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Tiller Regeneration: A Case Study of *Andropogon Gayanus* In Derived Savanna

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Abstract
*The study sought to determine tiller regeneration under different regimes of land management in a derived Savanna vegetation. The pilot study was meant to serve as a guide for effective land management and sustainability of the area. Andropogongayanus, a perennial grass species, and an important fodder for livestock and wildlife in the *Savanna was monitored in the study area to evaluate the effect of fire on it. Three plots of a hectare each were randomly marked out. Within the 3 plots consisting of burnt, slashed and standing or control, 30 tussocks each were marked out and pegged for weekly observations of new flush or tiller regeneration for a period of six months. The weekly numbers of new tillers were recorded against every pegged tussock in the 3 plots. There was significant difference in tiller regeneration between the plots. Tiller regeneration was adduced to be responsible for corresponding herbaceous production. Soil analysis of the three plots showed the burnt plot to be of superior quality in Carbon, organic matter, Nitrogen and Phosphorus content, followed by the slashed plot. The control showed the least content of the soil parameters. The implications of these in a derived savanna were discussed.*

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I. Introduction

Fire is an important factor in Savanna ecology. In Africa, fire history runs across geological timescales, from the pre-Quaternary times, into the current day (Weiss *et al.*, 1996; Bird & Cali, 1998;; Salzmann, 2000). Fire is considered as an important factor in shaping the Savanna landscapes. Many studies on modern vegetation covers show that physiognomy and species composition are highly influenced by human impact, particularly cultivation, livestock grazing and firewood gathering (Salzmann, 2000). Bush-burning is a common practice in the Savanna vegetation and fire serves as a valuable tool for bush control in rangelands. Burning of the dead, unpalatable grasses in the dry season is an essential part of pastoral and hunter-gatherer systems in Savannas. Savanna as a vegetational landscape cannot exist without periodic burning since fire maintains it (Usman, 2004).

Carrying capacity is the measure of the amount of individuals of any species that a particular environment can support without degrading the environment for present and future generations. No population can exist beyond the carrying capacity for very long. Sustainable development is a pattern of resources used that aims to meet human needs while preserving the environment so that those needs can be met not only in the present, but also for generations to come.

Anyigba area of the Derived Savanna belt in Nigeria is rich in agricultural produce that serves the state and the nation. It has no empirical data on herbaceous production or of the carrying capacity as obtained in other Savanna zones in Nigeria. Sustainability of the land and vegetation development necessitates the need for the study. *Andropogongayanus* is a perennial grass species, an important fodder for livestock and wildlife in the Savanna and is here employed as a case study.

II. Materials and Methods

Study area: Anyigba is located between latitudes 7^{o}301N and longitude 7^{o}101E within the Derived Savanna zone of Nigeria. It has an altitude of 420m above sea level and covers an area of approximately 40 kilometer square. The study was carried out at Iji Phase II area of Anyigba. The site was chosen because of its minimal human impacts and the homogeneous nature of its physiognomy and species composition.The area is characterized by a mean annual rainfall of about 1,000mm. Rainfall begins in April and ends in October. Rainfall has two maxima, July and September. Dry season begins in November and ends in March. Within the dry season, harmattan sets in.

Marking out plots: In the first week of February (2010) when herbaceous materials were dried up, three plots of one hectare each were sampled, following Usman, (1990), marked out, using strides (one stride being an equivalent of one meter). Fire trace was made around each of the plots. Controlled burning was administered in the first plot in March when herbaceous materials were thoroughly dried. The second plot was slashed to the ground level using cutlass and raked out. The third plot was allowed to remain untouched, representing the control plot. Within the 3 plots (burnt, slashed and standing), 30 tussocks each of Andropogongayanus were randomly marked out and pegged for weekly observations of new flush or tiller regeneration for a period of six months. Weekly numbers of new tillers were recorded against every pegged tussock in the 3 plots.

