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EFFECT OF ROOTING MEDIA, NAPHTHELINE ACETIC ACID AND GIBBERELIC ACID (GA_3) ON GROWTH PERFORMANCES OF *CHIRITA MOONII*

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ABSTRACT

The effects of rooting media and Naphthelene Acetic Acid (NAA) on rooting as well as Gibberallic Acid (GA_3) on growth and flowering of the endemic wild plant *Chirita moonii* were investigated. Two rooting media (i.e. sand alone and sand + coir dust (1:1)) with four levels of NAA (0 mg/l, 100mg/l, 150mg/l and 200mg/l) in factorial combinations were used to investigate the most suitable rooting media and NAA levels for rooting of soft wood cuttings. Three rooting media of sand, coir dust and sand + coir dust (1:1) with four levels of NAA (0 mg/l, 1000mg/l, 2000 mg/l and 3000 mg/l) were tested on rooting of leaves. Effect of five concentrations of Gibberalline (0 mg/l, 50 mg/l, 100 mg/l, 150 mg/l and 200 mg/l) on growth and flowering of seedlings were investigated. Significantly higher ($p<0.05$) root fresh weight, root length and root vigour were observed in cuttings grown on sand +coir dust (1:1) medium treated with 150mg/l NAA. Cuttings planted in sand + coir dust medium had a higher shoot length compared to cuttings grown on the sand alone medium. NAA levels did not affect shoot growth. Leaves planted in sand + coir dust (1:1) medium treated with 1000 mg/l NAA recorded the highest root fresh weight, number of roots and root length. Plants treated with 150 mg/l GA_3 showed the best plant height, inter nodal length and highest number of branches. GA_3 did not show any flowering in C*hirita mooii.*

Key words: endemic wild plant, growth media, sand coir dust medium

INTRODUCTION

Floriculture in Sri Lanka is an important foreign exchange earning sector, which also generates employment opportunities. However, lack of new varieties/ novelties is one of the major constraints faced in the expansion of the floriculture sector in Sri Lanka. Thus the introduction of wild flora with promising characters to the industry would be an ideal solution to solve this problem. (Krishnarajha *et al*., 2002).

Chirita moonii is an endemic wild flowering plant that belongs to the family Gesneriaceae. It is an irregularly branching shrub with woody base and produces very large solitary flowers in the upper leaf axils (Dassanayake, 1987). Sustainable utilization of *Chirita moonii* would lead to the twin benefits of conserving the species and also introducing a novelty to the floriculture industry.

Propagation of *Chirita moonii* can be done asexually by using cuttings and leaves or sexually through seeds. Naturally dispersed seeds germinate under favorable conditions. These plants are generally collected and used in house holds as ornamentals. Large scale extraction of plants from natural habitats can decrease populations to very low levels and may lead to extinction (Pathirana and Seneviratna, 2001). However, the technology available for the cultivation of endemic plant species such as *Chirita moonii* is very limited. Therefore, this study was aimed to determine the best rooting media, appropriate levels of NAA on rooting and effect of GA_3 on growth and flowering of *Chirita moonii*.

MATERIALS AND METHODS

Experiments were conducted to study the effects of rooting media, levels of Naphthelin acitic acid (NAA) and Gibberelic acid (GA_3) on the rooting, growth and flowering of *Chirita moonii*.

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Effect of rooting media and NAA levels on rooting of *C. moonii* cuttings.

A series of NAA solutions, 100 mg/l, 150 mg/l and 200 mg/l were prepared. Soft wood cuttings of 10-15 cm length were taken and the basal ends of the cuttings were dipped in each hormone solution for 5 minutes prior to planting. The treated cuttings were planted in two steam sterilized rooting media (sand alone and sand: coir dust 1:1) in plastic pots (11cm x 8cm).The experiment was arranged as a two factor factorial experiment in complete randomized design.

Shoot length, number of leaves and rooting percentage were recorded at two weeks intervals up to 3 months. Average root length, fresh weight and root vigour were recorded three months after planting.

Effect of rooting media and NAA levels on rooting of *Chirita moonii* leaves.

