Tropical Agricultural Research & Extension 13(4): 2010

Effect of Potting Mixture on Plant Growth, Yield and Oil Quality of Vetiver (*Vetiveria zizanioides* L)

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Accepted :14th September 2010

ABSTRACT

Vetiver is an economically important plant used in ayurvedic medicine and for extraction of some essential oils. The present study was undertaken to determine the effect of potting mixture on plant growth, root yield, oil content and oil quality of Vetiver. Plants grown in top soil : sand mixture (at 1:2) showed higher plant growth, oil content and quality as compared to other treatments.

Key words: *Oil content and quality, Root yield, Potting mixtures, Vetiveria zizanioides*

INTRODUCTION

Vetiver, (*Vetiveria zizanioides*) (Poaceae), is an important medicinal and aromatic plant. Economically most important part of the Vetiver plant is root. It is used for the treatment of arthritis, rheumatism, lumbago, sprain *etc.* Vetiver roots are used for extraction of essential oil which has a profoundly relaxing effect on the nervous system, relieving tension and stress (Maffei 2002).

One of the main problems in Vetiver production is the root damages caused during harvesting that reduce the harvestable yield. During manual harvesting 40% of the roots remain in the soil after harvesting (Maffei 2002). The damaged roots also affect the oil quality. Plant growth, root yield, oil yield and quality depend on various factors such as growing media, climatic conditions, quality and age of the roots. Hence a demand exists to determine a suitable growing media to increase the harvestable root yield while improving oil yield and oil quality.

MATERIALS AND METHODS

A pot experiment was carried out at the Medicinal Plant Garden, Faculty of Agriculture, University of Ruhuna. For the experiment fourteen different potting mixtures such as top soil: sand (1:1) (T_1), top soil: sand: coir dust (1:1:1) (T_2), top soil: sand: coir dust (1:1:2) (T_3), top soil: sand: paddy husk (1:1:1) (T_4), top soil: sand: paddy husk (1:1:2) (T_5), top soil: sand: saw dust (1:1:1) (T_6), top soil: sand: saw dust (1:1:2) (T_7), top soil: sand 1:2 (T_8), top soil: sand: coir dust (1:2:1) (T_9), top soil: sand: coir dust (1:2:2) (T_{10}), top soil: sand: paddy husk (1:2:1) (T_{11}), top soil: sand: paddy husk (1:2:2) (T_{12}), top soil: sand: saw dust (1:2:1) (T_{13}), top soil: sand: saw dust (1:2:2) (T_{14}) were used as different treatments with four replicates. Black polythene bags of 35cm height and 30cm width were used to fill potting mixtures. Tillers were used as planting material taken from mother stock maintained at the Medicinal Plant garden. Leaves of tillers removed 3cm from the base and a single tiller was planted per pot. Experiment was laid out in a Completely Randomized Design with 80 × 30 cm^2 pot spacing. Watering was practiced for first four weeks after planting for the proper root establishment and thereafter plants were grown under rain fed conditions. Weeding of pots was done at two month intervals.

Shoot and root dry weight, number of tillers and number of leaves were recorded at 9 month after planting. The data were analyzed using ANOVA with Statistical Analysis System (SAS). Roots were air dried for 3 weeks for the extraction of oil through steam distillation. Extracted Vetiver oils were analyzed for Khusimol, β- Vetivenene, β-Vetivone and α- Vetivone using Gas Chromatography Internal normalization method (ISO 7609-195 E).

RESULTS

Significantly higher ($P \leq 0.05$) root dry weight (521g) was recorded in plants grown in potting mixture of top soil: sand: coir dust (1:2:2) followed by potting mixture of top soil: sand (1:2) (482g) (Figure 1). It is reported that in South India, the average fresh root yield is around 4 -5 t/ha with a maximum of 7.6 t/ha (Chadha 1995). In Sri Lanka the local demand mainly supplied through the harvest from the wild.

Vetiver plants grown in potting mixture containing top soil: sand: coir dust (1:2:2) recorded significantly higher ($P \leq 0.05$) shoot dry weight (1,277g) followed by shoot dry weight (1,091g) of plant grown in potting mixture of top soil: sand (1:2).

The significantly higher ($P \leq 0.05$) number of tillers were recorded in Vetiver plants grown in potting

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Paper presented at the 2nd National Symposium, Faculty of Agriculture, University of Ruhuna

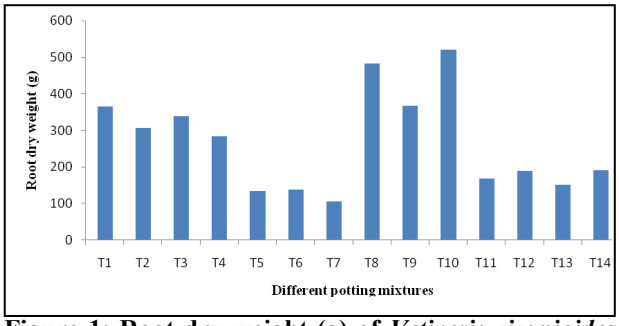

Figure 1: Root dry weight (g) of *Vetiveria zizanioides* grown in different potting mixtures

