

USING SHRIMP PASTE, VERMICOMPOST AND VITAMIN-B1 UNDER DIFFERENT MEDIA FOR PROMOTING ROOT GROWTH OF STEM CUTTINGS IN DRAGON FRUIT (*HYLOCEREUSUNDATUS*)

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ABSTRACT

Plant propagation is important factors in plant production. Many problems have been arisen in dragon fruit propagation, such as the rooting inability and the yellowing of cuttings. To solve this problem, the understanding how to choose suitable growing media and chemical control is needed. This study was conducted to investigate the effects of different growing media compositions on using shrimp paste, vermicompost and vitamin-B1+amino acid for promoting root growth of dragon fruit cutting was studied at Faculty of Agricultural Technology Songkhla Rajabhat University, Muang Songkhla, Songkhla province, southern Thailand from February to June, 2019. The experimental design was CRD growing media compositions with eight treatments and sampling for five replications namely T1 (shrimp paste soaking + coco peat), T2 (shrimp paste soaking + soil-based mix), T3 (vitamin-B1+amino acid + coco peat), T4 (vitamin-B1+amino acid + soil-based mix), T5 (vermicompost + coco peat), T6 (vermicompost + soil-based mix), T7 (coco peat) and T8 (soil-based mix). The study revealed that vermicompost, vitamin-B1+amino acid and shrimp paste treated stem cuttings gave better growth root system. Cuttings treated with vermicompost + coco peat produced the best results in number of root, number of shoots and the lengths of the roots. Thus, it was concluded that vermicompost was better growing media than other medias for propagating dragon fruit by cuttings.

Keywords: Dragon fruit, Using Shrimp Paste, Vermicompost, Vitamin-B1

1. INTRODUCTION

Dragon fruit (*Hylocereus* sp.) is a perennial climbing cactus, belongs to the family Cactaceae (Mirzahi and Nerd, 1996). It is native to tropical and subtropical areas of North, Central, and South America (Morton 1987). Major Dragon fruit growing countries are Vietnam, Colombia,

Mexico, Costa Rica, and Nicaragua (Le Bellec et al., 2006). Dragon fruit has been widely cultivated throughout the world because it has many advantages such as being high in economic value and health benefits. It is an excellent source of vitamin C and therefore are abundant with minerals, particularly calcium supplement as well as phosphorus (Dhruve et al., 2018). Moreover, it supplies fiber which is digestive and helpful for healthy liver. Dragon fruits consist of phytoalbumins, which may have anti-oxidant qualities which help to stop the development of cancer cells. It has received worldwide recognition as an ornamental as well as fruit crop. Fruits can be processed into products such as juice, sherbets, jams, jellies, ice cream, candies and pastries (Morton, 1987).

Dragon fruit is considered a promising crop to be grown commercially in dry regions (Vaillant et al., 2005). It is usually propagated by seeds or cuttings. Though seed propagation method is very simple but seeds are not true to type due to cross pollination (Andrade et al., 2005). Therefore, large number of plantlets with healthy shoot and root system can be produced to meet the demand of increasing commercial cultivation through vegetative propagation methods like cuttings. Propagating stem cuttings is also known to produce a derivative that is identical to the parent; beneficial properties can be ensured as a result. The problem with dragon fruit cultivation is obtaining high-quality cuttings. Availability can be enhanced by vegetative propagation such as by cutting. Cuttings of many plants are normally dipped in rooting hormone before planting to boost root formation (MAB Khalil Rahad et al., 2016). The vegetative propagation in Dragon fruit is utmost desirable in order to propagate true-to-type plants. Hence, vegetative methods of propagation viz., stem cuttings are done which is inexpensive, rapid and simple. The reports on an investigation on the propagation of Dragon fruit from cuttings and use of growth regulators for better root growth are scanty (Siddiqua et al., 2018). Therefore, the study was undertaken on the propagation of stem cutting dragon fruit using suitable growing media.

2. MATERIALS AND METHODS

The experiment was conducted at Faculty of Agricultural Technology SongkhlaRajabhat University, MuangSongkhla, Songkhla province, southern Thailand (7°17'12.2"N latitude and 100°61'26.5"E longitude) from February, to June, 2019. Thirty-centimeter stem cuttings of dragon fruit species (*H. undatus*) were used in this experiment. Eight different growing media were used: T1 (shrimp paste soaking + coco peat), T2 (shrimp paste soaking + soil-based mix), T3 (vitamin-B1+amino acid + coco peat), T4 (vitamin-B1+amino acid + soil-based mix), T5 (vermicompost + coco peat, T6 (vermicompost + soil-based mix), T7 (coco peat) and T8 (soil-based mix). Vermicomposts obtained from the earthworm of the *Perionyx excavates* species fed with various kinds of leftover organic wastes such as animal manure, plant, trash, or other waste; vermicompost is made from worm manure that has been decomposed and one material that can

