Plant Archives Vol. 25, No. 2, 2025 pp. 313-321 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.no.2.044

EFFECT OF GROWING MEDIA AND AUXINS ON ROOTING AND VEGETATIVE GROWTH OF DRAGON FRUIT CUTTING

Tasnim Ayshi, Naimur Rahman, Nazrul Islam, Tanzena Akter Shawon, Tristy Rani Mohonto and Shormin Choudhury*

Department of Horticulture, Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka 1207, Bangladesh

*Corresponding author Email: shormin2000@gmail.com

(Date of Receiving-25-05-2025; Date of Acceptance-04-08-2025)

ABSTRACT

This study was undertaken from October 2022 to February 2023 at the Horticulture Farm, Sher-e-Bangla Agricultural University, Dhaka 1207, Bangladesh, to investigate the growth performance of dragon fruit cuttings under various growing media and auxins. In this experiment different growing media such as M_0-Soil, M_1-Soil: Cocopeat: FYM (2:1:1), M_2- Soil: cocopeat: vermicompost (2:1:1) and different auxins *i.e.* G_0-Control (No auxins), G_1-IAA, G_2-IBA, G_3-NAA at 200 ppm. The findings revealed that soil: cocopeat: FYM (2:1:1) and IBA @ 200 ppm produced significantly greater rooting characteristics, such as root fresh and dry weight (2.80g and 1.21g), and root number/cutting (11.33). However, the average length of root (50 cm) and reducing sugar (3.74 mg/g) was higher in soil: cocopeat: vermicompost (2:1:1) combined with IBA @ 200 ppm. Different vegetative growth parameters, such as sprout number (1.67), new shoot length (14.67 cm), fresh and dried weight of new shoot (26.90g and 2.53g), and photosynthetic pigments, were significantly higher and required fewer root initiation days (22.66 days) under the soil: cocopeat: FYM and IBA treatment combination (M_1G_2) than the other treatments. Our findings suggest that using Soil: Cocopeat: FYM as a growing media with rooting hormone IBA can improve root initiation and growth quality of dragon fruit cutting.

***Key words*: Auxin, Dragon fruit, Growing media, photosynthetic pigments.**

Introduction

Dragon fruit is a member of the cactaceae family, a perennial climbing cactus plants native to tropical areas of North, Central, and South America (Mizrahi and Nerd, 2002). Dragon fruit is a healthy and exotic fruit in Bangladesh's fruit industry, while it was not indigenous in this country. The high vitamin and mineral content of dragon fruits may help to boost the metabolism of the human body. It is very beneficial to our blood circulation and digestion. According to reports, the fruit of the dragon has a positive impact in reducing body toxins and hypertension (Flores-Verastegui *et al*., 2019).

Typically, dragon fruit is propagated using grafting, cuttings, and seeds (Vishnupriya *et al*., 2019). Despite the relatively simple technique of seed propagation, cross pollination results in seeds that are not true to type (Andrade *et al*., 2005). In order to meet the demands of growing commercial cultivation, a high number of plantlets with a healthy shoot and root system can be produced via vegetative propagation techniques, such as cuttings (Dengri *et al*., 2025).

Stem cutting is the simplest, least expensive, most practical and rapid way to multiply dragon fruit. Few days later, every single large cutting had roots. Nonetheless, roots appeared in 87% of medium and 65% of small cuttings respectively, at the same period (Trivellini *et al*., 2020). Viñas *et al*., (2012) reported that the middle portion of the newly transplanted joint exhibited around 100% survival rates and exhibited greater growth in comparison to the distal and basal joints. There are few publications on research on growing dragon fruit from cuttings and using plant growth regulators (PGRs) to promote greater root growth (Ayesha *et al*., 2018). PGRs are used to change a variety of aspects of plant growth,

Table 1: Monthly average temperature (°C) and relative humidity (%) in a shade house at 12 hours

Month	12 hrs	
	Temperature (°C)	Humidity (%)
October, 2022	28	68.5
November, 2022	26.87	70.0
December, 2022	20.45	70.5
January, 2023	21.03	69
February, 2023	23.09	66

including roots, reducing shoot growth, enhancing return bloom, branching, pruning off surplus fruit, and changing fruit maturity. In order to promote root growth, many plants' cuttings are typically dipped in rooting hormone prior to planting (Rahad *et al.*, 2016).

The various medium types used to handle cuttings are concerning for their development and growth. Growing media plays a crucial role in propagation as rooting competency varies by medium (Mehmood *et al.*, 2013). According to Loach *et al.*, (1988), the quality and percentage of rooting are directly affected by the rooting medium used. Rooting media suitability is determined by species, cutting type, growing conditions, season, and cost-effectiveness (Jaleta and Sulaiman, 2019). According to Chaudhari *et al.*, (2018), using high-quality rooting media and rooting hormone can boost root induction.

Dragon fruit propagation has encountered numerous issues, including cuttings' browning and failure to root. Poor quality seedlings and a lack of quality planting material limit dragon fruit yield. In the current situation, when planting material is restricted due to massive land development, standardizing the propagation process is obvious. There has been little and no commercially viable study on the impact of different media compositions in the rooting and shooting of dragon fruit cuttings. As a result, the experiment aimed to assess the rooting and shooting competency of dragon fruit stem cuttings in response to growth media and auxins, which will improve plant establishment success.

