INCREASED EFFICIENCY IN VETIVER PROPAGATION WITH THE USE OF GROWTH PROMOTERS

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Abstract

Vetiver Farms, Inc. is a company based in the Philippines which sells and propagates vetiver and its related products. At present, the Philippines has a high demand for vetiver for use in controlling soil erosion and slope stabilization. Because of this, the company had to increase its production targets and improve some of its farm practices. This study reports the testing of several growth hormone solutions in shortening the growing period of vetiver. The growth rate was found to have increased considerably and can potentially reduce the growing period by as much as 50 %.

Introduction

Vetiver Farms, Inc. is a private company in the Philippines which sells among other things vetiver slips mainly for soil erosion control. Among the different projects for which the company supplies vetiver slips are road construction by the government, housing developments mostly located along mountainsides, and golf courses. In the few years of its existence, the company has experienced an increase in demand for the plant partly due to the economic crisis, which has heightened the need for a cheap means of controlling soil erosion, and to the growing acceptance in the Philippines of vetiver technology. Another reason could be the growing trend among developers to make soil erosion control measures pleasing to the eye, and using plants seems to answer this need.

Because of the increase in demand for vetiver, the normal wait of two months to come up with quality plants is too long. There is a need to shorten the growing period for vetiver. One of the alternatives explored by the company included the use of various growth promoters. The company surveyed the various brands available in the market and tested these in its operations, with mixed results.

This study was conceived to answer the basic question of what hormone mix would be useful in a nursery for propagating vetiver slips in polythene bags. The study seeks to establish that hormone treatment shortens the growing period and to determine the optimum concentration of growth promoters to be used.

We also tried to determine what type of growth effect is produced in a few weeks – increase in length, weight, solid content and number of shoots.

The findings of the study will serve as a guide to improve present farming practices and potentially reduce costs in the long term. However, a limited number of solutions and concentrations of hormones was used for the study. Long-term effects would not be seen and would require assessment of the performance of the plants in the field after planting in the project sites of which data are still being gathered and are thus not presented in this report.

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Methodology

Mother plants of vetiver were gathered from the field and 10 000 plant slips were prepared for use in the experiment. Planting and preparation of slips were done in a nursery. No special treatment was given to the plants and no effort was done to pre-select the plant slips to be used in the experiment. These precautions were taken to ensure that findings of the study would be applicable in a normal farm setting and not to make results seem artificial.

The plants were grouped into several treatments and coded as follows: W, RA, RB, RC, EMA, EMB, BA, BB and BC. Each group had 1 000 plants each. All the plants were pre-soaked before planting in the following solutions:

Treatment group	Solution	Auxin content (ppm)
W	Water	0.0000
RA	Auxin	0.3400
RB	Auxin	0.5100
RC	Auxin	0.6800
BA	Brand A	0.4150
BB	Brand B	0.1392
BC	Brand C	62.0000
EMA	Auxin + minerals	0.3400
EMB	Auxin + minerals	0.6800

** Brands A, B and C were mixed as suggested in label*
** Brand C contains several minerals*

After soaking for 15 to 20 minutes, the plant slips were individually planted in polythene bags and placed in plots (Fig. 1). The plants were randomly withdrawn after three weeks and measurements were made. The length and weight of the shoots and roots were taken as well as the number of slips counted.

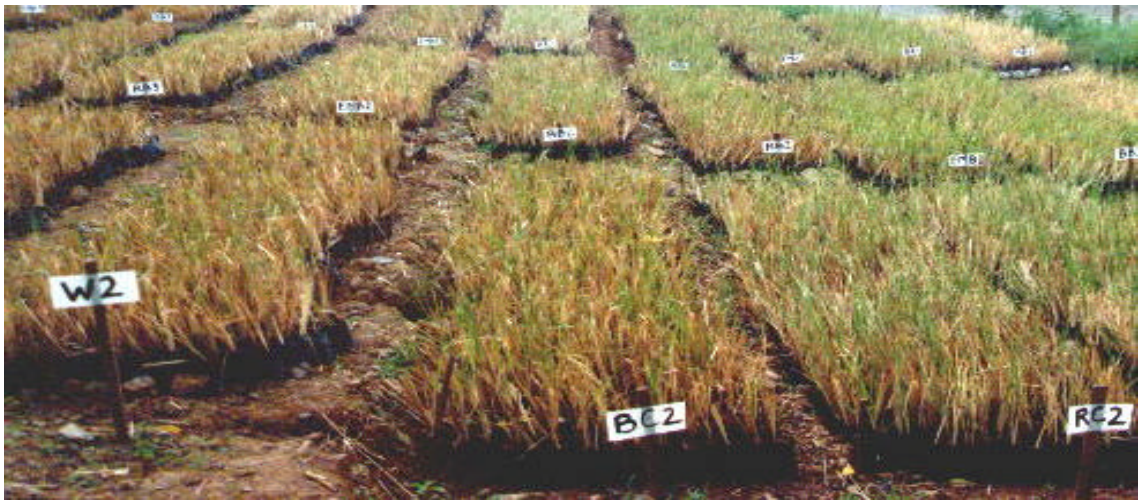

Fig. 1. Vetiver slips in polythene bags arranged in their respective plots

Results and Discussion

Plant samples withdrawn within the first and second weeks did not show appreciable changes in length or weight for either the shoots or roots (data not shown). However, on the third week the plants exhibited slight differences in growth pattern and biomass. As seen in Fig. 2, the difference between the various treatment groups is quite apparent from pictures of samples taken from the W, RA, RB and RC plots.