augment chemical nutrients in soil. The stem cuttings planted in a 15 cm-diameter polybag with the new selected growing medium. Watering, fertilizing and pest and disease control were conducted during the experimental period. Plant growth assessments were measured 4 and 8 weeks after replanting. The best of root length (cm) was measured from the stem base to the tip of the longest roots. Other parameter were investigated namely the number of shoots, the root length, the root length total and the number of roots. A completely randomized design with five replicates was used for this experiment. For the statistical data analysis, the data were tested for normality. One factor analysis of variance (ANOVA) was performed to analyze the data and followed with Duncan's Multiple Range Test (DMRT) at $p < 0.05$ to compare differences among the growing media.

3. RESULTS

The effect of shrimp paste, vermicompost and vitamin-B1+amino acid under different growing media on rooting parameters of stem cuttings in dragon fruit 4 weeks after replanting, Data showed that cuttings of dragon fruit can grow normally in different combinations of growing media. There are significant differences in all parameters of different plant materials for the development of stem cutting of dragon fruit. The data of number of roots showed that the combination of vitamin-B1+amino acid + coco peat (T3) and vermicompost + coco peat (T5) highest number of roots to 10.00 and 9.00 roots, respectively. The length of the longest root when use shrimp paste soaking + soil-based mix (T2) was 15.75 cm. Moreover, the data showing that using vermicompost + soil-based mix (T6) and shrimp paste soaking + coco peat (T1) causes the root number to be small. Therefore, the root length and total length are less than other materials as well (Table 1 and Figure 1A). In addition, in 4 weeks after replanting, no new shoots of dragon fruit in various materials.

The effect of growing medium on the quality of cuttings of dragon fruit was investigated. Data showed that cuttings of dragon fruit can grow normally in different combinations of growing media. All of the plants survived in all growing media with a growth rate of 100%. Significant variation of all parameters was observed between different treatments of growth media for root parameters of dragon fruit stem cuttings. It was found that vermicompost + coco peat (T5) highest number of roots but don't difference vermicompost + soil-based mix (T6) to 16.00 and 14.25, respectively (Table 2 and Figure 1B).

The data showed that the combination of vitamin-B1+amino acid + coco peat (T3) and shrimp paste soaking + coco peat (T1) improved the length of the longest root in stem cutting of dragon fruit was 41.75 and 39.25 cm., respectively. The application of vermicompost + coco peat (T5) or vitamin-B1+amino acid + coco peat (T3) as the growing medium significantly increased root length, the total root length was 319.25 and 314.25 cm., respectively (Table 2 and Figure 1B).

The information also shows that significant difference in average number of shoots among the treatments. The average number of shoots produced of vermicompost + soil-based mix (T6), vermicompost + coco peat (T5) and vitamin-B1+amino acid + soil-based mix (T4) growing media were 3.25, 2.75 and 2.50-fold greater than the number of shoot obtained from cutting potted in coco peat (Table 2 and Figure 2).

Table 1: Effect of shrimp paste vermicompost and vitamin-B1+amino acid under different growing media on rooting parameters of stem cuttings in dragon fruit 4 weeks after replanting

Treatment	Number of roots	Length of the longest root (cm)	Total root length (cm)
T1	2.25 ^c	02.75 ^e	4.00 ^b
T2	6.00 ^b	15.75 ^a	46.50 ^a
T3	10.00 ^a	08.75 ^d	41.75 ^a
T4	6.00 ^b	11.75 ^b	39.25 ^a
T5	9.00 ^a	10.75 ^{bc}	49.00 ^a
T6	3.75 ^c	03.50 ^e	9.25 ^b
T7	6.25 ^b	09.50 ^{cd}	36.00 ^a
T8	7.25 ^b	11.75 ^b	39.00 ^a
F-test	**	**	**
CV (%)	16.16	13.24	24.35

** Means with different letters are significantly different ($P \leq 0.05$) by Duncan's multiple range test

Table 2: Effect of shrimp paste Vermicompost and vitamin-B1+amino acid under different growing media on rooting parameters of stem cuttings in dragon fruit 8 weeks after replanting

Treatment	Number of roots	Length of the longest root (cm)	Total root length (cm)	Number of shoots
T1	10.00 ^e	39.25 ^a	190.50 ^d	0.25 ^c
T2	11.50 ^{cde}	32.00 ^b	208.25 ^{cd}	1.00 ^{bc}
T3	13.75 ^b	41.75 ^a	314.25 ^a	0.50 ^c
T4	13.25 ^{bc}	23.50 ^{cd}	215.75 ^{cd}	2.50 ^a
T5	16.00 ^a	34.25 ^b	319.25 ^a	2.75 ^a
T6	14.25 ^{ab}	21.00 ^d	180.50 ^d	3.25 ^a
T7	11.00 ^{de}	32.50 ^b	231.75 ^{bc}	0.25 ^c
T8	12.75 ^{bcd}	26.25 ^c	258.25 ^b	2.25 ^{ab}
F-test	**	**	**	**
CV (%)	11.03	6.67	10.90	56.91