Materials and Methods

Plant Materials and Growing Conditions

The experiment was conducted during the period from October, 2022 to February 2023 under natural lighting in a shade house at the Horticulture farm of Sher-e-Bangla Agricultural University in Dhaka, Bangladesh. According to the National Mapping Organization of Bangladesh, Dhaka is situated at 23°422 372 2 N latitude and 90°242 262 2 E longitude and has an average elevation of 4 meters (13.12 ft). In this experiment, dragon fruit (cv. BARI Dragon fruit 1) cuttings were used as planting material, with cuttings ranging in length from 15 to 18 cm. Every cutting from shoots with four to five nodes that are a year old was taken. The cuttings were planted under poly net house in growing bag (10 inch × 8 inch) containing the substrate mixtures of soil: cocopeat: vermicompost: FYM as per treatment. Between October 2022 and February 2023, temperatures and relative humidity were measured in shade house to keep track of the actual environmental conditions that the cuttings were grown in (Table 1)

Table 2: Initial nutrient composition of the following substrates.

Growing media	Nutrients		
	N (%)	P (%)	K (%)
Cocopeat	0.43	0.79	1.29
Vermicompost	1.21	1.10	1.15

Experimental Design and Treatments

Five replications of a randomized complete block design (RCBD) were used to carry out the experiment. Although it was a growing bag experiment, the similar bags were placed in the same section of the shade house as the block that received the treatment combination. The experiment was consisted of two factors; factor A: different growing media i.e., M_0 -Soil, M_1-soil: cocopeat: FYM (2:1:1), M_2- Soil: cocopeat: vermicompost (2:1:1), Factor B: different levels of auxins *i.e.* G_0- Control (No auxins), G_1-IAA (@ 200 ppm, G_2-IBA @ 200 ppm, G_3-NAA @ 200 ppm. Basal ends of cuttings were treated with different levels of auxin. The Bremner (1960) method was used to calculate the total nitrogen (N) content, and the Motsara and Roy (2008) method was used to determine the concentrations of potassium (K) and phosphorus (P) (Table 2). Depending on the growing media's nutrient state, the required dosage of fertilizers was applied in an insoluble form.

Data collection

Days taken to root initiation

A few days after the dragon fruit cutting was planted, roots began to sprout and emerged through the growing medium. The number of days for root initiation was recorded once the roots were visible through the transparent polybag.

Length of root (cm)

The roots were gently cleaned with tap water to separate substrates. The longest root length was (cm plant^{-1}) determined by measuring the distance between the longest root's end and the initiation point in cutting.

Number of root/cutting

To separate substrates, the roots were gently cleaned with tap water. Next, count the number of primary roots that extend from the rooting area's base.

Table 3: Effect of auxins and different growing media on days taken for root initiation, Number of roots/cutting, length of root, fresh weight and dry weight of root of dragon fruit cutting.

Auxins	Growing media	Days to root initiation	Number of roots/cutting	Length of root (cm)	Fresh weight of root (g)	Dry weight of root (g)
G_0	M_0	35.33a	6.33g	32g	1.34g	0.42g
	M_1	27.67de	8.31e	36f	1.60ef	0.62ef
	M_2	29.33bc	7fg	35f	1.46fg	0.54fg
G_1	M_0	31.67b	6.67g	35f	1.84de	0.63ef
	M_1	26.33ef	9.67cd	42de	2.30b	0.89c
	M_2	27.33ef	8.32e	40e	2.17bc	0.82cd
G_2	M_0	25.33fg	8.34e	43cd	2.19bc	0.79cd
	M_1	22.66h	11.33a	47b	2.80a	1.21a
	M_2	23.67gh	10.32bc	50a	2.58a	1.05b
G_3	M_0	28.33cd	7.67ef	36f	2.01cd	0.72de
	M_1	23.33gh	10.65ab	45bc	2.62a	1.06b
	M_2	25.00fg	9.34d	41de	2.33b	0.91c
$LSD_{(0.05)}$		2.548	0.896	2.67	0.242	0.117
CV%		5.54	6.11	3.93	6.80	8.60

M_0=Soil, M_1=Soil: Cocopeat: FYM (2:1:1), M_2= Soil: Cocopeat: Vermicompost (2:1:1); G_0= control (No auxins), G_1=IAA @ 200 ppm, G_2=IBA @ 200 ppm, G_3=NAA @ 200ppm. Means followed by same letter(s) in a column do not differ significantly at 5% level of LSD.

Fresh and dry weight of roots (g)

Twelve plants in each treatment and replication were used to measure the fresh weight of the roots 120 days after the planting. After thoroughly cleaning the roots by hand to get rid of any dirt or debris, we weighed the roots using an electronic balance to estimate their fresh weight. For dry weight estimation of shoot and root, the fresh shoot and root are kept in oven for 72 hours at 65°C, and then took the weight in balance.

