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INFLUENCE OF STORAGE ON GROWTH AND BIOMASS PRODUCTION OF VETIVER GRASS *(VETIVERIA ZIZANIOIDES L. NASH)* SLIPS

P.E. OKORIE and O.M. SALISSOU,

Department of Forestry and Environmental management,
Michael Okpara university of Agriculture,
Umudike Nigeria
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ABSTRACT

The use of vetiver grass (Vetiveria zizanioides L. Nash) for environmental amelioration, especially soil erosion control in Nigeria is very recent. Few attempts to utilize it on a number of eroded areas in S.E. Nigeria gave encouraging results but relevant local data on the cultural techniques for its establishment are lacking. Investigations were therefore carried out at Michael Okpara University of Agriculture, Umudike, Nigeria to determine the effects of storage on its survival, growth and biomass production. A total of 240 slips were prepared and differently stored for 1, 2, and 3 weeks under shade and sunlight respectively, before planting in the field. Survival counts were taken at 3 and 5 weeks, heights of tillers were measured at the 7th week and total biomass production was determined 11 weeks after planting. The results showed that storage of vetiver slips beyond two weeks significantly affected its growth and biomass production. To avoid wastage of slips, the crop should be planted soon after preparation but certainly not beyond two weeks to ensure good growth and successful establishment.

INTRODUCTION

Few ecological disasters have posed as much problem to the Nigerian nation as desertification and soil erosion. Desertification devastates the far north while erosion in form of sheet and gully has done serious damage to the soils of the south, particularly, south-eastern Nigeria, resulting in over 1000 deep gullies (Kio and Okrie 1987). Considerable effort has indeed been made to contain the problem through engineering construction of channels and dams and biological means thro

afforestation. Early biological methods concentrated on planting such tree crops as cashew (Anacardium occidentale), bamboo (Oxytenanthera abyssinicia) and Gmelina (Gmelina arborea) in the most erosin-prone areas of Anambra, Imo, Akwa-ibom and Cross River states of Eastern Nigeri (Okorie 1992). More recent work discarded the use of cashew because it retarded rather than enhance the growth of undergrowth which is essential in both flood and erosion control (Holy 1980). Rather, such trees as irvingia gabonensis var excelsa, Pinus caribaea, Acacia auriculiformis, Cassia nidosa and Pentaclethra macrophyla among others were planted (Okorie 1993).

Over 300 hectares of plantations of these tree crops have been established in Eastern Nigeria, (Okorie 1995). The ground flora comprised mainly Acioa barteri, Centrosema pubescens and indeed, the 'Miracle Grass' Vetiveria zizanioides. Nevertheless, the use of vetiver grass in environmental work, especially, soil erosion control and land rehabilitation in Nigeria is very recent, from only the early 1990s. Basic local information on the grass was lacking and the only available useful, sustainable information was from the Vetiver Network published in Washington, United States of America.

Based on it, the Gully Erosion Afforestation Project (GEAP) of the Forestry Research Institute of Nigeria, planted several hedge-rows of vetiver at regular intervals to check erosion in selected critical areas including the Abia Stat Univerity, Uturu, in Abia State; Oraukwu and Nnobi Gully Complexes in Anambra State and Onicha-Mbaise and Okwudor gullies in Imo State. The results obtained were most encouraging since the various gullies were ultimately stabilized (Okorie 1993, 1995).

Despite these successes, it was necessary to investigate some cultural techniques for the establishment of the grass to serve the various environmental purposes that will demand it, including rehabilitation and restoration of degraded lands.

Vetiver grass, unlike tree crops, is usually planted at very short spacing, less than 0.5m x 0.5m. To establish a hedge-row within a short time, spacings as little as 15cm x 15cm or 20cm x 20cm are recommended (The World Bank 1990). Consequently, very large quantities of slips are often required to establish extensive hedge-rows which will effectively check massive soil erosion characteristic of most erosion-prone areas of Nigeria.

More-over, most of the slips are not raised in polythene bags. Rather, they are exposed and at best covered with some leaves and other grasses to reduce dessiccation, and may be left unplanted for a considerable length of time. It was therefore important to determine the critical period of storage beyond which survival, good growth and biomass production would be hampered. Investigations were therefore carried out to determine the critical storage periods for vetiver grass slips for good performance.

METHODOLOGY

The study was carried out in 1999 at the Michael Okpara University of Agriculture, Umudike (MOUAU) Nigeria, $5^{O}28'N$ $7^{O}35'E$ Attitude 122M, in the Humid tropics, with average annual rainfall of 217mm and Relative Humidity 72 and monthly ambient temperature range of $17^{O}C - 36^{O}C$. Some clumps of vetiver grass from the Vetiver Plot in the MOUA. Forestry and Ornamental Nursery, were uprooted with a spade. A total of 240 vetiver slips were detached from them. Each slip was cut to 15cm length with 2-4 roots, trimmed to about 2cm long using a secateur. The slips were subsequently divided into three sets of 60, 90, 90 slips each for subsequent treatment.

The first set of 60 slips were planted on the same day of preparation (To) after a short time 3-4 hrs. Storage; 30 under the nursery shade with temperature range of $26.5^{O}C - 28.8^{O}C$ while the other batch of 30 slips were left in the open at full sunlight with temperature range of $31^{O}C - 46^{O}C$. This was the first treatment. (To) which also served as the control.