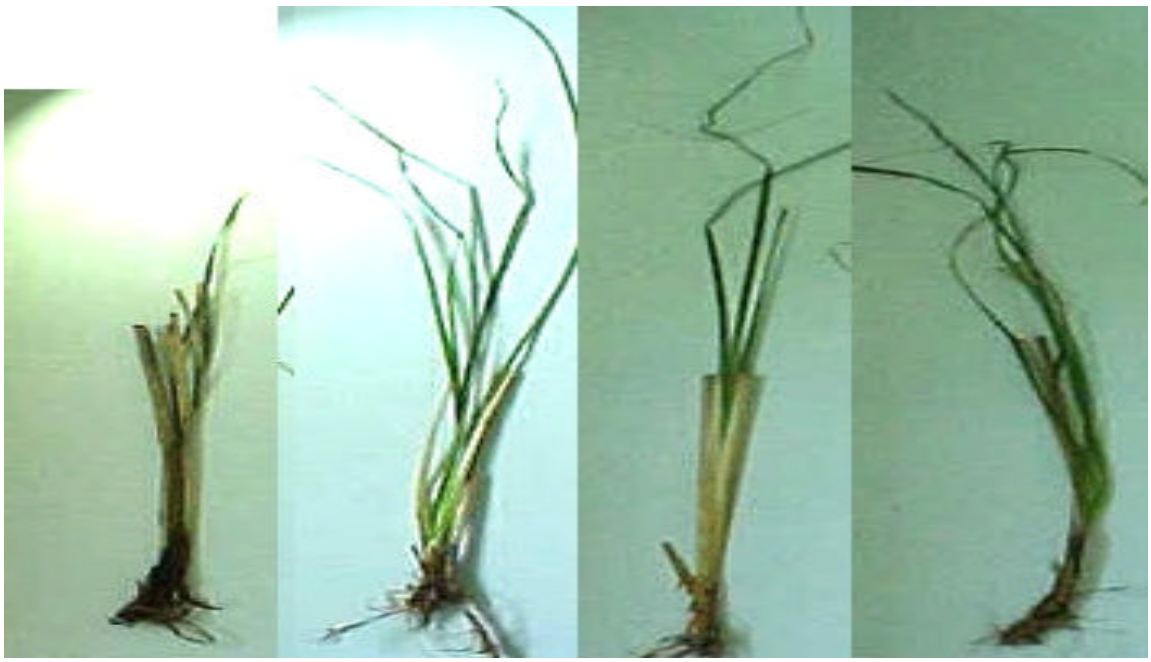

Fig. 2: Plant samples withdrawn on the third week from groups W, RA, RB & RC (L-R)

The shoot length measurements (Fig. 3) were significantly different from each other (ANOVA, P=0.03). Group RA exhibited the highest average length three weeks after planting. Groups RB and RC, although having been treated with higher levels of auxin, exhibited a lower average shoot length compared to group RA. Groups RA and RB were found to have similar effects on shoot growth with auxin levels at .34 and .51 ppm respectively. Group RC had the highest auxin content among the three treatment groups and had an effect similar to that of water. The decrease in shoot length average for group RC could mean that the auxin level applied is excessive. A different physiological response is achieved with this concentration and not the desired effect of increasing shoot growth.

Group	Average
W	50.00
RA	72.33
RB	71.17
RC	53.00

Fig. 3. Average length of shoots measured on the third week after planting for treatment groups W, RA, RB and RC

The root length data (Fig. 4) also had almost similar trends compared to those of the shoot length data. Root lengths were found to be significantly different (ANOVA, P=0.00039). Group RA had the greatest effect with root lengths almost doubling that seen in the group treated with just water (W). However, group RB and RC both had decreased root lengths. These data suggest that the optimum auxin level must be around 0.34 ppm (the auxin level of treatment group RA). The decrease in root

length is quite understandable since increased auxin levels are known to promote shoot and inhibit root growth in certain elevated concentrations.