** Means with different letters are significantly different ($P \leq 0.05$) by Duncan's multiple range test

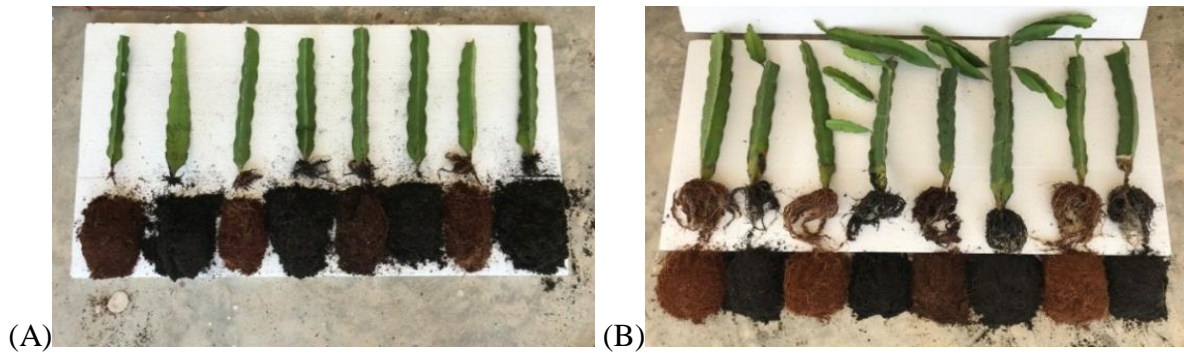


Figure 1: Effect of shrimp paste, vermicompost and vitamin-B1+amino acid under different growing media on rooting parameters of stem cuttings in dragon fruit 4 weeks (A) and 8 weeks (B) after replanting



Figure 2: Shoot length of dragon fruit cuttings at 8 weeks after replanting

4. DISCUSSION

In this study, root formation in the cuttings of dragon fruit was significantly influenced by the application of shrimp paste, vermicompost and vitamin-B1+amino acid under different growing media. This study showed that the application of vermicompost resulted better cutting growth and development for dragon fruit compared with soil-based alone as same as Sudarjat et al (2018) and Tisdale et al (1990) reports that soil with organic matter such as vermicompost can increase soil nutrients and improve its physical properties, and plant growth is also influenced by nutrients such as nitrogen, which is an essential macronutrient for plants. Vermicompost, vitamin-B1+amino acid and cuttings with shrimp paste improved the root system in the recorded agricultural parameters same as MAB Khalil Rahad et al (2016) reported that soil with the addition of Indole-3 Acetic Acid can increase root length, number of roots per cutting, number of branches and first root initiation.

This study showed that cuttings treated with vermicompost + coco peat produced the best results in number of root formation without being significantly differed from cuttings treated with shrimp paste soaking + coco peat. They show the largest number of shoot and roots significantly more than cuttings growth in the soil alone. Such as Sudarjat et al (2018) reported concludes that vermicompost is better than compost in terms of increasing the physical and chemical properties of the soil. Moreover, vermicompost is a type of organic fertilizer and one material that can augment chemical to the soil.

However, the highest shoots were obtained from fermentation with vermicompost + soil-based mix treatment but they were remarkably different from other treatments except vermicompost + coco peat, vitamin-B1+amino acid + soil-based mix and soil-based mix. Again, on the basis of results obtained in the experiment, it can be concluded that among the 8 treatments, vermicompost showed comparatively good results with respect to rooting and shooting parameters followed by the vitamin-B1 + amino acid. Siddiqua et al (2018) recommended that vegetative method of propagation through stem cuttings in Dragon Fruit by growth regulators IBA, NAA is reliable for commercial plant production as it is quick and economical method of vegetative propagation on the suitable growing media. In these cases, cuttings treated with vermicompost + coco peat gave the best results. As a result, vermicompost would be better in rooting and shoot formation of the cuttings of dragon fruit plants for better plant growth in vegetative propagation.

5. CONCLUSION

The results of the experiment can be concluded that the media of dragon fruit stem cuttings with vermicompost, vitamin B1 + amino acids and shrimp paste improve the root system. Cuttings

treated with vermicompost + coco peat produced the best results in the number of roots, number of shoots and length of the roots. Therefore, it can be concluded that vermicompost is a better growth medium than other media for propagating dragon fruit by cuttings.

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