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Propagation of *Bauhinia kockiana* Korth through stem cuttings as affected by maturity stage of cuttings and different biofertilizers

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ABSTRACT

Bauhinia kockiana Korth (Kock's Bauhinia) belongs to family Fabaceae and is consisting with effective anti-cancer substances. Currently plant is propagated by air layering and it takes longer duration to flower. Also it is not practicable for mass propagation. Thus, the present study was conducted to find out the suitability of stem cuttings as mass propagation method. Three types of stem cuttings (Top, Semi-Hard Wood and Hard Wood) with four types of bio fertilizers (jeewamruthum, vermi wash, fish tonic and indo chinese traditional microbial culture) were used for the experiment. Experiment was arranged as Complete Randomize Design with ten replicates per treatment at Seethawaka wet zone botanic gardens, Avissawella. Bio Charcoal & River Sand in 1:1 ratio was used as potting medium. Growth parameters were collected in weekly up to eleven weeks after planting. Data was analyzed using the Mini Tab 17 statistical package. Result revealed that the top cutting with indo chinese microbial culture significantly increased the plant height, cumulative number of new leaves, cumulative number of new buds and the root volume. Therefore, it can be concluded that top cuttings planted in Bio Char & River sand 1:1 potting media treatd with indo chinese microbial culture could be used for propagation of Bauhinia kockiana Korth .

Keywords : Bauhinia kockiana Korth, Jeewamruthum, Vermiwash, Fish Tonic, Indo Chinese Microbial Culture

INTRODUCTION

Kock's Bauhinia (*Bauhinia kockiana* Korth.) is belongs to family Fabaceae and is a floricultural crop, native to Malaysia and Indonesia, which is mostly using as one of the major landscaping floricultural crops in Sri Lanka for constructing the landscape gardening as an excellent specimen for trellises, arbors, arches, arch ways, pergolas and using for ornamental purposes in home garden exterior decorations as cascading over a garden wall, lamp posts and for fences due to spectacular attractive blooms. *Bauhinia kockiana* Korth. is a perennial semi-deciduous vigorous creeper type woody plant that can reach a height of about 10-15 feet in gardens. The flowers of *B.kockiana* Korthare in large clusters that open yellow but gradually turn to scarlet-orange and blooming throughout the year. Cut flowers can be kept for about 5 days without any colour change on the petals (Chong *et al*., 2009).

This plant also has medicinal value and used several parts to treat various health complications. For instance, its roots are used by the Kelabit ethnic group in Sarawak, eastern Malaysia to treat gonorrhoea, nervous debility, insomnia and fatigue. The infusion of bark and root are also used traditionally to treat toothache. *B. kockiana* flowers enrich with anticancer properties and anticancer agents. So the flowers can be used to prevent and treat for the cancers. A study reported that *B. kockiana* plant exhibited fairly strong antioxidant and antimicrobial activities. Some papers had focused and founded on the assessment of antibacterial activity of *B. kockiana* towards methicillin-resistance *Staphylococcus aureus* (MRSA), to purify and to identify the antibacterial compounds, and to determine the mechanism of antibacterial activity (Chew *et al*., 2014).

Since, the huge demand for *B. kockiana* Korth in the local market among the landscape designers, the supply is not matching by the growers. This plant is currently propagated through layering only as done in many fruit plants like pomegranate (Bhagwa *et al*., 2017) but most of the local growers are now discouraging to plant production of *B. kockiana* Korth due to the higher time consuming and less number of plants are produced from layering. Therefore, main objective of this study

was to evaluate the most suitable maturity stage of the cuttings of *B. kockiana* Korth on rooting as affected by different bio fertilizers that can be prepared in locally and easily available for the growers.

MATERIALS AND METHOD

Stem cuttings of *Bauhinia kockiana* Korth were collected from a vigorous mother plants maintained at the Seethawaka Wet zone Botanic Gardens-Avissawella, Sri Lanka. There were three types of stem cuttings (top cutting, semi-hard wood cutting & hard wood cutting). All the cuttings were in same length with four leaves, that were removed half of the leaf blade and having 3-4 active buds. Before entering the stem cuttings in to the potting medium of Bio Char and River Sand in 1:1 ratio, treated with 3 ml each of different bio fertilizers viz., Jeewamruthum, Fish Tonic, Vermy Wash and Indo Chinese Traditional Microbial Culture.

