Web The Effects of Dracaena Sanderiana Extract on The Rooting of Myrtle Cuttings

Chaoming Ma[1], Liqiong Wu [1*], Haiyan Feng[1] and Jihua DU[1]

[1]South Subtropical Crop Research Institute, China Academy of Tropical Agricultural Sciences (CATAS), Zhanjiang 524091, China

Abstract. In this paper, to identify a utilization direction for the processing waste of dracaena sanderiana and improve the rooting rate of myrtle cuttings, with rooting rate, average number of roots and average root length as rooting indicators, we discussed the effects of D. sanderiana extract, different concentrations, IAA and other factors on the rooting of myrtle cuttings. The results showed that D. sanderiana aqueous extract had a comparable rooting-promoting effect to that of IAA and suggested that a rooting-promoting substance existed in D. sanderiana extract, which can provide an experimental technical support for a cheap, non-toxic and effective specialized rooting agent for myrtle, as well as the cutting breeding of myrtle.

1 Introduction

Myrtle (rhodomyrtus tomentosa), also known as gangrenzi, and hill gooseberry, is an evergreen shrub in the family Myrtaceae and the genus Rhodomyrtus. It has beautiful flowers, leaves and fruits, and is a good native greening tree species and one of the pioneer tree species for the landscaping of barren hills and green waters and the conservation of water and soil[1]. It is widely distributed in the southeast, south and southwest of China, South Asia, Southeast Asia and Japan [2]. Besides, the roots, leaves and fruits myrtle are also of certain medicinal value and a common herb in traditional Chinese medicine. The roots can dispel wind, invigorate collaterals, astringe and stop diarrhea, the leaves can astringe and stop diarrhea and bleeding, and the fruits can replenish blood, nourish and prevent miscarriage. It has been used in Chinese patent drugs, such as Huahong Tablets and Abrus Cantoniensis Hance Hepatitis Pills [3]. With the expansion of the application scope of myrtle in landscaping, nutrition, health care, pharmacy, etc. [4], the shortage of myrtle seedlings has become one of the important factors restricting the large-scale development of myrtle. Cutting breeding is an important way to obtain a large number of seedlings quickly, but subject to the problem of low rooting rate [5]. In addition, the main component of rooting agent is growth regulator, which has a high price and limited agent retention time, thus the application of rooting agent in production is restricted. A key to solving the large-scale development of myrtle is to select a specialized rooting agent for myrtle with low price, high rooting rate and stable properties[6-9].

D. sanderiana [Disporum cantoniense (Lour) Merr] is an evergreen foliage plant in the family Asparagaceae [10]. Zhanjiang is an important export base for D. sanderiana, with an export volume of up to 8,261 tons. The utilization rate of D. sanderiana in the course of processing is about 50%. Every year, nearly 1 million tons of D.cantoniense wastes are dumped in landfills or at the roadside, which not only pollutes the environment, but also causes a waste of resources [11].

D. sanderiana has an extremely strong rooting ability. When its water or methanol extract are used to treat the cuttings of mung bean, rice, Hibiscus rosa-sinensis, Thai pine and Rhododendron pulchrum, the rooting-promoting effect is very remarkable [12-14]. Yu Shuhong [15] et al. carried out a preliminary study on the components of D. sanderiana extract and discovered that the extract contained IAA (indole-3-acetic acid). If a special rooting-promoting substance for myrtle can be extracted from the processing waste of D. sanderiana, to increase the value and utility of waste and provide an experimental technical support for the cutting breeding of myrtle, that would be undoubtedly of great significance for the comprehensive use of local resources, the increase of economic revenues in local areas and the promotion of sustainable development of industry. But so far, there are no relevant reports at home and abroad.

2 MATERIALS AND METHODS

2.1. Experimental Materials

D. sanderiana: The pruning wastes of D. sanderiana branches at a specialized D. sanderiana processing plant of Shiqiao Village, Huguang Town were selected as the experimental material.

Myrtle: Robust and disease-free twigs of wild myrtle seedlings in Wuchuan City, Zhanjiang, were selected as the material to be tested.

Rooting agent for contrast: indole-3-acetic acid (IAA).

* Corresponding author: 1765460405@qq.com

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2.2 The Preparation of D. Sanderiana Extract

A certain number of D. sanderiana stems were weighed, crushed and ground into homogenate through the addition of water, transferred into a triangular flask with a plug, sealed and digested at 160r/min under dark conditions of 27 ℃ for 24h and filtered. The filter residue was washed for 3 times and the filtrate was collected. The filtrate was filled to a fixed volume by adding water according to 2mL/g of the fresh weight and stand by.