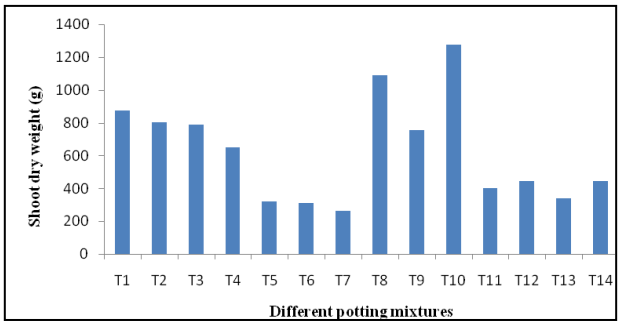

Figure 2: Shoot dry weight (g) of *Vetiveria zizanioides* grown in different potting mixtures

mixture containing top soil: sand: coir dust (1:2:2) (58) followed by plants grown in potting mixture of top soil: sand: coir dust (1:2:1) (48) and top soil: sand (1:2) (46). Significantly higher ($P \leq 0.05$) number of leaves of Vetver was recorded in potting mixture, containing top soil: sand: coir dust (1:2:2) (308) followed by top soil: sand 1:1 (298) and top soil: sand 1:2 (296) respectively.

Plants grown in potting mixture with paddy husk found unsuitable for *Vetiveria* root production because of the lower yield and adhered husk particles to the roots. Higher amount of sand and coir dust can retain adequate moisture and ability to provide better aeration for the root growth and development of *Vetiveria*. This may be one of the reason for better growth and yield performances occur at the top soil: sand: coir dust (1:2:2) than other treatments.

The quality of oil depends upon the age of the root and the length of distillation period (Maffei 2002). If the roots stay in ground for over two years, the yield of oil diminishes considerably as the root system tend to become woody and lose in essential oil content and the oil becomes very viscous with a dark colour but of high quality (Chadha 1995). Because of these reasons root samples taken from 9 months after planting was used for the oil extraction.

Table 1: Percentages of oil and its components in Vetiver grown in different potting mixtures

Treatments	Oil %	β-nene %	Vetive-β-Vetivone %	Khusimol %	α-Vetvone %
$T_1S_1P_1$	**1.84**	**1.6**	**4.0**	**13.7**	**5.7**
$T_1S_1C_2$	**1.80**	**1.3**	**3.6**	**16.1**	**5.4**
T_1S_2	**1.78**	**0.8**	**4.5**	**16.3**	**6.4**
$T_1S_2C_2$	**1.74**	**0.9**	**4.3**	**15.8**	**6.3**
$T_1S_1P_2$	**1.70**	**0.9**	**4.9**	**15.9**	**7.0**
$T_1S_1C_1$	**1.68**	**1.0**	**4.3**	**15.0**	**5.8**
$T_1S_2P_1$	**1.62**	**0.7**	**5.3**	**15.0**	**7.0**
$T_1S_2W_1$	**1.60**	**1.1**	**4.7**	**13.1**	**6.1**
$T_1S_2P_2$	**1.48**	**1.1**	**3.9**	**14.3**	**5.5**
$T_1S_1W_2$	**1.46**	**0.1**	**4.6**	**13.5**	**7.0**
$T_1S_2C_1$	**1.46**	**0.2**	**3.5**	**15.3**	**5.5**
$T_1S_1W_1$	**1.44**	**0.4**	**4.7**	**16.7**	**6.3**
$T_1S_2W_2$	**1.06**	**0.4**	**4.2**	**15.9**	**5.4**
T_1S_1	**1.86**	**0.4**	**3.9**	**16.9**	**6.3**

(T – Top soil, S – Sand, C- Coir dust, P- Paddy husk, W- Saw dust)

Khusimol is an important active ingredients used in quality assessment of Vetiver (Maffei 2002). Plants grown in top soil: sand (1:2) mixture had appreciable levels of oil and β- Vetivenene, β- Vetivone, Khusimol, α- Vetivone.

Plants grown in mixtures containing top soil: sand: coir dust (1:2:2) and top soil: sand (1:2) showed the highest growth and yield with higher oil content and quality than other treatments. *Vetiveria* grown in mixtures containing coir dust particles had coir dust adhered to the roots and made cleaning a labour intensive process. Coir dust also affected badly on oil distillation process and reduced the purity of the oil. Because of these practical difficulties observed in the top soil: sand: coir dust (1:2:2) potting mixture, top soil: sand (1:2) mixture is considered as the most promising potting mixture for Vetiver root production.

ACKNOWLEDGEMENT

Department of Ayurveda, Ministry of Indigenous Medicine is greatly acknowledged for the funds provided for this research project.

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