The Jeewamruthum, Fish Tonic, Vermy Wash were in liquid phrase and the Indo Chinese Microbial Culture was in semi-solid phrase. So the all three types of the stem cutting were planted in the inert medium as about 3cm inside the inert medium to maintain a constant height. All the stem cuttings were in same height (15cm). Before planting the stem cuttings, the each and every plating pot with the potting medium had treated with 3ml from Jeewamruthum, Fish Tonic and Vermy Wash by drech them into the potting medium and mixed well the pottiug medium. We used 3mg of Indo Chinese Microbial Culture and mixed through the pulp in the potting medium. Then pots were irrigated properly and carefully. After the irrigation, the planting pots were introduced to Plant Propagator. After placing all the planting pots in the inside of plant propagator it was closed for the better maintained of temperature and the relative humidity inside the Plant Propagator. After one week from the planting the pots were treated again according to the treatment schedule. It was used 3ml from Jeewamruthum, Fish Tonic and Vermy Wash for the in-cooperation to the medium without disturbing to the stem cutting. 3g of the Indo-Chinese Traditional Culture was mixed with 3ml of de-choronized water was used and in-cooperate to the medium. The same was applied for the two weeks and three weeks after planting the stem cuttings.

Treatment scheduled was as T 1- Top Cutting with Jeewamruthum; T2- Top Cutting with Vermi Wash; T3- Top Cutting with Fish Tonic; T4- Top Cutting with Indo- Chinese Traditional Microbial Culture; T5- Semi-Hard Wood Cutting with Jeewamruthum; T 6- Semi-Hard Wood Cutting with Vermi Wash; T 7- Semi-Hard Wood Cutting with Fish Tonic; T 8- Semi-Hard Wood Cutting with Indo- Chinese Traditional Microbial Culture; T 9- Hard Wood Cutting with Jeewamruthum; T 10- Hard Wood Cutting with Vermi Wash; T 11- Hard Wood Cutting with Fish Tonic; T 12- Hard Wood Cutting with Indo- Chinese Traditional Microbial Culture; T 13- Top Cutting with Rooting Hormone; T 14- Semi-Hard Wood Cutting with Rooting Hormone (Control) and T 15- Hard Wood Cutting with Rooting Hormone. So, total number of treatment combination=15; Number of replication (cuttings taken) in each treatment=10 and thereby total number of cuttings used in the experiment=150. The experimental design was two factor Complete Randamozised Design. The cuttings were tested separately in each week up to 12 weeks period inside the plant propagator.

Just after establishment of plants in pots, water well before introducing the bio fertilizers kept in the plant propagator. Data was collected in each weekly up to 11 weeks. Cumulative plant height, cumulative number of new leaves per cutting, cumulative number of new buds per cutting, root length and the root volume were measured as growth parameters. Statistical analysis was performed by using ANOVA in Mini Tab 17. Grouping was done to determine the significance among clusters.

RESULTS AND DISCUSSION

Results revealed that, the significantly highest cumulative plant height was recorded in top cuttings treated with indo Chinese traditional microbial culture, followed by top cuttings with jeewamurthum medium and semi hardwood cutting treated with Indo Chinese traditional microbial culture at 2 weeks after planting (Figure 1). The same result was recorded in 5 weeks after planting also (Figure 2) and 11 weeks after planting (Figure 3).

Result revealed that the excretions secreted by the microbes can induce the plant growth. The results had identified by Rini *et al* (2014) on *Piper nigrum* L. it had indicated that the maximun increase in the plant height had recorded by the bio fertilizers used for the experiment. Similar observations were reported by Kiran *et al.* (2012). According to the findings of Devakumar *et al*. (2014) that higher number of bacteria, different fungi and N-fixers clearly indicate that the jeevamruthum is enriched consortia of native soil microorganisms. Due to the higher beneficial microbial load would mobilize more of plant nutrients and provide plant growth promoting substances and also other micro nutrients required by the plants. Result of the research on gherkin cultivation of Devapriya and Yapa (2017) again proved the result that newly introduced bio fertilizers- earthworm cast treated with Jeewamruthum + compost, Indonesian bio-fertilizer are the most suitable fertilizer category.

Number of New Leaves per Cutting

The significantly highest cumulative number of leaves was recorded in top cutting with indo chinese traditional microbial culture and semi hardwood cutting with indo chinese traditional microbial culture among the all treatments in 6 weeks after planting (Figure 4). Top cutting with indo chinese traditional microbial culture, top cuttings with jeewamurthum medium and semi hardwood cutting with indo chinese traditional microbial culture were significantly effect for the cumulative number of leaves in 11 weeks after planting (Figure 5).