Fresh and dry weight of shoot (g)

Twelve plants in each treatment and replication were used to measure the fresh weight of new shoots, 120 days after the plantation. By weighing the fresh shoot of each cutting of dragon fruit on an electronic balance, the fresh weight of each treatment from each cutting was determined. For dry weight estimation of shoot and root, the fresh shoot and root are kept in oven for 72 hours at 65°C and then took the weight in balance.

Newly emerged shoot/cutting

At the time of harvesting (the last week of January), the total number of shoots per cutting was recorded in each treatment, and their average was reported in the number of shoots per cutting.

Length of new shoot (cm)

Five plants in each treatment and each replication were used for newly emerged shoot of dragon fruit cuttings. Shoot length was measured from the base of new sprout to the top of the sprout.

Photosynthetic pigments

Porath and Moran's (1980) approach was used to detect photosynthetic pigments. One milliliter of 100% N, N-dimethyl formaldehyde (DMF) was used to homogenize the 0.2 grams of leaf tissue that had been pounded into a powder using liquid nitrogen. The supernatant was collected by centrifuging homogenized samples for 10 minutes at 10,000 rpm. Following another addition of 1 ml DMF, the samples were centrifuged. After removing the supernatant, 1 milliliter of DMF was added. In a spectrophotometer, the absorbance was measured at 663 and 645 nm. 100% DMF was used as a blank for calibration. Chlorophyll *a*, *b* and total chlorophyll were calculated by the following formulas:

$$\text{Chlorophyll } a(\text{mg g}^{-1}\text{ tissue}) = \frac{[12.7\,(OD663) - 2.69\,(OD645)] \times V}{1000} \times W$$

$$\text{Chlorophyll } b(\text{mg g}^{-1}\text{ tissue}) = \frac{[22.9\,(OD645) - 4.68\,(OD663)] \times V}{1000} \times W$$

$$\text{Total Chlorophyll (mg g}^{-1}\text{ tissue)} = \frac{[8.02\,(OD663) + 20.20\,(OD645)] \times V}{1000} \times W$$

Where

OD: Optical density at respective nm,

V: Final volume of chlorophyll extract,

W: Fresh weight of the tissue extracted

Reducing sugar

The phenol-sulfuric acid method (DuBois *et al.*, 1956) was used to determine reducing sugar, with a few adjustments made to the assay volume and wavelength. The extract was filtered after 0.2 g of fresh sample of

Table 4: **E**ffect of growing media and auxins on fresh weight of shoot, dry weight of shoot and newly emerged shoot/cutting of dragon fruit cutting.

Auxins	Growing media	Fresh weight of shoot (g)	Dry weight of shoot (g)	Newly emerged shoot/cutting	Length of new shoot (cm)
G_0	M_0	18.39h	1.73g	0.33h	8.13i
	M_1	23.13de	2.18de	1.67de	9.00h
	M_2	20.383g	1.92f	1.00fg	10.16fg
G_1	M_0	19.19gh	1.81fg	0.67gh	9.47gh
	M_1	23.99cd	2.26cd	2.33c	11.55de
	M_2	22.63ef	2.14de	1.67de	12.23cd
G_2	M_0	21.83f	2.07e	1.33ef	14.66a
	M_1	26.89a	2.52a	3.67a	13.00bc
	M_2	25.65ab	2.41ab	2.33c	9.66gh
G_3	M_0	20.13g	1.89f	1.00fg	11.00ef
	M_1	24.8bc	2.33bc	3.00b	13.66ab
	M_2	23.96cd	2.17de	2.00cd	12.16cd
CV%		3.37	3.51	8.48	3.63
$LSD_{(0.05)}$		1.28	0.12	0.58	0.49

M_0=Soil, M_1=Soil: Cocopeat: FYM (2:1:1), M_2= Soil: Cocopeat: Vermicompost (2:1:1); G_0= control (No auxins), G_1=IAA @ 200 ppm, G_2=IBA @ 200 ppm, G_3=NAA @ 200ppm. Means followed by same letter(s) in a column do not differ significantly at 5% level of LSD.

shoot was mixed with deionized water. 0.4 milliliters of 5% phenol were combined with 2 milliliters of the solution. After that, 2 milliliters of 98% sulfuric acid were quickly added to the blend. After ten minutes at room temperature, the test tubes were submerged in a water bath set at 30°C for twenty minutes to develop their color. The spectrophotometer was then used to record the light absorption at 540 nm. The same procedure was used to prepare the blank solution, which is distilled water. Reducing sugar contents were expressed as mg/g FW.

Statistical analysis

The experiments employed a randomized complete block design (RCBD), with twelve cuttings in each replicate and three replications for each treatment. Statistics 10 (IBM Corp, Armonk, NY, USA) was used for statistical analysis. The mean value across treatments was deemed statistically significant when $P<0.01$. The mean ± SE for each outcome was determined using the replicated data. The Microsoft Excel was used to create the graphs.