2.3 The Preparation and Treatment of Cuttings and Materials

Robust and disease-free twigs of wild myrtle were selected from the vicinity of Qianshui Town, Wuchuan City, Zhanjiang. After being picked, the twigs were immediately taken to a shady place for pruning. Depending on the length of twigs, they were cut into cuttings with 2-3 nodes. The leaves at the base of the cuttings were cut off, while the upper leaves were retained. Cuttings were made by cutting an upper incision horizontally 1.0 cm away from the axillary bud, and cutting a lower incision obliquely 0.5 cm away from the axillary bud. The bases of the cuttings were soaked in carbendazim powder diluted by a factor of 100 in time, for 10min and then stand by.

2.4 Experimental Design and Method

Taking a kind of agricultural straw-based fermentation substrate developed by Agricultural Machinery Institute, China Academy of Tropical Agricultural Sciences as the cutting substrate and taking the clear water treatment as a control, our study adopted a randomized block design. Four treatment groups were designed in this experiment: ① D. sanderiana extract; 2) D. sanderiana extract diluted to 10-1 (10 fold dilution); ③ D. sanderiana extract diluted to 10-3 (30 fold dilution); ④ 1000mg/L IAA. In each treatment group, 48 carbendazim-treated cuttings were selected, and their bases were soaked for 6 hours. The cuttings were inserted into a 24-hole plug, and the insertion depth was about 1/2 of the cuttings length, and the criterion was that the cuttings can be fixed. During the insertion, a small bamboo chip was first used to drill holes in the substrate, and then the cuttings were put into the holes and compacted gently by hands. After all cuttings were inserted, sufficient root fixing water was sprinkled, so that the bases of the cuttings can fully contact the substrate.

2.5 Daily Management

To avoid the water loss of twigs at the initial stage of cottage, water was sprinkled at least 5 times a day on sunny days, and about once every 2-3 hours. After that, the sprinkling frequency can be reduced, and water can be sprinkled once every morning and evening. The temperature in the shed was kept at 25-35℃, the relative humidity was about 90%, and the shading degree was about 80%. After 50 days, the number of new roots, root length, number of roots and root diameter were measured.

2.6 Statistical Analysis of Experimental Data

After 30 days, the rooting rate, average root length, average number of roots and other indicators were measured. The rooting rate = (the number of rooting cuttings/total number of cuttings)×100%. 10 rooting cuttings were taken from each treatment group and the average number of new roots was counted. 10 rooting cuttings were taken from each treatment group and the average root length was tallied. The data were analyzed and processed with Excel and DPS software.

3 RESULTS AND ANALYSIS

3.1 The Effects of Different Rooting Agents and Concentrations on the Rooting Rate of Myrtle Cuttings

The rooting of cutting seedlings was a major sign of the survival of myrtle. In our experiment, the rooting rate was used to represent the survival rate of cutting seedlings.

As can be seen from Fig.1, among the 5 different treatment groups, the clear water group had the lowest rooting rate, only 20.83%. The rooting rates of D. sanderiana extract and 10 fold dilution of D. sanderiana extract were more than 2 times that of the clear water group, which can significantly enhance the survival rate of myrtle cuttings. This showed that D. sanderiana extract had the same rooting-promoting effect as IAA, and was conducive to the survival of myrtle cuttings. Among them, the rooting rate of IAA treatment group was the highest, up to 47.92%. The rooting rates of myrtle cuttings treated with D. sanderiana extract and its 10 fold dilution were 45.83% and 43.75% respectively. However, the differences among three treatment groups were not significant. The 30 fold dilution of D. sanderiana extract also had a rooting-promoting effect, with a rooting rate of 37.5%, 16.67% higher than that of clean water group. But compared with IAA, it had a worse rooting-promoting effect and the rooting rate was 10% lower.

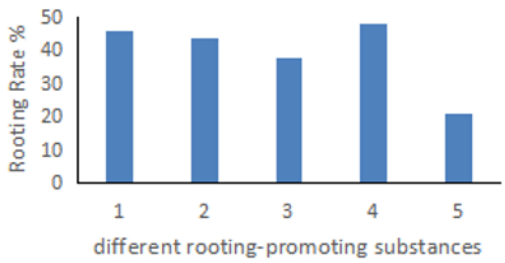

Fig. 1. The Effect of D. Sanderiana Extract and IAA Treatment on the Rooting Rate of Myrtle

1.D. sanderiana extract; 2. 10 fold dilution of D. sanderiana extract; 3. 30 fold dilution of D. sanderiana extract; 4. indole-3-acetic acid (IAA); 5. clear water control.