The other two sets of 90 slips each were covered with small quantity of moist soil, wrapped with woven sack and stored separately under the nursery shade and the other under direct sunlight. 30 slips from each set were planted at one week (T_1), two weeks (T_2), and at 3 weeks (T_3), after preparation. The experiments laid out in a randomized block design were in three blocks (replications) and the slips were irrigated twice weekly, at 3 day intervals and monitored for 11 weeks. Survival counts were made at the 3rd and 5th weeks of planting. Heights of tillers and length of five most vigorous roots at 7 weeks after planting were measured, while total biomass production was determined at the end of the experiment using the method of Nwoboshi (1983). Data obtained were subjected to statistical analyses and mean differences were separated using Least Significant Difference (LSD)

according to Stell and Torrie (1960).

RESULTS

(i) Survival of slips

The survival % of the slips at 3 and 5 weeks after planting are shown on Table 1.

Table 1: Vetiveria zizanioides: Survival of slips at 3 and 5 weeks of planting following different storage conditions.

Weeks after Planting	T_0		T_1		T_2		T_3	
	Exposure Method							
	Light	Shade	Light	Shade	Light	Shade	Light	Shade
	%			%		%		%
3	100	100	76.7	76.7	50	46.7	36.7	20
5	100	100	66.7	70	50	43.3	36.7	16.7

T_0: Control: No storage
T_1: Slips stored for one week
T_2: Slips stored for two weeks
T_3: Slips stored for three weeks

The Control TO, gave the highest survival at 3 and 5 weeks while T3 gave the least both in the shade and direct sunlight's. Except for T3, storage in shade or sunlight did not have any significant (P =05) effect on survival of the slips.

(ii) Height of Tillers (leaves)

Table 2 shows that slips stored under sunlight generally gave better growth than those under shade and this was significant at 5% level. The control TO, gave the highest growth while slips stored for three weeks, T3 gave the least. Nevertheless, storage significantly (P = 05) affected tiller height growth.

Table 2: Vetiveria zizaniodies: Length of tillers at 7 weeks of planting after storage.

Treatment	Exposure Light	Methods Shade (cm)	Mean
T_0	58.6	57.5	58.0
T_1	49.7	44.2	46.9
T_2	48.4	45.2	46.8
T_3	48.9	37.5	43.2
Mean	51.4	46.1	

F – LSD (0.05)
Storage periods = 6
Exposure = 4.3
Interactions = NS

T_0: Control: No storage
T_1: Slips stored for one week
T_2: Slips stored for two weeks
T_3: Slips stored for three weeks

(iii) Root length

The control TO gave the best root length but the other treatments T1 –T3 gave much similar results irrespective of exposure method, in shade or under sunlight (table 3). There was therefore no significant difference (P –05) due to storage.

Table 3: Vetiveria zizanioides: Length of roots at 7 weeks after storage.

Treatment	Exposure Light	(cm)	Methods Shade	Mean
T_0	25.9		25.7	25.8
T_1	23.1		22.8	22.9
T_2	25.0		22.7	23.9
T_3	26.6		20.2	23.9
Mean	25.2		22.9	

F-LSD (0.05) was not done because the effects of both storage period and exposure method were not significant (P = 0.05). Storage x Exposure method interaction was also no significant.

(v) Biomass Production

The dry weights of the crop (ie total clump) at 11 weeks of growth are shown on Table 4. Except the control T_0, which had the highest biomass, the other treatments T_1-T_3 gave similar results in the table. T_0 was significantly different from T_1-T_3 which were not significantly different from (p = 05) from each other.

Table 4: Biomass Production of V. zizanioides at 11 weeks after growth.

Treatment	Exposure Light	Method Shade	Mean
	gm/clump		
T_0	5.3	5.0	5.2
T_1	3.7	3.6	3.6
T_2	3.4	3.5	3.5
T_3	3.3	3.3	3.3
Mean	3.9	3.8	3.3

F. LSD (0.05) Storage period 1.1

Storage/period was significantly at p = 0.05 level
Exposure method NS.
Storage x Exposure method NS.
T_0: Control: No Storage
T_1: Slips Stored for one week
T_2: Slips stored for two weeks
T_3: Slips stored for three weeks

DISCUSSION

The primary aim of this experiment was to determine succinctly the hardiness of vetiver slips after preparation to dispel misconceptions which local users of the grass had about slips that were not planted the same day they were prepared.

In earlier trials, slips were discarded if they were stored 2-4 days before planting, resulting in severe wastage of planting materials. The result of this experiment, though preliminary, have shown that vetiver slips could remain even under intense sunlight for over 7 days and yet retain their viability and suitability for planting in the field.

The idea of storing under sunlight was predicated by the realization that the availability of suitable shade to store planting material could hardly be guaranteed in most parts of Nigeria, particularly the Sahel Region of the country. In that case, the bunches of slips could naturally be left under intense sunlight for some time before planting. This investigation has proven that if the slips were planted 1-2 weeks after preparation , they would still do very well with survival rate of about 50% and biomas production of 3.4 gm/plant. This compared favourably with the results obtained by Marcelino (1996) stressing the very study

feature of vetiver grass. Storage in sunlight had the added advantage of enhancing tiller growth.

No doubt, it is best to plant the slips soon after preparation but where this is not possible due to logistic problems, the crop should not be stored beyond two weeks irrespective of exposure method, to ensure good performance in the field. Vetiver grass is a valuable crop used widely in the tropics for soil erosion control, water and soil conservation, and embarnkment stabilization among other uses. Since large quantities of its slips are often required for these environment. The results of this study showed that the slips can remain viable even after 3 weeks of storage either in a shade or sunlight. It is advisable to plant them soon after preparation for optimal growth and biomass production. However, where this is not possible, the slips should not be stored beyond two weeks.

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