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**Research Article**

# EFFECT OF SPLIT APPLICATION METHOD OF INORGANIC FERTILIZER ON THE NUTRITIONAL COMPOSITION OF VETIVER GRASS (*VETIVERIA NIGRITANA*)

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## ABSTRACT

The utilization of vetiver grass in south western Nigeria is still at a novel stage with the potential of it being introduced to farmers. The effect of split application method of inorganic fertilizer (urea 46%N) on the nutritional composition of the grass (Vetiveria nigritana.) was thus investigated. The study comprises of five treatments with varying level of nitrogen fertilizer application. The control (no fertilizer) treatment A (single application of 200kg/ha), treatment B (twice application at 100kg/ha each), treatment C (thrice application at 66.67kg/ha each) and treatment D( four times application of 50kg/ha each). Treatments were replicated thrice. The crude protein increases with increase in split method, treatments were significantly different (P > 0.05) from each other and highest value observed in treatment D (9.75%).The crude fibre decrease with increase in split method in fertilized plots. Treatment D with four applications is recommended because of it appreciating nutritional composition.

***Key Words:*** Vetiver grass, African dwarf sheep and goats, forage, pasture, Herbage.



## INTRODUCTION

The nutritional development of ruminant animals is subject to increase pasture production. Pasture has a great potential for increasing animal production. In Nigeria and many other countries in the tropics low yield, poor quality and inefficient utilization of natural pasture are some of the factors limiting livestock production (OkeAgu and Akinola, 1982). Improvement and development of pasture are initiated through a number of different approaches among which is the applications of fertilizer. There are also different methods of fertilizer application to meet the soil - plant- animal requirements. Split fertilizer application method is a system in which a known quantity of fertilizer is applied repeatedly with a predetermined interval of periods. This method has been known to reduce wastage of fertilizers to leaching and water run-offs**.** Vetiver grass (*Vetiveria nigritana*) is a fragrant grass originating from Africa, it belongs to the family graminea, sub-family panicoidae and tribe andropogonae (Greenfield, 1989), that's the same sub-tribe of grass family as maize, sorghum and lemon grass. Vetiver grass is environmentally friendly with high nutritive value for animal feed (Anonymous, 1993) and in addition a sustainable solution for stopping land erosion and conserving soil and water. Vetiver grass is a promising feed resource. Aderinola, *et al* (2008) fed vetiver grass to West African Dwarf (WAD) sheep and goat and observed that feed intake, digestibility and nitrogen balance of both West African Dwarf Sheep and Goats increased with increasing supplementation of vetiver grass with *Gliricidia sepium.* Annon (1990) and Panichol *et al.,* (1996) reported vetiver grass to be an edible herbage of high quality for ruminants especially in there growing season. Vetiver grass has relatively higher structural carbohydrate compared to native grasses and rice straw. It also has optimal level of crude protein considered to be enough to maximize intake and digestion of forage, these information affirms its potential usefulness as a forage plant (Annon 1990). This study aimed at determining the effect of split application method on the nutritional composition of vetiver grass so as to provide more information on the usage of fertilized vetiver grass by ruminant animals.

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## METHODOLOGY

### Experimental site

Existing *Vetiveria nigritana* field at the Pasture Unit of the Teaching and Research Farm of Ladoke Akintola University of Technology, Ogbomoso, Oyo State in the Derived Savannah zone of Nigeria was weeded and cut to a pre-determined height of about 15cm and the field was divided into five (5) plots of 5m x 5m plot each. Treatment was arranged in Randomized Complete Block design, The plot with no treatment was labelled "control" while others was labelled Plot A, Plot B, Plot C and Plot D. The study lasted 16 weeks during the period of the rainy season (June –September 2010). Each plot represents a treatment each which was replicated thrice to cater for the topography of the land. The entire plots except the "control" were treated with 200kg /ha of urea fertilizer (46%). Table 1 show the treatment applied.