1000, 2000, and 3000 mg/l NAA solutions were prepared. Three rooting media *i.e.* sand, sand + coir dust (1:1) and coir dust only were tested. Semi matured leaves of *Chirita moonii* were collected from green house grown plants and dipped in the NAA solutions separately for 10 seconds prior to planting. Treated leaves were planted in 11cm x 8cm plastic pots containing three rooting media and kept in single propagators for rooting.

The number of primary roots, average root length, rooting percentage, root vigour (visual observation of healthiness of the primary roots) and fresh weight of roots were recorded three months after planting.

Effect of Gibberelline on growth and flowering of *Chirita moonii.*

Three months old seedlings, planted in sand + leaf mould (1:1) were used in this experiment (*i.e.* seedlings from self pollinated seeds). Gibberelic acid solutions of 50, 100, 150 and 200 mg/l were prepared. These hormone solutions were applied as foliar applications. Plant height, number of leaves, inter nodal length, leaf size, number of branches and number of flowers were recorded at two weeks intervals.

Statistical Analysis

Statistical analysis was performed using SAS (Release 9.1). Factorial CRD and GLM procedure was applied for the analysis of data. The significance of the difference between means was performed by the Least Significance Difference (LSD) test.

RESULTS

Effect of rooting media and NAA levels on rooting of *Chirita moonii* cuttings.

The highest root fresh weight was observed in cuttings planted on sand + coir dust (1:1) medium and treated with 150mg/l NAA. The lowest root fresh weight was observed in cuttings planted on sand medium without NAA treatment. Significantly ($p<0.05$) higher root length (Fig. 1) was observed in sand + coir dust (1:1) medium at 150mg/l NAA level (T7). Furthermore, significantly higher ($p<0.05$) mean root vigour (Table 1) was observed in sand + coir dust (1:1) medium at 150 mg/l NAA level. Root vigour decreased with the increase of NAA concentrations beyond 150mg/l concentration as well as in treatments without NAA or lower concentrations of NAA. Roots grown in sand medium were less vigourous and had short root hairs. They had lower numbers of adventitious roots compared with those grown in sand + coir dust medium. Between the two rooting media, the highest mean shoot length was observed in sand + coir dust medium.

A significantly ($p<0.05$) high mean shoot length was observed in cuttings treated with NAA. The lowest shoot length was observed in untreated cuttings. No significant difference was observed among plants grown from cuttings treated with varying levels of NAA three months after rooting. Treatments did not have any significant effect on percentage of rooting.

Table 1. Effect of rooting media and NAA on root length, shoot length, root vigour and rooting percentage of *C. moonii* cuttings.

Treatments			Mean root length	Mean shoot length	Mean root vigour	Mean rooting percentage
Code	Media	NAA (mgl^{-1})				
T1	sand	0	3.9^{g}	6.5^{f}	11.8^{h}	80^{b}
T2	sand	100	5.3^{f}	7.0^{c}	18.0^{g}	100^{a}
T3	sand	150	5.5^{e}	7.2^{d}	45.0^{c}	80^{b}
T4	sand	200	5.3^{f}	7.0^{e}	33.4^{e}	80^{b}
T5	sand + coir dust	0	6.0^{d}	7.7^{e}	30.0^{f}	100^{a}
T6	sand + coir dust	100	8.1^{c}	8.1^{b}	41.9^{d}	100^{a}
T7	sand + coir dust	150	9.4^{a}	8.3^{a}	62.0^{a}	100^{a}
T8	sand + coir dust	200	8.4^{b}	8.1^{b}	52.0^{b}	100^{a}
L.S.D. ($p=0.005$)			0.1697	0.1734	1.9268	0

Means with the same letter are not significantly different.

