

## Tiller Effects of Vetiver Grass (*Vetiveria zizanioides* (L.) Nash)

Mohammad Golam Moula and Mohammad Sayedur Rahman\*

Bangladesh Forest Research Institute  
Sholashahar, Chittagong, Bangladesh  
<gmoulabfri@yahoo.com>

### Abstract

A study on the nursery performance of vetiver grass (*Vetiveria zizanioides* (L.) Nash) was undertaken from June 2000 to June 2001 with different number of tillers. The percentage survivability (mean  $\pm$  SD) of the clump was found as  $73.08 \pm 1.57$ ,  $96.79 \pm 0.91$  and  $91.67 \pm 1.26$  for single, double and triple tillers, respectively. On the other hand, net tiller increment per clump (mean  $\pm$  SD) was found as  $10.21 \pm 0.81$ ,  $16.99 \pm 1.06$  and  $14.02 \pm 2.27$  for the single, double and triple tillers, respectively. The maximum number of tillers per clump was found with the double tillers. The results revealed that propagation of vetiver clump with double tillers is better than single or triple tillers.

**Keywords:** Clump, nursery performance, survivability, culm branch, culm cutting.

### Introduction

Vetiver is a perennial grass belonging to the family Poaceae. It is an ancient Old World grass and is found and cultivated in at least 70 countries over the globe (NRC 1993). It has multiple uses, such as forage, thatch and roofing materials, fencing materials, shedding materials, firewood, raw materials in cottage industries and medicinal herbs (Kirtikar and Basu 1986), soil conservation and in perfume industry (Bor 1960).

In the Old World tropics, the genus *Vetiveria* comprised of 11 species. Of these, five species are endemic to Australia, two are from Africa, one is the member of Southeast Asia, and one is endemic to Mauritius and neighbouring island of Rodrigues in the Indian Ocean (Rahman, *et al.* 1996). Out of the remaining two species, *Vetiveria lawsonii* is endemic to southern India and *Vetiveria zizanioides* occurs in Northeastern Indian and Bangladesh.

The generic name, *Vetiveria*, is derived from a Tamil word, 'vettiver' which refers to root that is dug up. The specific epithet, *zizanioides*, means by the riverside, reflecting the fact that the plant is commonly found along the waterways (NRC 1993). The root of vetiver grows extremely fast. The roots angle steeply downwards and do not appear to compete with neighboring crops. Tillers, culm branches and culm cuttings can do its multiplication. Under certain conditions, vetiver produces fertile seeds that can germinate. June to November is the flowering period of vetiver. It grows in low, damp sites such as bogs. It also grows very well on hillsides. The plant's environmental limits are surprisingly broad. It can grow on sites where annual rainfall ranges from 200 to 5,000 mm (Rahman, *et al.* 1996). It can withstand adverse climatic change. It can survive with temperature ranging from 0° to 50°C. Vetiver can grow on different types of soil (NRC 1993). It grows on both highly acidic (pH 4) and alkaline (pH 8) soil (Rahman, *et al.* 1996). It is mostly pest and disease resistant. Vetiver is both xerophyte and hydrophyte and once established, it can withstand drought, flood, windstorm, grazing animals, long period of water logging and other

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\* Bangladesh Betar, Chittagong-4100, Bangladesh  
<sayed\_radio@yahoo.com>

forces of nature except freezing. It cannot grow in saline area (Islam 2000). Although an extensive work has been done on the tiller effects of vetiver in some parts of the world, but there is no reported work in this respect in our country. So, the present study was undertaken to explore the survivability as well as propagation of vetiver under field condition.

### Study Area

A nursery of vetiver grass was established at Char Laxmi of Noakhali District under Char Osman Research Station, Plantation Trial Unit Division, Bangladesh Forest Research Institute (BFRI) in June 2000 with single, double and triple tillers to find out their survivability and increment performances. The selected land was a rain fed low agriculture land situated at the inner side of the Char Laxmi Embankment (59-3b polder), the Eastern Shoreline of Bangladesh. General characteristics of soils of the study area are given in Table 1.

## Materials and Methods

### Seedling Collection

Vetiver clumps were collected from Char Kasem, Amlibaria, Choto Bashdia, Baher Char of Patuakhali District from 16 to 19 June 2000 by uprooting the rhizomes and transported to the experimental site. The seedling collection site was the Western Shoreline of Bangladesh and the soil characteristics of the area are given in Table 1.

### Land Preparation

A total of three tilling was done up to a depth of 30 cm to prepare the land. *Cynodon* and other grasses were removed from the experimental field after second tillage. Before the last tillage, chemical fertilizers (NPK as urea, MP and TSP) were mixed at the rate of 30, 40 and 40 kg.h<sup>-1</sup> respectively. After the final tillage, laddering was done with a locally made ladder. Then the nursery beds were prepared.

### Nursery Bed Preparation

The nursery beds were prepared at the size of 365.76 cm x 91.44 cm. A 30.48 cm drain was prepared around the beds for drainage of water and other maintenance and observation purposes.

### Nursery Design and Layout

A Randomized Complete Block Design (RCBD) was followed with three treatments:

Treatment 1 ( $T_1$ ): Vetiver with single tiller.

Treatment 2 ( $T_2$ ): Vetiver with double tillers.