### Data Collection

Soil sampling and analysis: Pre and post (at 16 WAP) soil sampling were carried out. The post cropping sampling was done according to the fertilizer rates used to determine the soil

physiochemical properties .The soil samples were collected with the aid of a soil auger at a depth of 15 cm. The samples were bulked and sub samples taken for laboratory analysis to determine total nitrogen, organic carbon, organic matter, potassium, phosphorus, magnesium, manganese and calcium contents. The result is presented in Table 3. Sub samples of the forage were cut from each replicate per treatment, thoroughly mix together for the determination of the proximate nutrient composition of the forage according to AOAC (1990) method while the fibre fractions was done according to Van Soest and Wine (1967) method.

**Statistical Analysis**

All data collected were subjected to statistical analysis of variance using computer statistical package of SPSS. Means were separated using Duncan Multiple Range Test at $P \leq 0.05$ of the same statistical package.

## RESULTS AND DISCUSSION

The proximate composition of vetiver grass as influenced by split application method of inorganic fertilizer is as shown in Table 2. Dry matter (DM) value observed in the control treatment and treatments B, C and D were similar ($P<0.05$). The crude protein is significantly different among treatments. The crude protein content increases with increase in split method and the highest CP content was shown in treatment D (9.75%).With high quantity of nitrogen fertilizer applied at a single application, more fertilizer will be exposed to leaching or run-off , however with split application lesser nitrogen will be washed away and subsequent fertilizer application will boost the nutrient content.

**Table 1: Treatment and application rate of urea fertilizer (46% n) with split method periods**

| Periods of application (week) | Control | Plot a | Plot b | Plot c | Plot d |
|---|---|---|---|---|---|
| Week 0 | Nil | 200kg | 100kg | 66.7kg | 50kg |
| Week 4 | Nil | Nil | 100kg | 66.7kg | 50kg |
| Week 8 | Nil | Nil | Nil | 66.7kg | 50kg |
| Week 12 | Nil | Nil | Nil | Nil | 50kg |

**Table 2: Proximate Analysis of Vetiver Grass**

| Percentage Composition | Control | Plot A | Plot B | Plot C | Plot D | SEM |
|---|---|---|---|---|---|---|
| DM | $43.34^{a}$ | $39.56^{b}$ | $42.82^{a}$ | $44.61^{a}$ | $42.59^{a}$ | 0.54 |
| CP | $7.10^{e}$ | $8.15^{d}$ | $8.61^{c}$ | $9.16^{b}$ | $9.75^{a}$ | 0.24 |
| CF | $36.43^{a}$ | $36.47^{a}$ | $34.00^{b}$ | $33.93^{b}$ | $32.00^{c}$ | 0.47 |
| ASH | $4.10^{c}$ | $4.97^{b}$ | $5.20^{b}$ | $5.43^{ab}$ | $5.90^{a}$ | 0.17 |
| EE | $3.09^{c}$ | $3.57^{c}$ | $4.75^{b}$ | $5.33^{a}$ | $5.80^{a}$ | 0.28 |
| NDF | $73.33^{b}$ | $73.17^{b}$ | $71.50^{b}$ | $79.67^{a}$ | $78.83^{a}$ | 0.98 |
| ADF | $52.67^{b}$ | $47.00^{c}$ | $54.83^{ab}$ | $50.00^{bc}$ | $56.00^{a}$ | 0.93 |
| ADL | $8.97^{a}$ | $8.23^{b}$ | $8.90^{a}$ | $8.10^{b}$ | $8.00^{b}$ | 0.12 |
| NFE | $49.27^{a}$ | $47.23^{b}$ | $47.44^{b}$ | $46.13^{b}$ | $46.55^{b}$ | 0.33 |

$^{a,b,c}$ means along the same row with different same superscript are significantly different ($P>0.05$)