Results and Discussion

Days to root initiation

Root initiation of dragon fruit cuttings varied significantly due to the effect of growing media and auxins (Table 3). The minimum number of days (22.66) was recorded in G_2M_1, which was statistically similar to the treatment of G_3M_1 (23.33), and G_2M_2 (23.66). The maximum number of days (35.33) was recorded from M_0G_0 treatment. Auxins are essential for the promotion of adventitious roots in vegetative proliferation (Wang *et al.*, 2021). It is anticipated that the exogenous administration of auxin, like IBA, will cause the cuttings to develop roots (Jdaidi *et al.*, 2021). IBA is a PGR that increases the cambium layer's ability to initiate roots and encourages the growth of roots (Jamal *et al.*, 2021). The rooting performance of pepper reveals that improved metabolic processes and root initiation are attributable to growing media with improved aeration (Amanah *et al.*, 2022). FYM improves the soil's ability to hold water and ensures appropriate aeration, which contributes in boosting the quantity of soil microorganisms, improving the soil's capability to feed plant nutrients and promoting root initiation (Setyowati *et al.*, 2023).

Number of roots per cutting

The number of roots in a dragon fruit plant was significantly impacted by the various auxins and growing media (Table 3). The height value (11.33) was obtained from M_1G_2 treatment and the lowest value (6.33) was obtained from M_0G_0 treatment. The use of the growth regulator IBA proved beneficial for root development in stem cuttings of *Actinidia deliciosa* rootstock (Sekhukhune *et al.*, 2024). IBA treatment enhanced the average number of roots per olive stem cutting (Kurd *et al.*, 2010). It is probable that the IBA increased the mobilization and utilization of the nitrogen fraction and carbohydrates, allowing them to produce more roots in litchi (Sharma *et al.*, 2022). According to Susikaran *et al.*, (2023), the highest number of roots in mulberry cuttings was found with the media of Soil: Coir pith: FYM

(1:1:1). In our result, the increased number of roots in soil: cocopeat: FYM is linked to better gaseous exchanges, excellent drainage, a high content of organic matter, and a good capacity to hold water. In poplar stem cuttings, the number of roots was considerably greater in media containing soil and FYM (Chhetri *et al*., 2021).

Length of root (cm)

Root length changed dramatically as a result of the effect of growing media and auxins (Table 3). The maximum value (50 cm) was observed from the treatment of M_2G_2 and the minimum value (32 cm) observed in M_0G_0 treatment. Singh and Singh (2016) found that semi-hardwood sweet orange (*Citrus sinensis* L. Osbeck) cv. Malta cuttings treated with IBA produced the longest root length. Exogenous IBA increases the rate of cambium de-differentiation, callus development, and hydrolytic activity, all of which lead to longer roots in guava (Zheng *et al*., 2019). Medicinal plants such as Medicinal Coleus and Kesavardhini plants grown in vermicompost had the longest roots (Kumaresan *et al*., 2023). The combination of vermicompost and cocopeat prevents cuttings from drying out by holding more water and acting as an aerating agent, allowing air to circulate inside the medium, resulting in longer roots (Vijay *et al*., 2024).

Fresh and dry weight of roots (g)

The effect of auxins and growing media significantly influence on the fresh and dry weight of root (Table 3). The M_1G_2 treatment gave the highest fresh (2.80g) and dry (1.21g) weight of root and the lowest fresh (1.34g) and dry weight (0.42g) was found in M_0G_0 treatment. Pandey *et al.,* (2022) demonstrated that increased IBA concentrations promoted root development and increased the number of roots in dragon fruit cuttings. The higher percentage of root can increase the sum total root weight. The higher dry matter weight of roots may be related to the greater number and length of roots (Neumann *et al*., 2017). IBA dramatically increased the length, diameter, and quantity of roots in guavas, hence increasing the total dry matter in the roots (Abdallatif *et al*., 2022). According to Singh *et al.,* (2020), using farmyard manure in crop cultivation improves soil structure, creating better conditions for root growth, thus increase root weight. Parakhiya *et al*., (2023) discovered that in a rooting environment containing Sand, vermicompost, FYM, and vermiculite (1:1:1:1), Pomegranate had the highest root fresh weight. FYM's improved performance could be linked to increased crop nitrogen availability, which raised plant dry matter accumulation and reduced nitrogen loss via $NH4^+$ ion fixation with FYM's humus.

Fresh and dry weight of shoot (g)

The fresh and dry weight of dragon fruit cuttings varied significantly due to the effect of growing media and auxins (Table 4). The maximum fresh weight (26.89g) and dry weight (2.52g) of dragon fruit cuttings was observed from the treatment of M_1G_2 and the minimum fresh weight (18.39g) and dry weight (1.73g) was recorded from M_0G_0 treatment. Hakim *et al*., (2018) reported that the fresh weight of pomegranate shoots treated with IBA was higher than that of other treatments, which supports these findings. Stem cuttings of dragon fruit treated with an IBA solution exhibited the highest dry weight, which could be attributed to the rapid breakdown of polysaccharides contained in the cuttings into physiologically active sugars via hydrolytic enzyme activation (Singh *et al*., 2024). The greatest shoot dry weight of fig was recorded with the growing media containing FYM (Dahale *et al.,* 2018). Growing media containing FYM helps promote more root & branch growth as it provides an efficient supply of nutrients which in turn results in increased weight of shoots (Dey *et al*., 2022).