Soil Analyses: Using soil auger, soil samples were randomly removed (after clearing the litter layer), from different spots in the burnt, slashed and standing plots from th e top 15cm, labeled and carried in polythene bags to soil science laboratory of Kogi State University. In the laboratory, the labeled soil samples were air-dried for a week and sieved through a 2mm mesh to remove stones and root materials. The labeled soil samples (burnt, slashed and standing) were used to determine percentage organic carbon, percentage organic matter, total Nitrogen, available phosphorus and soil pH.

Determination of Soil Organic Carbon: Organic carbon was determined by the wet oxidation method of Walkley and Black as described by Allison, (1965). This method measures active or decomposable organic matter in the soil. Oxidizable matter in the soil sample were oxidized by $Cr_2O_7^{2-}$ and the reaction was facilitated by the heat generated when 2 volumes of conc. H_2SO_4 was mixed with 1 volume of 0.167M $K_2Cr_2O_7$solution. It was assumed that an average of 75% of the total organic carbon was attacked and the amount calculated from the titration was multiplied by 100/75 (1.33) to give percentage organic carbon. It was also assumed that soil organic matter contains 58% of carbon and the result was expressed as percentage organic matter multiplied by 100/58 (1.724).

Calculations

(a)% Organic carbon = (B – T)x M x 0.003 x 1.33 x $^{100}/_{wt}$

Where B = Blank titre value

T = Sample titre value

M = Molarity of (NH_4) 2Fe $(SO_4)2.6H_2O$

(b)% Organic matter = % Organic carbon x 1.724

(c) % Organic Nitrogen = $\frac{\%\ \text{total carbon}}{20}$

Determination of Phosphorus: Available phosphorus was determined by the Bray P – 1 method (Juo, 1978). 5g of soil that was screened through 2mm mesh was weighed and 35ml of extracting solution (30ml of 1M NH_4F and 50ml of 0.5M HCl) added. This was shaken for 1 minute and filtered. Using a colorimeter, sample readings were taken.

Calculation: P(ppm) = Sample reading x slope x $\frac{35}{5}$ x $\frac{50}{5}$

Determination of Soil pH**:** Soil pH was determined in water at a soil/solution ratio of 1:2.5 (weight/volume) after shaking thoroughly for 30 minutes. pH meter was used to read off the samples' values.

Plate 1: Sites at onset of experiment vs Tiller Regeneration

Burnt plot

Slashed plot

Control plot

Tiller Regeneration

Burnt Plot

Slashed Plot

Standing/Control Plot

III. Results

Tiller Regeneration:

TABLE I: Comparison of Total Tiller Regenerations in the Burnt, Slashed and Control Plots using ANOVA

Source of Variation	Sum of Square (SS)	Mean Square (MS)	Degree of Freedom (DF)	F-ratio calculated
Between plot	12383.36	6191.68	2	17.70
Within plots	30430.3	349.77	87	
Total	**42813.66**	**6541.45**	**89**	

There was significant difference in tiller regeneration among the plots.

Soil Analyses: The burnt plot had the highest value of organic carbon (0.605%), organic matter (1.04%), total Nitrogen (0.030%) and available phosphorus (34.30ppm). This was followed by the slashed plot and the control plot with the least values for the parameters.
PH values were 5.9, 5.4 and 6.1 for the burnt, slashed and control plots, respectively.

TABLE II: Results of Soil Analyses

Sample Identification	Organic Carbon	Organic Matter	Total Nitrogen	Phosphorus	pH
Burnt Plot	0.605%	1.04%	0.030%	34.30ppm	5.9
Slashed Plot	0.554%	0.95%	0.027%	7.00ppm	5.4
Control Plot	0.441%	0.76%	0.022%	3.50ppm	6.1

IV. Discussion

Fire increases herbage production and enhanced the flushing of new shoots as can be seen in the burnt plot. This result is in agreement with Sanford, (1980) and Usman, (1990) that fire stimulates the early flushing of perennial grasses. Because of the heat received, tussocks in the burnt plot regenerated faster, were fresher and greener compared with plots not burnt. This was an indication of the level of available nutrients (Table II). A vegetation dominated by plants with high Nitrogen concentration would likely have positive effects on mineralization rate (Grime, 1998). Without the scientific background of their activities, the herdsmen have over the years been cashing in on this principle of tiller regeneration in the much societally condemned bush burning. Tiller regeneration provides fresh flush of herbaceous materials for the cattle.