**Table 3: Soil Composition of Vetiver Grass**

| Chemical Properties | Initial | Control | Plot A | Plot B | Plot C | Plot D | SEM |
|---|---|---|---|---|---|---|---|
| pH | 6.0 | 6.10 | 5.50 | 5.70 | 5.95 | 6.68 | 0.14 |
| %OC | 0.85 | 0.80 | 1.60 | 1.2 | 0.90 | 0.85 | 0.13 |
| % OM | 1.24 | 1.19 | 1.43 | 1.38 | 1.30 | 1.25 | 0.12 |
| %N | 0.08 | 0.09 | 0.17 | 0.14 | 0.12 | 0.10 | 0.11 |
| Mg (cm/kg) | 0.55 | 0.50 | 1.15 | 0.85 | 0.70 | 0.60 | 0.13 |
| K (cm/kg) | 0.19 | 0.20 | 0.36 | 0.27 | 0.24 | 0.21 | 0.11 |
| Ca (cm/kg) | 2.50 | 2.55 | 3.05 | 2.98 | 2.75 | 2.63 | 0.12 |
| P (mg/kg) | 9.3 | 9.21 | 9.03 | 8.75 | 8.45 | 8.05 | 0.16 |
| Mn (cm/kg) | 0.15 | 0.10 | 0.30 | 0.20 | 0.20 | 0.10 | 0.12 |

$^{a,b,c}$ means along the same row with different same superscript are significantly different ($P>0.05$)

The lowest CP content was observed in the control (7.10%). The crude fibre in the control and treatment A are similar (36.43% & 36.47%), it was significantly different from treatment B and C which were also similar (34.00% & 33.93%) and treatment D has the lowest crude fibre (32.00%). The crude fibre content decreasing with increase in fertilizer application was in agreement with the report of Bartholomew (2000) that increasing application of fertilizer decreases the crude fibre content of herbage. The ash content in treatment D is the highest (5.90%) but similar to that of treatment C. Values recorded in treatment B and A are also significantly similar ($P<0.05$) while the control has the lowest ash content (4.10%). The ether extract increase with increase in split application with the highest value recorded in treatment D (5.08%) and the lowest value in the control treatment (3.09%). The Ash content and ether extract increase with increasing split application. The increase in EE was in agreement with the findings of Aderinola (2008) who observed that ether extract contents of forages increase with increasing levels of fertilizer application. The Acid – detergent fibre (ADF) was observed to be inconsistent although highest ADF was observed in treatment D (56.00%) it was not similar to the work of Isah *et al* (2008) who reported 38% and 43% in giant star grass and lemon grass respectively.

The highest NDF value (79.67%) was recorded in treatment C, This was however similar ($P<0.05$) to treatment D (78.83%) the lowest NDF value was recorded in treatment B (71.50%), however similar ($P<0.05$) to the control treatment (73.33%) and treatment A (73.17%). The mineral content of the soil was as shown in Table 3 which consists of the pH, OC, OM, N, Mg, K, Ca, P and Mn. Among the treatments that received fertilizer applications, higher values were generally recorded in treatment A that received the fertilizer application at once. Values were observed to decrease with rate of split application with the lowest value recorded in treatment D. The highest soil ph value observed in treatment A shows a higher residual effect of acidity on the soil. The soil organic carbon, organic matter, magnesium and phosphorus decreases with increase in split application of fertilizer. Nitrogen causes and increases the organic matter available and influences the level of other nutrients in the soil which serves as the source of nutrient for the growth of the forage (Ayinde, 1998). The increase in phosphorus content at a single application also agrees with the previous work of Galloway *et al.* (2002) who reported that phosphorus at any planting period is always released in excess of it requirement for the next plant. Phosphorus helps in seed herbage production and increases voluntary intake of ruminant animals. Soil Calcium and manganese contents showed that there is increase in the treatment fertilized than the treatment not fertilized and this is because as the level of nitrogen in the soil increases, the amount of available manganese increased. Adeoye (1988) reported increase in amount of available manganese with increasing level of nitrogen in soil. The study shows that the split effect was more obvious in treatment D with four time application of 50kg/ha in term of nutritional composition. The strategic utilization of this method especially towards the late dry season will ensure availability of more nutritious forages to be conserved for animal use during the dry seasons.

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