Group	Average
W	10.83
RA	20.33
RB	10.50
RC	7.50

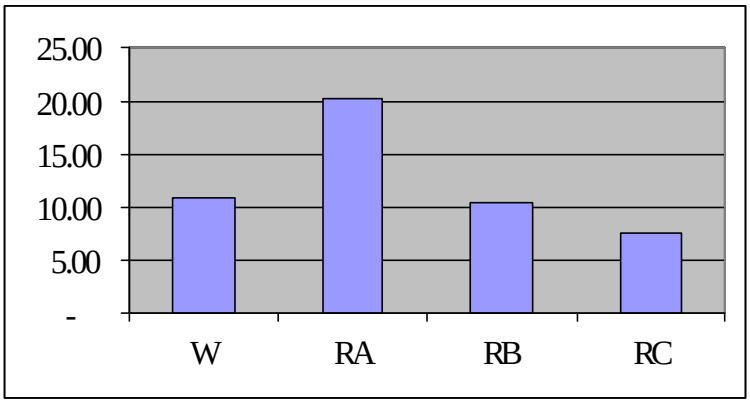

Fig. 4. Average length of roots measured on the third week after planting for treatment groups W, RA, RB and RC

Taking these results into consideration, the concentration of auxin to be applied onto vetiver plant slips should be about 0.34 ppm. This level would achieve a potential increase in shoot growth of approximately 45% on the average and increase in root growth of approximately 88% on the average. The data suggest that the growing period of vetiver slips treated with 0.34 ppm of auxin can potentially be reduced by 50 % or more. If the normal growing period is of about two months, then the plants would be ready in just under a month when treated with 0.34 ppm of auxin.

Fig. 5 shows the comparison between the shoot and root length measurements done on the treatment groups for the different brands of growth promoters in the market.

Group	Shoot	Root
W	50.00	10.83
RA	72.33	20.33
BA	65.50	14.33
BB	71.17	7.83
BC	66.33	11.17
EMA	58.67	9.50
EMB	67.83	11.17

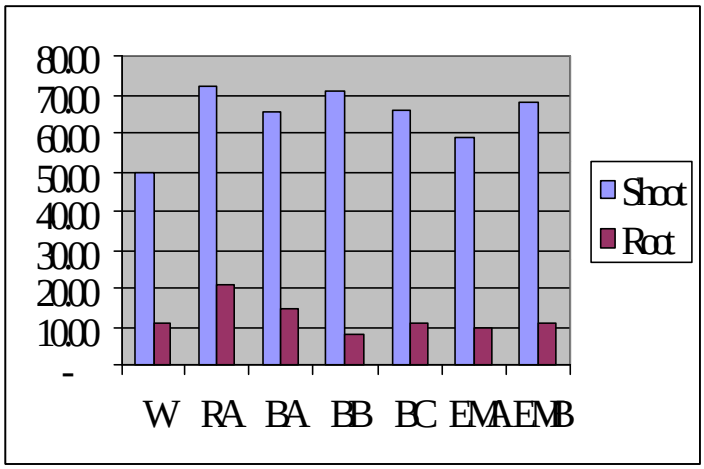

Fig. 5: Average length of shoots and roots for W, RA, BA, BB, BC, EMA and EMB

For Brand A (BA), the shoot length is slightly lower than compared to group RA (auxin = 0.31 ppm). This is despite the fact that BA has a higher auxin content. The optimum levels for auxin must lie below 0.415 ppm. Brand B showed almost the same average length measurements as RA. Brand B had an auxin content of 0.139 ppm. These data suggest that the optimum auxin level for shoot growth is about 0.34 ppm.

Brand C (BC) had similar results as BA, despite the fact that BC contains an excessive amount of auxin. This result could mean that Brand C contains other components, which may have balanced out the effects of auxin. Groups EMA and EMB are formulations of hormone solutions, which contain some minerals similar to those of group BC. The effect as expected was similar to that of Brand C (BC). The results seen in groups BC, EMA and EMB seem to be more complex than could be explained simply as an effect of the auxin content. Apparently, mineral content of the solution used is a prime consideration. It is hard to come up with any clear explanation of the effects observed but one

may infer that growth is affected by factors relating to the availability of nutrients and consequently the presence of certain plant hormones, the interaction of which creates a unique effect to the plant.

The root measurements for the treatment groups BA, BB, BC, EMA and EMB had trends similar to those of the shoot measurements. The only difference was that Brand B had a lower root average length measurement compared to either RA or Brand A. The data again suggests that auxin levels of about 0.34 ppm are optimum for root growth.

Weight measurements of the shoots and roots were also done. The values gathered were not significantly different from each other (data not shown).

In conclusion, the study found that shortening the growing period is possible with hormone treatment. The gain in shoot and root length in just three weeks is almost double that of the control (water, W). An auxin level of about 0.34 ppm is preferred since this amount does not appreciably inhibit root growth and yet produces a good enough shoot growth.

NB: The data presented here are incomplete and the group is awaiting additional information to come from other analyses being done in the laboratory.

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