3.2 Different Rooting Agents and Their Effects on the Number of Roots of Myrtle Cuttings

As can be seen from Fig. 2, myrtle cuttings treated with different rooting substances had different numbers of roots. The clear water group had the lowest number of roots, only 5.5 roots per plant., while the IAA treatment group had the highest number of roots, 12.6 roots per plant. D. sanderiana extract can increase the number of roots of myrtle cuttings, regardless of its concentrations. With the increase of dilution ratio, the number of roots decreased. The number of roots obtained by D. sanderiana extract group and IAA treatment group were not significantly different.

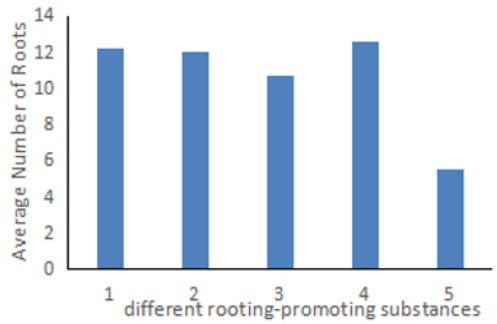

Fig. 2. The Effects of D. sanderiana Extract and IAA Treatment on the Average Number of Roots of Myrtle Cuttings

1.D. sanderiana extract; 2. 10 fold dilution of D. sanderiana extract; 3. 30 fold dilution of D. sanderiana extract; 4. indole-3-acetic acid (IAA); 5. clear water control.

3.3 Different Rooting Agents and Their Effects on the Root Length of Myrtle Cuttings

Fig. 3 showed the effects of different rooting-promoting substances on the root length of myrtle cuttings.
The clear water group had the lowest root length, only 3.48 cm. Both IAA and D. sanderiana extract can promote the growth of the root length of cuttings to varying degrees. Between them, IAA had the best growth-promoting effect (6.11 cm), followed by 10 fold dilution of D. sanderiana extract. Different concentrations of D. sanderiana extract had different effects on the root length of myrtle cuttings, of which the root length of 10 fold dilution of D. sanderiana extract was the longest, at 5.91 cm, followed by D. sanderiana extract, at 5.89 cm. The 30 fold dilution of D. sanderiana extract had a slightly poor effect, at 5.16cm, as evidenced by the fact that the root length first increased and then decreased, with the reduction of the concentration of extract, suggesting that it was not that the higher the concentration of D. sanderiana extract, the better effect. Too low concentration would also influence the growth of the root length of cuttings.

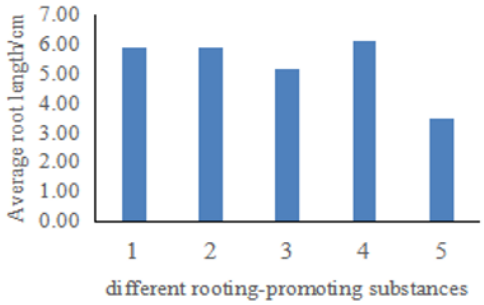

Fig. 3. The Effects of D. sanderiana Extract and IAA Treatment on the Average Root Length of Myrtle Cuttings

1.D. sanderiana extract; 2. 10 fold dilution of D. sanderiana extract; 3. 30 fold dilution of D. sanderiana extract; 4. indole-3-acetic acid (IAA); 5. clear water control.

4 CONCLUSION

The key to the survival of cuttings is to make the cutting twigs root. The difficulty of rooting is not only related to the properties of the plant itself, but also related to the types and concentrations, etc. of the rooting-promoting agents of cuttings. The results of this experiment show that different concentrations of D. sanderiana extract can improve the rooting rate, average number of roots and root length of myrtle cuttings. The D. sanderiana extract has almost the same rooting-promoting effect as IAA (there are no significant differences in terms of rooting rate, average number of roots and root length), indicating that there exist rooting-promoting substances in D. sanderiana extract, which is simple, cheap, non-toxic and effective, and can provide a data support for the high-value utilization of the processing wastes of D. sanderiana. But the rooting-promoting mechanism of D. sanderiana warrants further research.

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