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Effect of different concentration of organic liquid fertilizer 'Amirthakaraaisal' on growth of Polyscias spp. in Sandy Regosol

Brintha Karunarathna^{*} and J. Mayoory

Department of Crop Science, Faculty of Agriculture, Eastern University, Sri Lanka
ilbrintha@yahoo.co.in

Abstract

Organic liquid fertilizers are believed to be an effective way to sustain soil fertility and plant growth. An experiment was conducted at the Crop Farm, Eastern University, Sri Lanka during 2017-2018 to assess the influence of different concentration of organic liquid fertilizer Amirthakaraaisal on growth of Polyscias spp. in sandy regosol. This experiment was conducted in poly bags which laid out in a Completely Randomized Design (CRD) with five replicates. Treatments of different concentrations of Amirthakaraaisal such as 1% (T2), 3% (T3), 5% (T4) and 7% (T5) were prepared separately and water was used as control (T1). While planting, Polyscias cuttings were dipped into different concentration of Amirthakaraaisal solutions and water according to treatments for a period of 15 minutes. Same quantity of Amirthakaraaisal was pour into poly bags in once in four days for three weeks. The study revealed that there were significant differences ($P < 0.05$) in plant height, root length, fresh and dry weights of plant, shoot, root and number of roots of Polyscias spp. It was high in T3 compared with tested treatments. However, there was no significant differences ($P > 0.05$) in chlorophyll content and number of branches. The present study suggests that 3% of Amirthakaraaisal would be the most suitable concentration to enhance the rooting and growth of Polyscias spp. in sandy regosol.

Key words: Amirthakaraaisal, liquid fertilizers, Polyscias

^{*} Corresponding author. Tel.: +94-776651937
E-mail address: ilbrintha@yahoo.co.in

1. Introduction

Ornamental plants industry has grown greatly during the last decades in Sri Lanka and there is a renewed demand for flowers and foliage in export markets. *Polyscias* spp. is a common foliage type of ornamental plant in the world floriculture industry, especially in countries where tropical climate is available. It is a perennial crop, belonging to family Araliaceae. It is extensively used in landscaping purposes and also popular as a potted ornamental plant (Bose and Chowdhury, 1991). The morphology of the leaves adds value for its quality to attract people especially in the export market and demand for the *Polyscias* spp. is very high because of its bushy growth habit.

The successful propagation of plants is an essential in ornamental sector. Vegetative propagation methods are most popular method used to propagate ornamental plants of family Araliaceae in commercial nurseries to maintain uniformity in growth and development. In such places, root formation is induced and controlled by endogenous and exogenous factors, such as temperature, light, plant hormones and organic compounds. A rooting hormone is a naturally occurring or synthetic hormone that stimulates root growth in plants. However, continuous and intensive use of synthetic products in the recent past have degraded soil and water quality and seriously affected agro-biodiversity, increased the loss of soil organic carbon, salinization and soil erosion, thus accelerating the land degradation. Conserving the environment for holistic and inclusive growth with a long-term vision and perspective rather than satisfying short sighted and sectarian requirements in the pretext of development is vital for sustainability by preserving the environment and land fertility. Also management techniques of agricultural production are nowadays focused on a greater commitment to environmental sustainability. Therefore it is necessary to minimize the application of inorganic rooting hormones by substituting with organics.

Many agricultural products used in organic farming are liquid manures. Organic liquid fertilizer is the substance containing all macro and micro essential nutrients that improve the growth and productiveness of plants, enhance the natural fertility of the soil or replace the chemical elements taken from the soil by previous crops or other factors and improve the essential micro organisms in the soil. Amirthakaraaisal is one of the effective organic manure which is used as a growth stimulator, growth promoter and immunity booster. Amirthakaraaisal is mixed with irrigation water acts as an toxic for the soil and makes it rich in nutrients. Amirthakaraaisal proved its value by providing strength and great resistance to the crop. Amirthakaraaisal acts as an organic pesticide. Application through irrigation reduced the root borne diseases. Amirthakaraaisal is organic concoction formed by the mixture of four ingredients such as cow dung, cow urine, jaggary and water. Cow dung acts as medium for the growth of beneficial microbes. Presence of naturally occurring beneficial microorganisms, predominantly bacteria, yeast, actinomycetes, and certain fungi have been reported in cow dung (Radha and Rao, 2014). Cow's urine provides nitrogen which is essential for the plant growth. And jaggary uses as a fermenter. Amirthakaraaisal proved its value by providing strength and great resistance to the crop (Gayathri et al., 2015). Earth worms which live deep under the soil surface come to the top to feed on this solution.

2. Materials and Methods

An experiment was conducted at the Crop Farm, Eastern University, Sri Lanka during 2017-2018 to assess the influence of different concentration of organic liquid fertilizer Amirthakaraaisal on growth of *Polyscias* spp. in

sandy regosol. The experiment site is situated between 81° 34' latitude and longitude and 7° 48' longitude which come under the agro ecological zones of low country dry zone. This experiment was conducted in poly bags which laid out in a Completely Randomized Design (CRD) with five replicates. The poly bags were filled with top soil: red soil: cow dung at the ratio of 1:1:1 and leaving 1 inch at the top for watering. Uniform stem cutting was taken from selected mother plants. Cut just below a leaf node and remove the lower leaves from the cutting.