Newly emerged shoot/cutting

The sprout number of dragon fruit cuttings varied significantly due to the effect of growing media and auxins (Table 6). The lowest number of sprouts per cutting (0.33) was obtained in the M_0G_0 treatment, which was statistically similar to the treatment of M_0G_1 (0.67), and the highest number of sprouts (3.67) showed in the M_1G_2 treatment. Dharani *et al*., (2023) found that cuttings treated with IBA produced considerably more shoots per stem of dragon fruit. Sunita *et al.,*\ (2022) found that IBA-treated stem cutting showed the highest number of stem sprouts in dragon fruit, indicating that IBA raised endogenous auxin levels, which are known to stimulate root and shoot growth in plants. Yesuf *et al.,* (2021) showed that Chaya cuttings grown on top soils in FYM medium produced more leaves and had significantly higher regrowth of the stem. Ahmad *et al.,* (2022) revealed that FYM's enhanced organic matter content is linked to the establishment of high nutrient concentrations in the cells thus, increase shoot number/plant.

Length of new shoot (cm)

The effect of growing media and auxins significantly influenced the length of new shoots of dragon fruit cuttings (Fig. 1). The maximum length of shoot (14.67cm) was observed from the treatment of M_1G_2 and the minimum length of shoot (8.13) was recorded from the treatment of M_0G_0. Tanwar *et al*., (2020) found that IBA produced the longest roots per cutting in pomegranates. This

Table 5: Combined effect of different growing media and Auxins on chlorophyll a, chlorophyll b, total Chlorophyll of dragon fruit cutting.

Auxins	Growing media	Ca	Cb	Tc
G_0	M_0	1.22g	0.76e	0.61h
	M_1	1.42f	0.91d	0.78fg
	M_2	1.52e	0.85de	0.71g
G_1	M_0	1.41f	0.98d	0.78fg
	M_1	1.72c	1.22bc	0.92cd
	M_2	1.67cd	1.13c	0.82ef
G_2	M_0	1.61de	1.24c	0.96c
	M_1	2.10a	1.54a	1.23a
	M_2	1.88b	1.34b	1.06b
G_3	M_0	1.51ef	1.15c	0.85df
	M_1	1.86b	1.35b	0.98bc
	M_2	1.75c	1.24bc	0.90cde
CV%		3.65	7.02	5.58
$LSD_{(0.05)}$		0.101	0.136	0.083

[**Ca:** Chlorophyll a (mg/g); **Cb:** Chlorophyll b(mg/g); **Tc:**Total chlorophyll (mg/g)]
M_0=Soil, M_1=Soil: Cocopeat: FYM (2:1:1), M_2= Soil: Cocopeat: Vermicompost (2:1:1); G_0= control (No auxins), G_1=IAA @ 200 ppm, G_2=IBA @ 200 ppm, G_3=NAA @ 200ppm. Means followed by same letter(s) in a column do not differ significantly at 5% level of LSD.

process can be used in conjunction with the incorporation of new cell wall polymers, which causes the stem to elongate (Sunita *et al*., 2022). The maximum stem length in fig cutting was obtained with media containing FYM as the main source (Mehmood *et al*., 2020). Patel *et al*., (2020) found that Farmyard manure applications were mainly responsible for this rise in shoot length and other physiological characteristics of pomegranate. This is due to the fact that FYM permits the organic acids found in organic manures to be present in the medium, which improves the availability of nutrients.

Photosynthetic pigments

The effect of growing media and auxins significantly influenced the photosynthetic pigments of dragon fruit cuttings (Table 5). The maximum chlorophyll a (2.10 mg/g), chlorophyll b (1.54 mg/g), and total chlorophyll (1.23 mg/g) were observed from the treatment of M_1G_2 and the minimum chlorophyll a (1.22 mg/g), chlorophyll b (0.76 mg/g) and total chlorophyll (0.61 mg/g) was recorded from the treatment of M_0G_0. Auxins can significantly affect the chlorophyll content of cuttings, with the application of IBA often leading to increased chlorophyll levels, indicating improved photosynthetic activity due to enhanced root development and nutrient uptake in the cutting (Rani *et al*., 2018). IBA enhanced the photosynthetic pigments in dragon fruit shoots, which was consistent with findings from another study (Khandaker *et al*., 2022), showing that IBA treatment had the highest chlorophyll concentration when compared to other treatments, including control. The improvement in the physiochemical features of the soil may be attributable to an increase in microbial population, plant growth hormones, and enzymatic activity brought on by the use of adequate growing media (Singh *et al*., 2011). Dragon fruit shoots grew taller and produced more shoots when grown on FYM-based media, which provided sufficient microclimate conditions in the root zone, resulting in more photosynthate accumulation in plants (Islam *et al*., 2023).