Due to the substances that is secreting by the microbes, it is inducing the growth of leaves of the *Bauhinia kockiana*stem cuttings. The most significant growth of leaves or the cumulative number of new leaves was recorded by the top cutting with the indo chinese traditional microbial culture. Bio fertilizers were found very effective on the plant growth especially on healthy leaf production. Sadanshu *et al* (2009) reported that bio fertilizers are considered to be a panacea for the prosperity of agriculture. The effect of bio fertilizers on the growth improvement was suggested by Muhammed (2010).

Number of New Buds per Cutting

Results emphasized that, the significantly highest cumulative number of the new buds was recorded in top cutting with indo chinese traditional microbial culture, top cuttings with jeewamurthum medium and semi hardwood cutting with indo chinese traditional microbial culture among the all treatments in 5 weeks after planting (Figure 6). Although in the 11 weeks after planting it had recorded that was significantly highest cumulative number of the new buds in top cutting with indo chinese traditional microbial culture, top cuttings with jeewamurthum medium, semi hardwood cutting with indo chinese traditional microbial culture and in the hard wood cutting with indo Chinese microbial culture among the all treatments(Figure 7).

Sladky and Tichy (1959) compared the effects of foliar or nutrient solution application of the humic substances on shoots. Young leaves responded to a greater extent than older ones. Previous studies reported that bio fertilizers had improved soil productivity, fertility and the propagation, which improved the yield and quality in the floricultural crops. (Dinesh *et al*., 2010) Application of foliar bio fertilizer spray on begonia plants (Sladky, 1959) yielded similar results had recorded.

Root Length

The significantly highest length of the roots was recorded in top cutting with indo chinese traditional microbial culture, top cuttings with jeewamurthum medium, hardwood cutting with indo chinese traditional microbial culture, top cutting with rooting hormone, semi hard wood cutting with rooting hormone and hard wood cutting with rooting hormone among the all treatments in 11 weeks after planting (Figure 8).

Similar results had overview by Ramya (2014) in the *Piper nigrum* L. cuttings that had used to propagate by using the bio fertilizers. By using the chemically synthesized rooting hormone can react with the plant physiology in various manners and can induce the root growth than other solution which had used in this experiment.

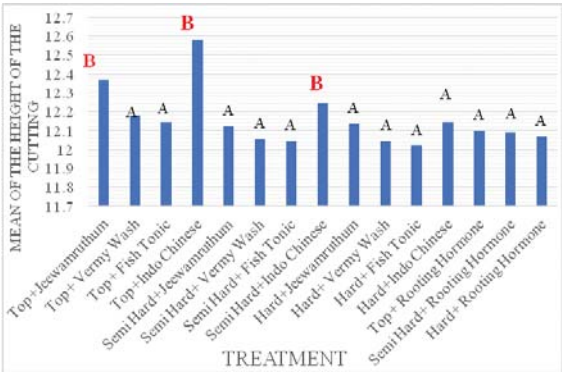

Figure 1: Effect of cutting type and different bio-fertilizers on mean shoot height of *Bauhinia kockiana*. Korth, 2 weeks after planting.
Means on the bars represent the same letter are not significantly different at P d™ 0.05 probability level.

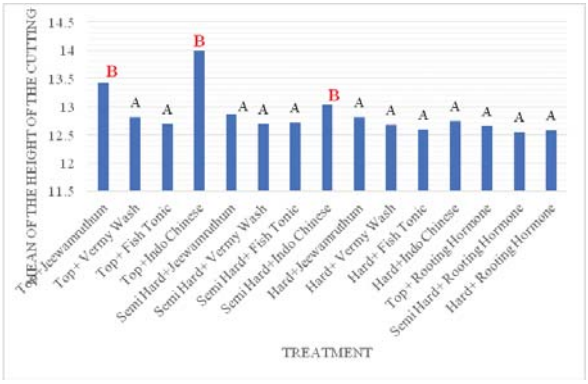

Figure 2: Effect of cutting type and different bio-fertilizers on mean shoot height of *Bauhinia kockiana*. Korth, 5 weeks after planting.
Means on the bars represent the same letter are not significantly different at P d" 0.05 probability level.

