidalis, Animal nutrition*

ORIGINAL ARTICLE

INTRODUCTION

Rangelands in Sudan occupy an area of 110 million hectares and provide about 62 million ton of feed for livestock, varied from open grassland to seasonal water courses, flood plains, river bank and associated island wood lands, hills and mountain slopes Harrison and Jackson (1958) and Wickens (1991).

River sides in Sudan, flood region and seasonal water land are rich with many types of grasses. According to Abusuwar (2007), river sides and seasonal swamps grasses with permanent moisture are mainly of the genus *Echinochloa* including the species: *echinochloa stagnina* (burdi) and *echinochloa pyramidalis* (Om fola), therefore its evergreen and supplies animals with green forages.

Vegetation in the flood region, 14% of the country, is associated with *Echinochloa pyramidalis* and *Echinochloa stagnin*a Sutcliffe (1974) and Petersen (2007). The major food items selected by herbivores in Dinder National Park Sudan were echinochloa sp Abdel Hameed (1985).

These wild grasses may grazed directly in dry season or purchased from market in nearby towns. Its consumed by all domestic animal species especially donkeys which contribute significantly to economic and social development in towns and rural communities in Sudan; where they were used mainly for transport , riding , pack transport and as draught animal for pulling carts.

Serious problem of feed shortage in Sudan especially green fodder will constrain animal production particularly in dry summer and this will incite to seek for easy and available substitutes. Accordingly to estimate feed resources for animals, this study aimed to evaluate *Echinochloa* species which is considered as a part of a solution for forages shortage in dry summer.

MATERIALS AND METHODS

Samples of *Echinochloa stagnina* and *Echinochloa pyramidalis* were cut and collected from banks of White Nile River near Kosti city in Sudan from area equal approximately one kilometer in December 2009.

Samples were dried and kept for further analysis. Chemical analysis for organic matter (OM), crude protein (CP), crude fiber (CF), nitrogen-free extractive (NFE), ether extract (EE) , total ash, sodium and potassium contents of

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the two samples were carried out according to A.O.A.C. (1990). Neutral detergent fiber (NDF), acid detergent fiber (ADF) and ADL were determined according to Van Soest et al (1991) Cellulose and hemicelluloses were then calculated.

Calcium (Ca) and magnesium (Mg) determination was carried out according to the method of Chapman and Pratt (1961). Total phosphorus was determined according to the method described by Hanson (1973) using spectrophotometer.

Dry matter digestibility of the samples was determined using the procedure 'tow-stage *in vitro'* described by Tilly and Terry (1963). Residues remained were analyzed in the term of (ADF) (NDF), (CP), and (CF) to determine their digestibility.

Metabolizable energy values were calculated from chemical composition according to the following equation adopted by Ellis (1981). ME (MJ/Kg DM) = 0.012 CP + 0.031 EE + 0.005 CF + 0.014 NFE Where: CP (Crude Protein), EE (Ether Extract), CF (Crude fiber), NFE (Nitrogen-free extractive).

Statistical analysis: Data were analyzed by a Student's t test Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Chemical composition of *Echinochloa stagnina* and *Echinochloa pyramidalis* are shown in (Table 1). CP content in *Echinochloa pyramidalis* (9.7%) was almost higher than in *Echinochloa pyramidalis* (6.5%) and both of them were within the range of crude protein content in grasses that reported by Bogdan (1977) and McDonald et al (2002). Similar to the results of crude protein content were informed by Gohl (1981) who reported 11.3% in *Echinochloa stagnina* and 7% *Echinochloa pyramidalis*. CP content of tropical grasses falls below 6-8 percent, appetite will be depressed by CP deficiency. Animal and grazing cattle required a diet of 10 percent CP on dry matter basis and mature cattle required 7% CP for maintenance (Skerman and Riverose 1990). Therefore CP in both *Echinochloa stagnina* and *Echinochloa pyramidalis* will influence animal appetite. And they may provide grazing cattle with maintenance requirement only.