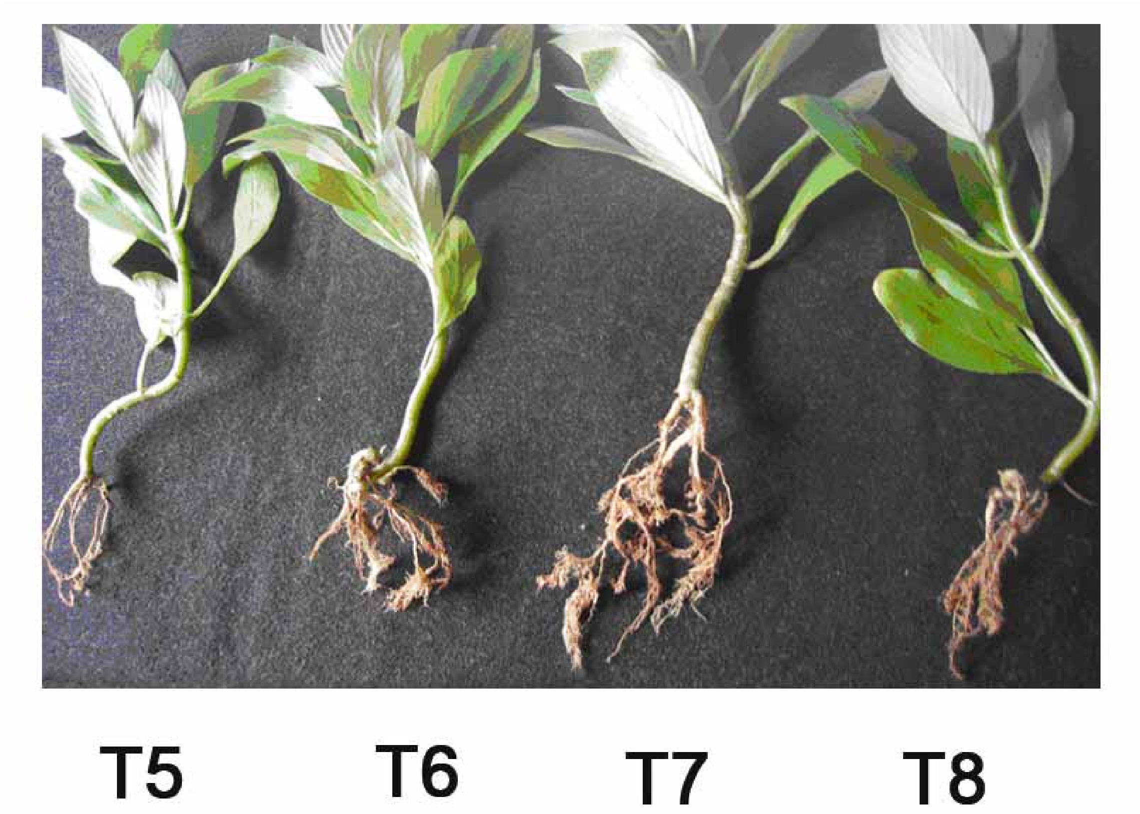

Figure 1. Soft wood cuttings of *C. moonii* grown in sand + coir dust medium (T5-0mg/l NAA, T6-100mg/l NAA, T7-150mg/l NAA, T8-200mg/l NAA).

Effect of rooting media and NAA levels on rooting of *Chirita moonii* leaves.

Maximum rooting of 100% was observed in the treatment of coir dust with 1000mg/l, 2000mg/l and 3000mg/l NAA concentrations. Comparatively poor rooting was observed in sand medium with 2000mg/l and 3000mg/l NAA levels.

Among all treatments, sand + coir dust (1:1) medium with 1000mg/l NAA, had significantly high mean root fresh weight at 5% significance level (LSD = 0.0932). After 3 months of planting , media containing coir dust with 1000mg/l NAA and sand + coir dust medium with 1000mg/l NAA (Fig. 2) showed significantly high mean average root length and high root vigour compared to other treatments at 5% significance level (LSD = 0.9332). Root length decreased with increasing concentrations of hormones.

Maximum number of roots was observed in 1000mg/l NAA level followed by 2000mg/l. Poor rooting was observed in 3000mg/l and 0mg/l NAA levels. Number of primary roots decreased with increasing concentrations of hormone.

Effect of Gibberalline on growth and flowering of *Chirita moonii*.