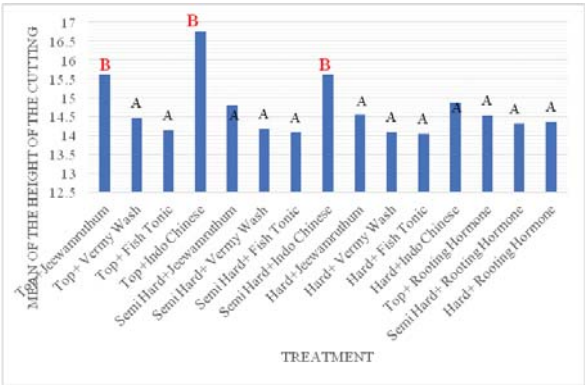

Figure 3: Effect of cutting type and different bio-fertilizers on mean shoot height of *Bauhinia kockiana*. Korth 11 weeks after planting.
Means on the bars represent the same letter are not significantly different at P d" 0.05 probability level.

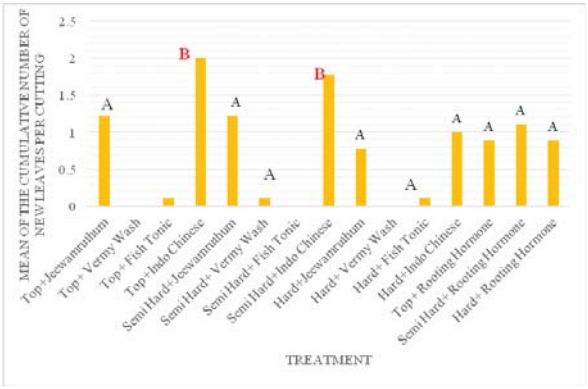

Figure 4: Effect of cutting type and different bio-fertilizers on mean number of leaves in *Bauhinia kockiana* Korth, 6 weeks after planting.
Means on the bars represent the same letter are not significantly different at P d" 0.05 probability level.

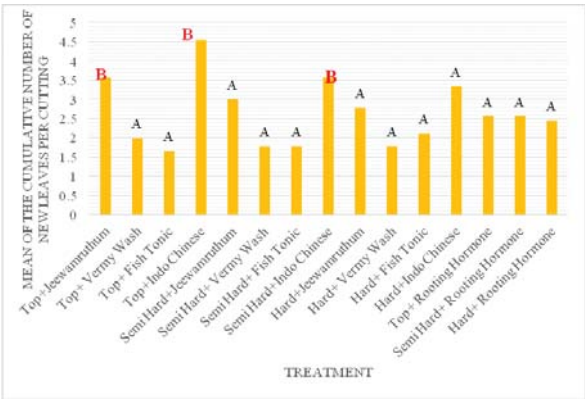

Figure 5: Effect of cutting type and different bio-fertilizers on mean number of leaves in*Bauhinia kockiana* Korth 11 weeks after planting.
Means on the bars represent the same letter are not significantly different at P de 0.05 probability level.

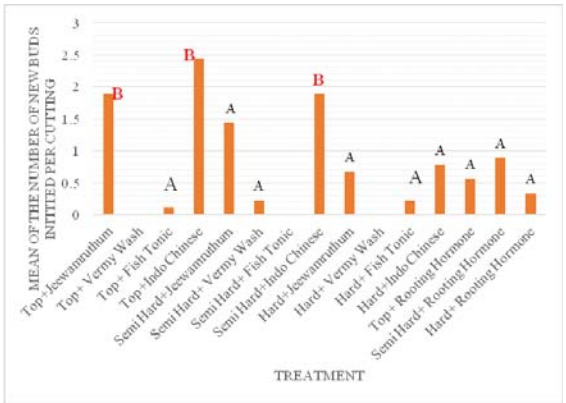

Figure 6: Effect of cutting type and different bio-fertilizers on mean number of new buds in *Bauhinia kockiana* Korth 5 weeks after planting.
Means on the bars represent the same letter are not significantly different at P de 0.05 probability level.

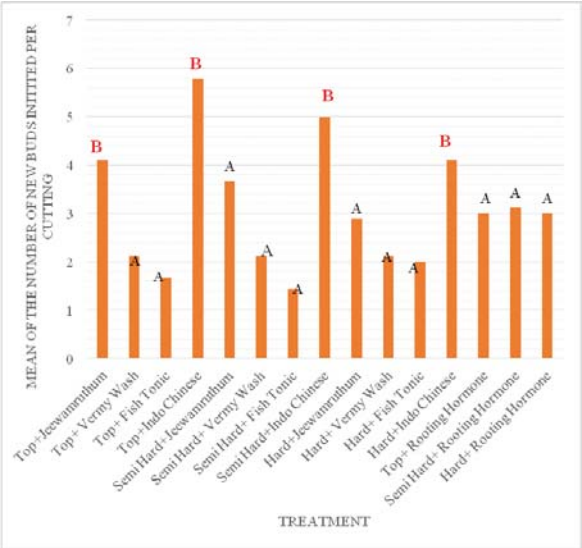

Figure 7: Effect of cutting type and different bio-fertilizers on mean number of new buds in *Bauhinia kockiana* Korth 11 weeks after planting.
Means on the bars represent the same letter are not significantly different at P d" 0.05 probability level.