Treatment 3 ( $T_3$ ): Vetiver with triple tillers.

Each treatment was replicated (defined as block) three times:

Block 1	$T_1$	$T_3$	$T_2$
Block 2	$T_3$	$T_1$	$T_2$
Block 3	$T_2$	$T_3$	$T_1$

### Outplanting the Seedlings

Vetiver clumps were separated with single, double and triple tillers. Then the clumps were sown at 30.48 cm spacing. Thus a total of 52 (4 x 13) clumps was planted in each plot on 25 June 2000.

### Data Collection and Analysis

After one year (24 June 2001) the total number of tillers was counted manually from the survived ones. The percentage of clump survival rate was counted by using the following formula:

$$\text{Clump survival rate (\%)} = \frac{(\text{Number of clump planted} - \text{Number of clump survived})}{(\text{Number of clump planted})} \times 100.$$

On the other hand, net increment of tiller per clump was calculated by using the following formula:

$$\text{Net increment of tiller per clump} = \frac{(\text{Total number of tiller at count} - \text{Number of tiller planted})}{(\text{Number of clump planted})}.$$

### Result and Discussion

Survival percentage of vetiver clump for different number of tillers is shown in the Table 2. The survivability of vetiver grass was found in the order of  $T_2 > T_3 > T_1$ . The survivability of vetiver clump showed a highly significant difference between  $T_1, T_2$  and  $T_1, T_3$  at 0.1% level of significance while a significant difference was found between  $T_2$  and  $T_3$  at 5% level of significance. Xia (2003), in his two-month period of study, found the survival rate of vetiver as 70, 81 and 98% for the single tiller, double and triple tillers per clump, respectively. In the present study, the survival rate of vetiver clump in case of single and double tillers was found higher, while for the triple tillers it was found lower in comparison to the findings of Xia (2003).

The net increment of tillers per clump of vetiver grass for different number of tillers is shown in the Table 3. The mean of the net increment of tillers per clump was found in the order of  $T_2 > T_3 > T_1$  with the value (mean  $\pm$  SD) of  $16.99 \pm 1.06$ ,  $14.02 \pm 2.27$  and  $10.21 \pm 0.81$ , respectively. However, the net increment of tillers per clump between  $T_1, T_2$  was found highly significantly different at 0.1% level of significance while there was found a significant difference between  $T_1, T_3$  and  $T_2, T_3$  at 5%

level of significance. Xia (2003), in his two-month study, found the net increment of tillers per clump as 1.19, 1.30 and 2.03 for single, double and triple tillers, respectively. Yoon (1993) found the net increment of tiller as 6.2 and 5.2 for the single and triple tillers, respectively, over a period of four-month study. The present study showed higher rate of increment of tillers per clump, which might be due to the prolonged experimental duration.

Xia (2003), in his two-month period of study, found a maximum of 51 tillers with the triple tillers whereas in the present study, a maximum of 81 tillers was found with the double tillers. Yoon (1993) also opined for use of three tillers as starting material for multiplication purpose, but the present study showed that double tiller is better than triple tiller.

### Conclusion

The productivity of vetiver grass depends on the number of tillers. Considering the survivability, tiller increment and maximum number of tillers observed in the present study, it may be concluded that propagation of the vetiver grass with double tiller is better than that of single tiller or triple tiller.

Table 1. General characteristics of soils along the Eastern Shoreline of Bangladesh.

Soil characteristics		Eastern shoreline	Western shoreline
Texture		Silty to silty-clay loam	Sandy loam to silty-clay loam
$p^H (H_2O)$		8.0-8.3	7.5-8.1
ECe ( $dSm^{-1}$ )	Wet season	3.0-4.5	1.5-2.5
	Dry season	5.5-12.0	3.0-7.5
Salinity		slight to moderate	slight to moderate
Organic carbon (%)		0.5-2.5	0.5-1.8
Total nitrogen (%)		0.08-0.20	0.05-0.15
Available nutrients	N (ppm)	60-150	65-125
	P (ppm)	15-20	15-20
	K (ppm)	200-250	200-300
	S (ppm)	150-250	150-250

Sources: Hasan (1987); Cahudhuri and Choudhury (1994); Karim (1994); Khan *et al.* (1998).

Table 2. Survival percentage of vetiver grass (clump).

Treatments	% of survival			
	Plot - 1	Plot - 2	Plot - 3	Mean ± SD
Vetiver grass with single tiller (T <sub>1</sub> )	73.08	75.00	71.15	73.08±1.57
Vetiver grass with double tillers (T <sub>2</sub> )	96.15	98.08	96.15	96.79±0.91
Vetiver grass with triple tillers (T <sub>3</sub> )	93.31	90.38	92.31	91.67±1.26

Table 3. Net increment of tillers per clump.

Treatments	Net increment of tillers per clump			
	Plot - 1	Plot - 2	Plot - 3	Mean±SD
Vetiver grass with single tiller (T <sub>1</sub> )	10.71	9.06	10.85	10.21±0.81
Vetiver grass with double tillers (T <sub>2</sub> )	17.06	15.65	18.25	16.99±1.06
Vetiver grass with triple tillers (T <sub>3</sub> )	13.71	11.40	16.94	14.02±2.27

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