Significantly taller plants (Table 2) were observed in plants treated with 150mg/l and 200mg/l GA_3 levels. Untreated plants had poor growth compared to the treated plants. Plants treated with 50mg/l, 150mg/l and 200mg/l GA_3 levels had significantly high inter nodal lengths compared to the other treatments. The lowest inter nodal length was observed in the control (0 mg/l GA_3). Mean number of leaves were significantly increased in seedlings treated with 100 mg/l, 150 mg/l and 200 mg/l GA_3 levels. The highest mean number of branches (Table 2) was observed in 150 mg/l (T4), followed by the 100mg/l and 200mg/l Gibberalline levels. Untreated plants had the lowest number of branches. Application of GA_3 (*i.e.* at all concentrations) resulted in a significantly ($p<0.05$) high mean petiole length. The lowest petiole length was observed in untreated plants. No significant differences were detected between the different GA_3 treatments. The treatments had no significant effect on the number of flowers.

Table 2. Effect of GA_3 on plant height, inter nodal length, number of leaves, length of petiole, number of branches and number of flowers of *C. moonii*.

Treatments		Height of Plants	Inter nodal length	Number of leaves	Petiole length	Number of branches	Number of flowers
Code	GA_3(mgl^{-1})						
T1	0	25.4^c	3.4^c	3.5^d	1.87^b	0.4^c	3.5^a
T2	50	37.3^b	6.0^{ab}	5.1^c	3.2^a	1.8^{bc}	3.8^a
T3	100	36.8^b	5.6^b	5.4^{bc}	2.9^a	2.9^{ab}	3.5^a
T4	150	42.2^a	6.4^a	6.9^a	3.0^a	2.3^b	3.8^a
T5	200	39.0^{ab}	6.2^{ab}	6.6^{ab}	3.1^a	4.1^a	3.7^a
L.S.D. ($p=0.05$)		4.33	0.69	1.42	0.28	1.77	0.97

Means with the same letter are not significantly different.