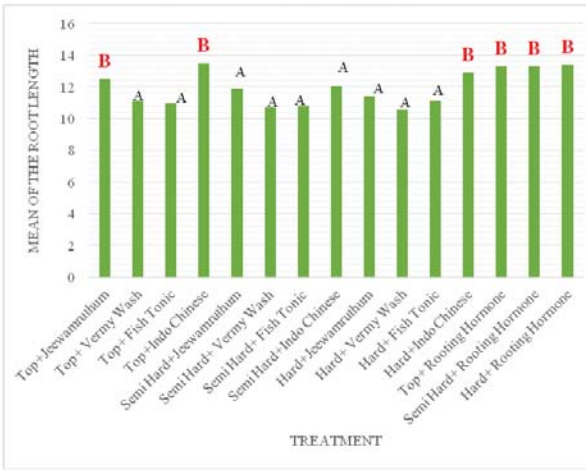

Figure 8: Effect of cutting type and different bio-fertilizers on mean root length in *Bauhinia kockiana* Korth 11 weeks after planting.
Means on the bars represent the same letter are not significantly different at P d" 0.05 probability level.

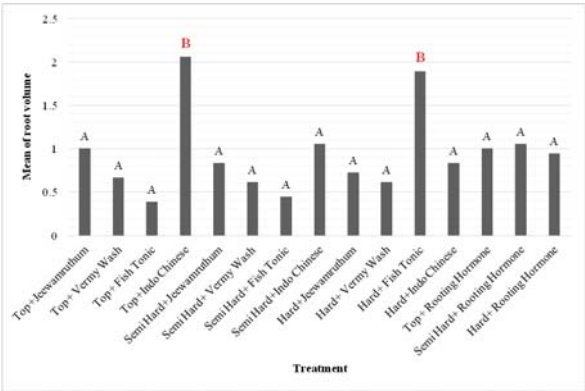

Figure 9: Effect of cutting type and different bio-fertilizers on mean root volume in *Bauhinia kockiana* Korth 11 weeks after planting.
Means on the bars represent the same letter are not significantly different at P d" 0.05 probability level.

Root Volume

Results had shown that, top cutting with indo chinese traditional microbial culture and hard wood cutting with the fish tonic were significantly affect for the amount of the root volume among the all treatments in 11 weeks after planting (Figure 9).

Most of the reports on the usage of bio fertilizers are emphasizing the efficacy of bio control agents in enhancing the plant growth, root growth and the root volume in addition to their ability in increasing the yield. The results of the present study are in agreement with Manoranjitham *et al*. (2000) and Manomohandas (2001). Plant growth regulators like gibberllins, cytokinins and indole acetic acid (IAA) induced by the strains might have contributed for better plant growth and development (Dubeikovsky *et al*., 1993).

The growth observations like plant height and number of leaves were also maximum in the treatment T4 when compared to the other treatment combinations. This might be due to the cumulative effect of all organic bio fertilizers such as jeewamruthum, vermy wash, fish tonic and indo Chinese traditional microbial culture, due to the good water holding capacity, high porosity, increased surface area that provides many microsites for microbial activity and strong retention of nutrients. Previous studies reported that organic bio fertilizers improved soil productivity and fertility, which improved the propagation (Hossain and Ishimine, 2007, Velamurugan *et al*, 2007, Mohaopatra and Das, 2009 and Dinesh *et al*, 2010).

CONCLUSION

With the using of *Bauhinia kockiana* Korth stem cuttings in this experiment it had resulted that they can propagate through stem cuttings easily rather than using of air layering or marcotting in the propagation for the mass production in the commercial purposes in the floricultural industry in Sri Lanka. Results had highlighted that the type of stem cuttings for the using as a propagation of *Bauhinia kockiana* Korth is the top cutting and the best type of bio fertilizer that can be used to the propagation of *Bauhinia kockiana* Korth is Indo Chinese Traditional Microbial Culture.

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