Reducing sugar

The effect of different growing media and Auxins had shown significant results on reducing sugar content (Fig. 1). Experimental results showed that the maximum reducing sugar content of dragon fruit (4.743 mg/g) was obtained in M_2G_2 treatment whereas the lowest reducing sugar content of dragon fruit cutting was obtained in soil-based growing media, without Auxins (M_0G_0). The function of auxin is linked to photosynthesis, which produces large amounts of oligosaccharides and polysaccharides, as well as the conversion of carbohydrates into sugars, which increases reducing sugars (Khan *et al*., 2023). The use of exogenous IBA, which promotes sugar production in plants, may explain the increase in reducing sugar in IBA-treated jujube (Bons *et al*., 2019) compared to the control. According to (Kazimi *et al*., 2024), the vermicompost-containing treatment showed the highest reducing sugar. This is mostly because of the physical and chemical properties of the substrate, which in turn affect the plant's qualitative traits. These results are in line with those of Lakshmikanth *et al*., (2020), who found that the cocopeat and vermicompost medium may raise the maximum levels of

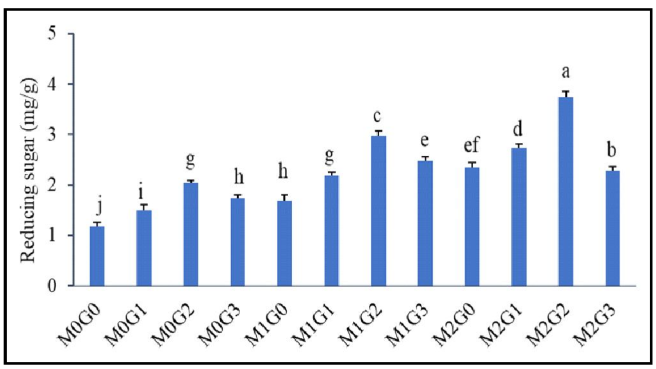

Fig. 1: Combine effect of growing media and Auxins on reducing sugar of dragon fruit cutting. M_0 =Soil, M_1=Soil: Cocopeat: FYM (2:1:1), M_2= Soil: Cocopeat: Vermicompost (2:1:1); G_0= control (No auxins), G_1=IAA @ 200 ppm, G_2=IBA @ 200 ppm, G_3=NAA @ 200ppm.

reducing and non-reducing sugar. Vermicompost also has the potential to affect the vegetative and chemical properties of strawberry fruits, and it can increase reducing sugar because it supplies essential elements like nitrogen, potassium, and phosphorus (Singh *et al*., 2023).

Conclusion

On the basis of results revealed from the study, it is concluded that growing media significantly influenced the rooting and growth parameters of dragon fruit cutting. Among different growing media, soil: cocopeat: FYM media showed higher root number/cutting, root fresh and dry weight, sprout number, new shoot length, fresh and dried weight of new shoot, photosynthetic pigments. Dragon fruit cuttings grown in IBA at 200 ppm in this experiment produced the best results in all aspect. Thus, soil: cocopeat: FYM is recommended as growing media along with IBA (200 ppm) for successful propagation of dragon fruit cutting.

Acknowledgement

The present work was financially supported by the Sher-e-Bangla Agricultural University Research System (SAURES), Dhaka, Bangladesh.

References

Ahmad, I., Rashid M.H.U., Nawaz S., Asif M., Farooq T.H., Shahbaz Z. and Shaheen M. (2022). Effect of different compost concentrations on the growth yield of Bombax ceiba (Simal). *Natural Resources for Human Health*, **2**, 222-227.

Andrade, R.A.D., Oliveira I.V.D.M. and Martins A.B.G. (2005). Influence of condition and storage period in germination of red pitaya seeds. *Revista-Brasileira-de-Fruticultura* **27(1)**, 168-170.

Ayesha, S., Thippesha D., Shivakumar B.S., Adivappar N. and Ganapathi M. (2018). Effect of growth regulators on rooting and shooting of stem cuttings in dragon fruit [*Hylocereus undatus* (Haworth) Britton & rose]. *Journal of Pharmacognosy and Phytochemistry*, **7(5)**, 1595-1598.

Abdallatif, A.M., Hmmam I. and Ali M.A. (2022). Impact of silver nanoparticles mixture with NAA and IBA on rooting potential of Psidium guajava L. stem cuttings. *Egyptian Journal of Chemistry*, **65(132)**, 1119-1128.

Amanah, S., Budiastuti M.S. and Sulistyo A. (2022). Effect of the media type and auxin concentration on the growth of cuttings seedlings of pepper (*Piper nigrum*). *Cell Biology and Development*, **6(1)**, 32-40.

Bremner, J.M. (1960) Determination of Nitrogen in Soil by the Kjeldahl Method. *Journal of Agricultural Sciences*, **55**, 11-33.

Bons, H.K. and Kaur M. (2019). Role of plant growth regulators in improving fruit set, quality and yield of fruit crops: a review. *The Journal of Horticultural Science and Biotechnology*, **95(2)**, 137-146.

Chhetri, S. and Pandey S. (2021). Effect of different growing media on the growth and biomass of poplar (*Populus deltoides* W. Bartram ex Marshall) stem cuttings. *Research on Crops*, **22(3)**, 644-651.

Chaudhari, B.B., Bhatt D., Chawla S.L., Patel M.A. and Bennurmath P. (2018). Effect of rooting hormone and media on root induction in poinsettia (*Euphorbia pulcherrima* Willd.). *Journal of Ornamental Horticulture*, **21**, 7-12.