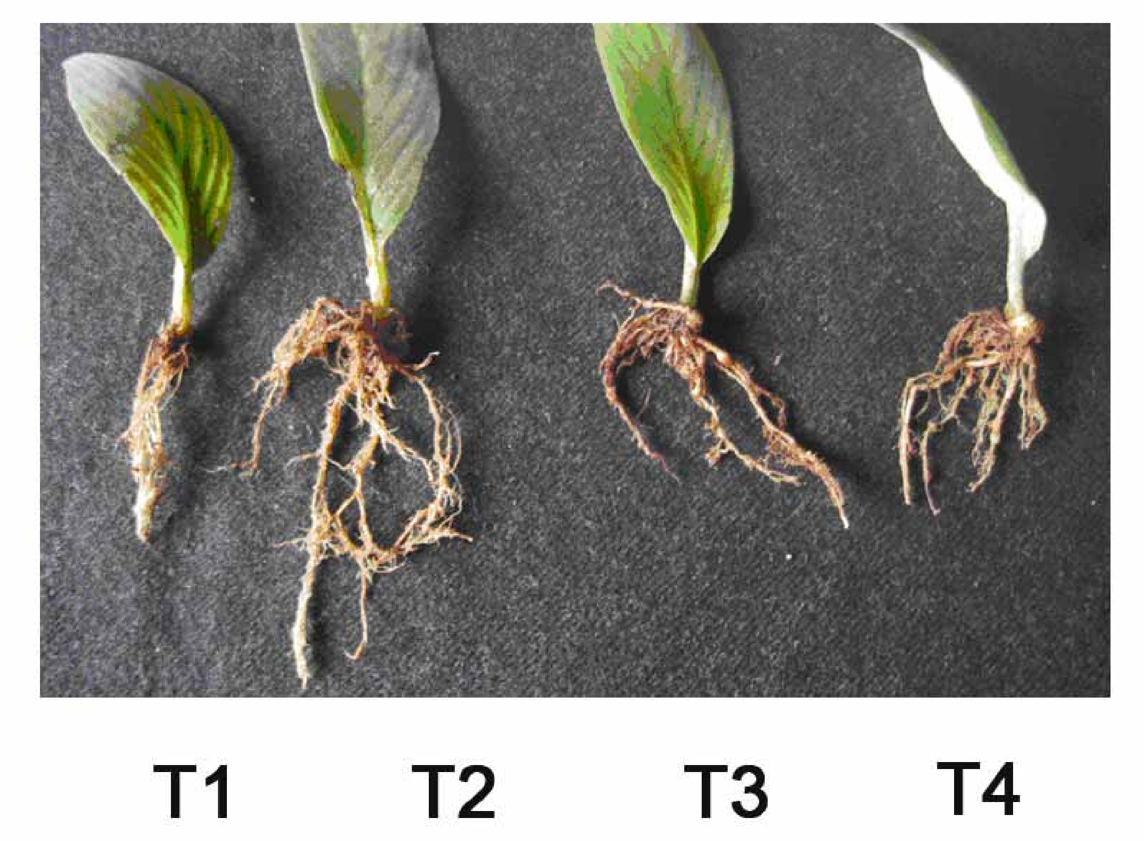

Figure 2. Leaves of *C. moonii* grown in sand + coir dust medium (T1- 0mg/l NAA, T2- 1000mg/l NAA, T3-2000mg/l NAA, T4-3000mg/l NAA).

DISCUSSION

Results of the present study showed that the auxin NAA promoted rooting in cuttings and leaves of *C. moonii*. Several workers have reported promotion of rooting by auxins in other plant species (Cope and Mandel, 2000). Use of NAA resulted in higher root fresh weight, root length and root vigour of *Chirita moonii*. All treated plants produced significantly high yields over the control treatment where no NAA was incorporated. However, performance of NAA was affected by the rooting media. The main reason for best performance of sand + coir dust medium with 150 mg/l NAA level in cuttings and 1000 mg/l NAA level in leaves, may be the high nutrients and high water holding capacity of the medium, since roots need to absorb water to increase their length. Coir has a low particle density indicating it' s high specific surface, which contributes to the high adsorption of water and ions. Coir dust has a high water holding capacity. The cataion exchange capacity of coir dust is also very high because of it' s high specific surface. Swamy *et al*., 2002 also observed that auxin treatments significantly enhanced the number of roots, root length, leaf number and the leaf area in *Robinia pseudoacacia* stem cuttings. In rooted cuttings, increase in concentration of auxins generally increased number of leaves and plant height. This can be attributed to the fact that auxins may have mobilized carbohydrates and borons from the leaves, which promote growth activities (Altaman and Wareng, 1975). Root length and number of primary roots of rooted leaves decreased with high concentrations of hormone. This implies the rates from 2000mg/l to 4000mg/l were too high and killed the cells. When auxins are too high they are injurious to the cells (Tchoundjeu and Leakey, 1998).

Use of GA_3 increased plant height, inter nodal length, number of leaves and number of branches of *Chirita moonii*. The best performance was recorded with GA_3 at 150mg/l. This is due to stimulation of cell elongation and cell division by GA_3 at the cellular level. Application of GA_3 significantly increased number of leaves and the number of branches in *Lagenaria siceraria* (Rahaman *et al*., 1992). It has been reported that plant height, number of leaves, leaf width, inflorescence length, flower length, flower width, number of flowers and rhizome weight of *Bleamcanada chinesis* can be increased and the time required for flowering can be reduced by applying 100 ppm GA_3 (Bhuj *et al*., 1998). However GA_3 did not affect flowering of C*hirita moonii* in this study. Thus, GA_3 cannot be recommended to manipulate flowering of *C. moonii.*

CONCLUSION

According to the experimental results; sand+ coir dust (1:1) medium with 150mg/l NAA level was best for root growth performances in soft wood cuttings of *C. moonii*. Sand + coir dust (1:1) medium with 1000mg/l NAA was best for root growth performances in *Chirita moonii* leaves. 150mg/l GA_3 was the best for growth performances in *Chirita moonii* seedlings.

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