The cow dung of 250 g and 250 ml cow urine were taken in a wide mouthed pot, 2.5 liter water was added to the mixture and a handful of jaggery also added and stirred well until the jaggery gets dissolved. Then this mixture was allowed to ferment for 24 hours and stored in the shade by covering it with lid to avoid the insects breeding. Then different concentrations of Amirthakaraaisal such as 1%, 3%, 5% and 7% were prepared separately in beakers by adding proper amount of water. Treatments were, water applied (T1), 1% (T2), 3% (T3), 5% (T4), and 7% (T5) Amirthakaraaisal solutions. While planting, cuttings were dipped into different concentration of Amirthakaraaisal solutions and water according to treatments for a period of 15 minutes. Then cuttings were planted into the prepared poly bags and labeled. Same quantity of Amirthakaraaisal was pour into poly bags in once in four days for three weeks. The following parameters viz., plant height, root length, chlorophyll content in leaves, fresh weights of plant, root and shoot, dry weights of shoot and root, number of branches and roots were measured at eight weeks after planting. Recorded data were analyzed statistically by using statistical packages.

3. Results and discussion

There was significant differences ($P < 0.05$) in plant height and root length are shown in Table 1. Plant height was high in T3 (13cm) followed by T2 (12cm) while shortest plant was noted in T1 (9.66cm). Plant height in T1 was not significantly ($P > 0.05$) differ from tested treatments except T3. Root length was high in T3 (15 cm) while shortest length was observed in T1 (7 cm). Amirthakaraaisal have well developed the roots which had allowed them to deeper inside the soil may be the reason for longest roots in Amirthakaraaisal treated cuttings compared with control. On the other hand Anjali et al. (2017) stated that shoot and root lengths of the chilli plants were higher in plants treated with 7% Amirthakaraaisal solution. There was no significant difference ($P > 0.05$) in chlorophyll content suggest that Amirthakaraaisal concentration not affect chlorophyll in *Polyscias* spp.

Table 1: Growth of *Polyscias* spp.

Treatment	Plant height (cm)	Root length (cm)	Chlorophyll
T1	9.66 ± 0.56 b	7.00 ± 0.12 b	23.66 ± 0.13
T2	12.00 ± 0.46 ab	11.26 ± 0.37 ab	25.93 ± 0.21
T3	13.00 ± 0.35 a	15.00 ± 0.46 a	20.46 ± 0.34
T4	11.33 ± 0.21 ab	9.33 ± 0.37 ab	20.46 ± 0.27
T5	10.66 ± 0.34 ab	11.00 ± 0.28 ab	23.30 ± 0.35
F value	*	*	ns

Value represent mean \pm standard error of four replicates.

F test: - *: $P < 0.05$; ns: not significant

Means followed by the same letter in each column are not significantly different according to the Duncan's Multiple Range Test at 5% level

There was significant differences ($P < 0.05$) in plant, shoot and root weights of Polyscias plant is shown in Table 2. Fresh weights of plant, shoot and root of 4.74g, 3.13g and 0.76g were noted in T3, respectively. Shoot dry weight of 0.72 g was recorded in T3 followed by T4 (0.32 g). Root dry weight was high in T3 (0.30 g) while low in T2 (0.10 g).

Table 2: Fresh and dry weights of Polyscias spp.

Treatment	Fresh weight			Dry weight	
	Plant	Shoot	Root	Shoot	Root
T1	2.22 c	1.17 b	0.38 b	0.19 c	0.12 b
T2	3.24 abc	2.09 ab	0.43 ab	0.23 b	0.10 b
T3	4.74 a	3.13 a	0.76 a	0.72 a	0.30 a
T4	2.74 bc	2.04 ab	0.47 ab	0.32 b	0.13 b
T5	3.97 ab	2.18 ab	0.40 b	0.31 b	0.16 b
F value	*	*	*	*	*

Value represent mean \pm standard error of four replicates.

F test: - *: $P < 0.05$

Means followed by the same letter in each column are not significantly different according to the Duncan's Multiple Range Test at 5% level

There was no significant difference ($P > 0.05$) among tested treatments in number of branches was confirmed with P values of 0.421 and chi square values of 3.89 is shown in Table 3 suggest that differences of concentration of Amirthakaraaisal which have been not significantly affected the number of branches in Polyscias spp. Root is an important component in nutrient uptake and transport. Number of roots in Polyscias spp. was significantly varied ($P < 0.05$) among the tested treatment is shown in Table 3 is confirmed with P values of 0.047 and chi square values of 9.64. More number of roots were noted in T3 (22) followed by T2 (17). It may suggest that 3% concentration of Amirthakaraaisal enhance the root growth in Polyscias spp.

Table 3: Number of branches and roots

Treatment	Branches	Roots
T1	6	15
T2	7	17
T3	8	22
T4	8	12
T5	7	12
P value	0.421	0.047
Chi – square	3.89	9.64

4. Conclusion

The present study revealed that there were significant differences ($P < 0.05$) in plant height, root length, fresh and dry weights of plant, shoot, root and number of roots of *Polyscias* spp. It was high in T3 compared with control. There was no significant differences ($P > 0.05$) in chlorophyll content and number of branches. The present study suggests that 3% of Amirthakaraishal would be the most suitable concentration to enhance the rooting and growth of *Polyscias* spp. in sandy regosol.

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