Dengri, D., Bairwa L.N., Bairwa S.K., Sen G. and Kumari P. (2025). Impact of indole butyric acid and growing media on growth parameters of dragon fruit [*hylocereus undatus* l.] cuttings. *Plant archives*, **25(1)**, 244-248.

DuBois, M., Gilles K.A., Hamilton J.K., Rebers P.T. and Smith F. (1956). Colorimetric method for determination of sugars and related substances. *Analytical chemistry*, **28(3)**, 350-356.

Dharani, J., Rajangam J., Beaulah A., Venkatesan K. and Vijayasamundeeswari A. (2023). Standardization of Length of Cuttings and Auxin Levels on Root and Shoot Growth of Dragon Fruit (*Hylocereus undatus* L.). *International Journal of Environment and Climate Change*, **13(10)**, 2709-2717.

Dey, S., Datta S., Alam M. and Datta P. (2022). Impacts of vermicompost and different organic growing media on the morpho-physiological characteristics of dragon fruit (*Hylocereus costaricensis* L.) in new alluvial zone of West Bengal. *The Pharma Innovation Journal* 2022; **11(7)**, 315-318.

Dahale, M.H., Shinde G.S., Bharad S.G., Nagre P.K. and Muske D.N. (2018). Effect of IBA and Different Rooting Media on Fig Cuttings. In *Sustainable Horticulture. Apple Academic Press*, **1**, 367-375.

Flores-Verastegui, M.I.M., Coe S., Tammam J., Almahjoubi H., Bridle R., Bi S. and Thondre P.S. (2025). Effects of Frozen Red Dragon Fruit Consumption on Metabolic Markers in Healthy Subjects and Individuals at Risk of Type 2 Diabetes. *Nutrients*, **17(3)**, 441.

Hakim, A., Jaganath S., Honnabyraiah M.K., Kumar S.M., Kumar S.A. and Dayamani K.J. (2018). Influence of biofertilizer and auxin on growth and rooting of pomegranate (*Punica granatum* L.) cuttings. *International Journal of Current Microbiology and Applied Sciences*, **7(2)**, 1187-1193.

Islam, N., Hossain I. and Choudhury S. (2023). Impact of Different Shed Houses and Growing Media on Growth, Yield and Quality of Strawberry. *Journal of Agricultural Production*, **4(1)**, 30-38.

Jdaidi, N., Aloui F., Selmi H. and Chabaane A. (2021). Proliferation and rooting tests of Prunus avium root segments cuttings: Effect of auxin and cutting date. *Algerian Journal of Arid Environment "AJAE"*, **11(1)**, 8-8.

Jamal, A., Ayub G., Ali Rahman A.R., Ali J. and Shahab M. (2021). Effect of IBA (Indole Butyric Acid) levels on the growth and rooting of different cutting types of

Clerodendrum splendens. *Pure and Applied Biology (PAB)*, **5(1)**, 64-71.

Jaleta, A. and Sulaiman M. (2019). A review on the effect of rooting media on rooting and growth of cutting propagated grape (*Vitis vinifera* L). *World Journal of Agriculture and Soil Science*, **3(4)**, 1-8.

Kumaresan, M., Nadhiya Devi K. and Rajaselvam M. (2023). Effect of organic media on growth and rooting performance of medicinal plants. *Research Journal of Agricultural Sciences*, **14(6)**, 1855-1858.

Kazimi, R., Tajzadah A.W. and Merzai M.S. (2024). Impacts of alternative growing medium in combination with Jeevamrit on strawberry growth, and fruit quality parameters under open field condition. *Multidisciplinary Science Journal*, **6(10)**, 2024212-2024212.

Khan, M.N. and Nabi G. (2023). Role of Auxin in vegetative growth, flowering, yield and fruit quality of Horticultural crops-A review. *Pure and Applied Biology (PAB)*, **12(2)**, 1234-1241.

Kurd, A.A., Khan S., Shah B.H. and Khetran M.A. (2010). Effect of indole butyric acid (IBA) on rooting of olive stem cuttings. *Pakistan Journal of Agricultural Research,* **23(3-4)**, 193-195.

Khandaker, M.M., Saidi A., Badaluddin N.A., Yusoff N., Majrashi A., Alenazi M.M., Saifuddin M., Alam M.A. and Mohd K.S. (2022). Effects of Indole-3-Butyric Acid (IBA) and rooting media on rooting and survival of air layered wax apple (*Syzygium samarangense*) cv. Jambu Madu. *Brazilian Journal of Biology*, **82**, p.e256277.

Lakshmikanth, K.H., Madaiah D. and Sudharani N. (2020). Effect of Different Pot Culture Media on Biochemical and Quality Parameters of Strawberry in Vertical System. *International Journal of Current Microbiology and Applied Sciences*, **9(7)**, 678-684.

Mehmood, S., Ayub Q., Khan S.M., Arif N., Khan M.J., Mehmood A., Shahzad Q., ul Haq N., Tanoli M.T.Z. and Ayub M.U. (2020). Responses of Fig Cuttings (*Ficus Carica*) to different sowing dates and potting media under agro-climatic conditions of Haripur. *RADS Journal of Biological Research & Applied Sciences*, **11(2)**, 112-119.