Table 1 - Chemical composition% of *Echinochloa stagnina* and *Echinochloa pyramidalis*

	E. stagnina	*E. pyramidalis*	SEM	Level of significance
Ash	11.4	10.8	0.01	NS
CP	9.7	6.5	0.04	*
CF	37.9	37	0.001	NS
NFE	31.4	35	0.07	*
EE	0.7	0.95	0.03	*
NDF	69.8	73	0.02	NS
ADF	51.6	55.7	2.1	*
Cellulose	29	31.6	2.13	NS
Hemicelluloses	18	17	2.1	NS
Lignin	11.8	9.6	0.03	*

SEM= Standard error of means, * = P<0.05 , NS = not significant

CP requirements of donkeys are low; falling between 3-8% of the diet (Eduardo valdes, 2007). Hence *Echinochloa* species would adequate donkey's performance. Crude fibre content in *Echinochloa stagnina* (38%) was not differ much than in *Echinochloa pyramidalis* (37%) and both of them were within the range of crude fibre content of grasses mentioned by Bogdan (1977) who found 22 to 46% and McDonald et al (2002) who reported 20 to 45%. While Gohl (1981) found lower values of crude fibre content in *Echinochloa stagnina* 32.5% and *Echinochloa pyramidalis* 31.4%, this may attributed to stage of growth.

ADF (51.6%), NFE (31.4%), NDF (69.8%) and EE (0.7%) in *Echinochloa stagnina* were significantly (P < 0.05) lower than in *Echinochloa pyramidalis* (55.6%, 35%, 73%, 0.95%) respectively. Cellulose and Hemi cellulose showed no differ in two species and the results were in consistent with the range mentioned by McDonald et al (2002) who reported 20 to 30% cellulose and 10 to 30% hemicelluloses.

Major mineral contents of *Echinochloa stagnina* and *Echinochloa pyramidalis* are shown in (Table 2). Phosphorus (0.60%), potassium (1.60%), calcium (0.30%) and magnesium (0.30%) content in *Echinochloa stagnina* were more or similar to that in *Echinochloa pyramidalis* (0.60%, 1.70%, 0.40%, and 0.40%) while sodium content was higher significantly (P < 0.05) in *pyramidalis* (0.70%) than in *stagnina* species (0.20%).

Table 2 - Major mineral composition and silica % of *Echinochloa stagnina* and *Echinochloa stagnina*

	P	K	Ca	Mg	Na	Silica
Echinochloa stagnina	0.60	1.60	0.30	0.30	0.20	10.8
Echinochloa pyramidalis	0.60	1.70	0.40	0.40	0.70	14.5
SEM ±	0.01	0.1	0.05	0.03	0.6	1.5
Level of significance	NS	NS	NS	NS	*	*

SEM= Standard error of means, * = P < 0.05 , NS = not significant

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These results were agreed with mineral range content of tropical grasses reported by Skerman and Riverose (1990). Major mineral content in *Echinochloa stagnina* and *Echinochloa pyramidalis* were meet requirement of dairy cow, beef cattle, growing and finishing steers and heifers which adopted by Reid and Jung (1974) and by Cohen (1980).

IVDMD, DNDF, DADF and DCF in *Echinochloa stagnina* were 63%, 71%, 69.8% and 38.3% respectively (Table 3). These were significantly ($P < 0.05$) higher compared with 56%, 58.5%, 54% and 33% in *Echinochloa pyramidalis* and this may be due to the high indigestible component of silica founded in *pyramidalis* (14.5%) which was significantly ($P < 0.05$) higher compared with (10.8%) in *stagnina* species.

These results were compared favourably with the range of DMD reported by Skerman and Riveros (1990) who found range from 30 to 75% and Crowder and Cheda (1982) who reported up to 80% for DCP and reported high range, from 50 to 70% for DCF in many grasses.

Feed with less than 50% DM digestibility failed to meet the requirement of cattle Coppock et al. (1987) and Salih (1986). Hence, *Echinochloa stagnina* and *Echinochloa pyramidalis* were capable to meet cattle nutrient requirement in term of DM digestibility.

Table 3 - Apparent digestibility (%) of MD, CP, CF, NDF and ADF and ME (MJ/KgDM) of *Echinochloa stagnina* and *Echinochloa stagnina*

	IVDMD	DCP	DCF	DNDF	DADF	ME (MJ/Kg DM)
Echinochloa stagnina	63	79.8	38.3	71.0	69.8	7.7
Echinochloa pyramidalis	56	81.6	33	58.5	54	7.8
SEM	1.7	2.14	1.8	2.18	1.9	0.002
Level of significance	*	NS	*	*	*	NS

SEM= Standard error of means, * = $P < 0.05$, NS = not significant

CONCLUSIONS

River banks in the Sudan, flood plains and seasonal water courses are rich with the fodder of *Echinochloa* species. Species of *Echinochloa* were adequately able to meet most of livestock nutrients requirements. Further research required to improve their nutritional value, digestibility and feed intake. It would be also interesting to evaluate it's anti nutritional and anti-herbaceous factors.

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