It was observed in this study that there was a positive correlation between total percentage Nitrogen and organic matter content. In the Savanna, water and nutrients are limiting resources for plant development. Water limitation is related to precipitation as well as soil physical factors. There is a relationship between annual rainfall and grass production.The grass species found in the study area were highly palatable and highly nutritious for ruminant animals most especially at flushing stages (Usman, 2004; Reddy, 2001). The presence of this species makes the area adequate for grazing. Such areas are best considered for grazing reserves. A mutual understanding and acceptance of this fact may help to minimize incidences of farmers/herdsmen imbroglio.

Fire is one of the four determinants of vegetation structures and ecosystem functions along with climate, shading and soil nutrient status and should not be eliminated from the Savanna for reasons mentioned above. If it is removed, Savanna will revert to forest. This will affect the level of protein in human diet as forests do not support livestock production due to the absence of grasses.

The scientific decision on the issue of fire should be on what the land is to be used for. If for timber production then fire should be eliminated to protect forest species but if for livestock production, then prescribed burning should be encouraged to provide fresh flush of perennial grasses for ruminants.

Savanna ecosystems are adapted to periodic fires. Burning regulates major functions and processes like regeneration, nutrient cycling, reproduction, preparation of seedbeds and clearing of accumulated dry matter. Burning improves the palatability of young pasture for grazing animals. Fire also eliminate parasites affecting livestock and wildlife and are used as cheap alternative to insecticides and herbicides.

References

[1]. Allison, L.E. (1965). *Organic Carbon*. In: Methods of Soil Analyses, Black, C.A. (Ed.). American Society of Agronomy, Madison, Wl., 1367 – 1382.

[2]. Bird, M.I. and Cali, J.A. (1998). A Million-year record of fire in the Sub-Saharan Africa. *Nature, 394:* 767 – 776.

[3]. Grime, J.P. (1998). Benefits of Plant Diversity to Ecosystem: Immediate, filter and founder effects. *J. Ecol., 86:* 902 – 910.

[4]. Juo, A.S.R. (1978). *Selected methods for soil and plant analysis*. Manual Series No. 1, International Inst. of Tropical Agriculture, Ibadan, Oyo State, Nigeria.

[5]. Reddy, D.V. (2001). *Applied Nutrition (Livestock, Poultry, Human, Pet, Rabbit and Laboratory Animals Nutrition)*. Oxford and IBH Publishing Co. Ltd, 122pp.

[6]. Salmann, U. (2000). Are Savannas degraded Forest? A Holocene Pollen Record from the Sudanian Zone of NE-Nigeria. *Vegetation History and Archaeo-botany, 9:* 1 – 15.

[7]. Sanford, W.W. (1980). Effects of Seasonal burning on Nigerian Savanna. *Proceed. MAB State-of-Knowledge Workshop on Nigerian Savanna*,Kainji, Nigeria.

[8]. Usman, S.S. (1990). Maximum herbaceous standing crop at Opi Lake Savanna Woodland. *Unpublished Ph.D. Thesis*, University of Nigeria, Nsukka, Nigeria.

[9]. Usman, S.S. (2004).*Nigerian Savanna*. Maxson Press, Makurdi, 92pp.

[10]. Weiss, K.F., Goldammer, J.G., Clark, J.S., Livingstone, D.A. and Andreae M.O. (1996). Reconstruction of Prehistoric Fire Regimes in East Africa by Lake Sediment Analysis. In: Levin, J.S., Editor. *Biomass Burning and global change*. 1, Cambridge (MA): MIT Press: 545.

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