The effect of different growing media on growth performance of *Clinacanthus nutans*

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Abstract. The effect of different growing media on the growth performance was tested for *Clinacanthus nutans* (Sabah snake grass). Five different growth media including T1: soil, T2: soil: coco peat (2:1), T3: soil: peat moss (2:1), T4: soil: coco peat (3:1) and T5: soil: peat moss (3:1) were used for growing *Clinacanthus nutans*. Height of the plants (cm), number of leaves, number of side branches, length of side branches (cm), root length (cm) and root weight (g) were determined. The chemical properties of each growth medium, including pH, nitrogen, phosphorus and potassium were also determined. The aim of this study was to measure the growth rate of *Clinacanthus nutans* affected by the different growing media. The findings of this study showed the height of the plants (cm), number of leaves, length of side branches (cm), root length (cm) and root weight (g) were affected significantly when the plants were grown in soil mix with peat moss in T3. The finding of this study showed that the increased of nutrient in the growth media can be useful in the growth performance of the *Clinacanthus nutans*.

1. Introduction

The common name of *Clinacanthus nutans* is Sabah snake grass. It is a perennial herb under a family of Acanthaceae [1]. This species is a popular plant in Malaysia and Thailand because of its high medicinal values until it has been recognized as one of the Thailand’s National List of Essential Medicines (2001) by the National Drug Committee [2]. It is high in antioxidant properties and has high potential in slow down or lessens the cancer cell in human body [3]. The leaves are important because of the present of bioactive compound and phenolic compounds. This species is often vegetative propagated by stem cuttings [4] because it is easily, economical, and also produces a high multiplication rate.

The plant vigor, a greater number of shoots and leaves are important features for good survival and growth of the plants. The growth of aerial part depends on the subterranean plant parts. As for the best plant growth, the suitable environment must be provided to the root system [5]. Thus, choosing a good growing medium is fundamental for the plants to grow healthy. Growing media described as materials used through which plant roots grow and extract water and nutrients [6]. Good growing media consist of mixtures of two or more ingredients. Every ingredient contains different chemical and physical properties that can improve the growth of the plants. Therefore, experiment on growing of *Clinacanthus nutans* with different types of growing media had been carried out to investigate the best growing media that can be used to initiate the most significantly growth performance of the plant. The objectives of the
study were: (i) to investigate the growth rate of *Clinacanthus nutans* affected by the different growing media used and (ii) to conduct the chemical analysis of the growing media.

2. Materials and methods

2.1 Plant material
*Clinacanthus nutans* was bought from local nursery. Stem cutting of *C. nutans* was used as the propagation technique. Ten stems cutting of the plants were used for each treatment. For five different treatments, 50 stems cutting of the plants were used. The plants were watered accordingly on the started day of the treatment. The observation was carried out for eight weeks and the result was collected. The growth measurement of *C. nutans* were taken on-site.

2.2 Growth media preparation
The stem cutting of *Clinacanthus nutans* were planted in polybags (6 × 6 cm) containing five different combinations of soil, coco peat and peat moss. The different compositions of the growing medium evaluated were as follow: T1: soil, T2: soil: coco peat (2:1), T3: soil: peat moss (2:1), T4: soil: coco peat (3:1) and T5: soil: peat moss (3:1).

2.3 Chemical analysis
A chemical analysis of all the growing media was carried out before and after the treatment. In conducting this method, Soil Test Kit (brand: Environmental Concepts 1662) was used. For every growth medium, the pH, nitrogen, phosphorus and potassium were determined.

2.4 Growth measurement
The growth rate parameter for the plant height, number of leaves, number of side branches, length of side branches, root length and root weight were recorded. For the plant height and length of side branches were measured by using ruler or thread in cm unit. While the number of leaves and number of side branches were counted manually. Root length was measured by using graph paper and ruler in cm unit and as for root weight was measured by using electronic microbalance in gram unit.

3. Results and discussion
The result showed the influenced of the different growing media used in *Clinacanthus nutans* on the growth rate. Table 1 showed five treatments contain of different types of growing media with different ratios were treated to the plants to observes the growth performance for each of the treatment. The best used of growing media that had higher in nutrient content proved the best in the growth performances and as for the growing media that had low in nutrient content, the growth performances was a little bit slower. It was proved that chemical characteristic of the growing media gave an importance effect on the growth of the plants.

In general, growing media in T3 (2 soil: 1 peat moss) gave the highest values of growth parameter such as height of plant, number of leaves and root length which were significantly higher than all the rest of the media. T3 had the most appropriate physical characteristics as well as a high level of nutrient content compared to other treatments and thus gave the highest values for most of the growth parameters measured in this study (Table 2).
Table 1. Chemical analysis of the growing media

| Chemical properties | pH  | Nitrogen   | Phosphorus | Potassium |
|---------------------|-----|------------|------------|-----------|
| T1 (Soil)           |     | Before     |            |           |
|                     |     | After      |            |           |
| T2 (2 soil: 1 coco peat) |     | Before     |            |           |
|                     |     | After      |            |           |
| T3 (2 soil: 1 peat moss) |     | Before     |            |           |
|                     |     | After      |            |           |
| T4 (3 soil: 1 coco peat) |     | Before     |            |           |
|                     |     | After      |            |           |
| T5 (3 soil: 1 peat moss) |     | Before     |            |           |
|                     |     | After      |            |           |

Table 2. Effect of different growing media on vegetative plant characteristic of Clinacanthus nutans

| Treatment        | Plant height (cm) | Number of leaves | Number of side branches | Length of side branches (cm) | Root weight (g) | Root length (cm) |
|------------------|-------------------|------------------|-------------------------|-------------------------------|-----------------|-----------------|
| T1               | 1.42              | 10.3             | 0                       | 2.8                           | 0.2             | 7.6             |
| T2               | 1.08              | 3.5              | 0                       | 0.5                           | 0.3             | 6.5             |
| T3               | 1.53              | 17.7             | 0.3                     | 9.7                           | 0.6             | 23.7            |
| T4               | 0.85              | 3.7              | 0                       | 0.4                           | 0.2             | 5.9             |
| T5               | 1.37              | 14.6             | 0.6                     | 6.1                           | 0.4             | 15.4            |

Figure 1. Plant height of Clinacanthus nutans under different treatments

One of the parameters measured was the height of the plant. All the five treatments showed the increasing result in height of the plants. T3 (2 soil: 1 peat moss) showed the greatest growth in height by increased of 1.53 cm in height. Whereas, T4 (3 soil: 1 coco peat) increase of only 0.85 cm, present
the lowest in growth height (Figure 1). T3 had the higher nutrient content (phosphorus and potassium) compared to T4 which was deficient in all nitrogen (N), phosphorus (P) and potassium (K). Nutrients uptakes were important for the physiological growth of the plants. Limited N, P and K supply decreases rates of cell division, cell expansion and cell permeability [7]. Thus, shorter plants under N, P and K deficiency might have been due to their effects on cell elongation as well as cell division [7]. This caused the lower in photosynthetic rate.

Moreover, Figure 2 showed the higher in result of the number of leaves for all type of treatments. T3 showed the greatest growth in the number of leaves by increasing of 12.7 numbers of leaves. The less growth in the number of leaves was T2 by only increase of 3.5 numbers of leaves. Leaf number was significantly different for every level of nutrient concentration. Fewer numbers of leaves produced under deficient N, P and K conditions resulted from the decreased net photosynthesis.

![Figure 2. Number of leaves of Clinacanthus nutans under different treatments](image)

Followed the same trends in other parameters, T3 gave the best significantly in values of the root length with 23.7 cm in length and the least in length was T4 which was 5.9 cm (Table 2). For the root length, it can be the key parameter as it plays an important role for the plant to absorb the nutrient and capturing water. The longest root (T3) developed an extensive root system thus it could help the plants absorbing more water and nutrient for successful in growth and development of the plants [8].

4. Conclusion
This study had been developed to observe the significant existed in the growth rate of Clinacanthus nutans grow with the different growing media. The changes showed in the growth parameters of those plants effect due to the different nutrient content. Plants grow in T3 showed the superior in growth performance due to high in nutrient content of the growing media with mixed with peat moss while plants grow in T4 showed the minimum in growth performance as the nutrient content of the growing media mix with coco peat is low. Therefore, peat moss is the best mixture of growing media compared to coco peat due to the higher in nutrient content. Thus, the selection of the appropriate medium of growth for plants (in this case Clinacanthus nutans) is very important to ensure the best in growth performances.
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