Mehmood, T., Ahmad W., Ahmad K.S., Shafi J., Shehzad M.A. and Sarwar M.A. (2013). Comparative effect of different potting media on vegetative and reproductive growth of floral shower (*Antirrhinum majus* L.). *Universal Journal of Plant Science*, **1(3)**, 104-111.

Motsara, M.R. and Roy R.N. (2008). Guide to laboratory establishment for plant nutrient analysis. Food and Agriculture Organization of the United Nations, Rome.

Moran, R. and Porath D., (1980). Chlorophyll determination in intact tissues using N, N-dimethylformamide. *Plant physiology*, **65(3)**, 478-479.

Mizrahi, Y., Nerd A., and Sitrit Y. (2002). New fruits for arid climates. *Trends in new crops and new uses. ASHS Press, Alexandria, VA*, 378-384.

Neumann, É.R., Resende J.T.V., Camargo L.K., Chagas R.R., and Lima B.R. (2017). Production of sweet potato seedlings in protected environment with the application of Ascophyllum nodosum extract. *Horticultura Brasileira*, **35**, 490-498.

Patel, K.D., Butani A.M., Thummar B.V., Purohit H.P. and Trambadiya R.D. (2020). Response of different media and iba on rooting and survival percentage of hardwood cutting in pomegranate (*Punica granatum* L.) CV. Bhagwa. *Journal of Pharmacognosy and Phytochemistry*, **9(5)**, 322-329.

Parakhiya, N.V., Patel M.V. and Hathi J.B.G.H.S. (2023). Effect of media on softwood cuttings of pomegranate (*Punica granatum* L.) cv. Bhagwa. *The Pharma Innovation Journal*, **12(1)**, 1778-1782.

Pandey, L., Verma R.S., Shukla K.K., Shukla J.K. and Pathak S. (2022). Effect of IBA and NAA on Rooting of Stem Cutting in Dragon Fruit [*Hylocereus undatus* (Haworth) Britton & Rose]. *Journal of Experimental Agriculture International*, **44**, 1-6.

Rahad, M.K., Islam M.A., Rahim M.A. and Monira S. (2016). Effects of rooting media and varieties on rooting performance of dragon fruit cuttings (*Hylocereu sundatus* Haw.). *Research in Agriculture Livestock and Fisheries*, **3(1)**, 67-77.

Rani, T.D., Srihari D., Dorajeerao A.V.D. and Subbaramamma P. (2018). Effect of rooting media and IBA treatments on shoot production and survival of terminal cuttings in guava (*Psidium guajava* L.) cv. Taiwan Pink. *International Journal of Current Microbiology and Applied Sciences*, **7(11)**, 231-242.

Setyowati, N., Permana I.G. and Hermansyah H. (2023). Effect of growing media and natural plant growth regulators on the growth of tea stem cutting. In *E3S Web of conferences. EDP Sciences*, **373**, 03004.

Singh, T.B., Ali A., Prasad M., Yadav A., Shrivastav P., Goyal D. and Dantu P.K. (2020). Role of Organic Fertilizers in Improving Soil Fertility. In: Naeem M., Ansari A., Gill S., editors. *Contaminants in Agriculture*. Springer; Cham, Switzerland.

Singh, S. and Singh K.K. (2016), Effect of various concentrations of IBA and Type of stem cuttings on the performance of rooting in sweet orange (*Citrus sinensis Osbeck*) cv. Malta under mist-house. *The Bioscan*, **11(2)**, 903-906.

Singh, B., Pathak, K., Verma, A., Verma, V. and Deka, B. (2011). Effects of Vermicompost, Fertilizer and Mulch on Plant Growth, Nodulation and Pod Yield of *French Bean* (L.). *Journal of Fruit and Ornamental Plant Research*, **74(1)**, 153-165.

Sharma, M.R. (2022). Effect of plant growth regulators and different growing media on propagation of fruit crops. *The Pharma Innovation Journal,* **11(12)**, 4638-4642.

Susikaran, S., Shandeep S.G., Haran M.S.R., Deeikshana T. and Abinaya C. (2023). Rooting Hormone and Substrate Effects on Mini-Cloned Mulberry (*Morus indica*).

International Journal of Plant & Soil Science, **35(20)**, 72-83.

Singh, D. and Kaur A. (2024). Response of dragon fruit (*Hylocereus* sp.) cuttings to different plant growth regulators. *Current Agriculture Research Journal*, **12(1)**, 339-347.

Sekhukhune, M.K. and Maila M.Y. (2024). Exogenous IBA stimulatory effects on root formation of Actinidia deliciosa rootstock and Actinidia arguta male scion stem cuttings. *Frontiers in Sustainable Food Systems*, **8**, 1461871.

Singh, S., Chandana B. and Yadav B.S. (2023). Effect of different growing media and growing condition on dry matter accumulation in guava (*Psidium guajava* L.) seedlings: Growing media and growing condition on guava. *Journal of AgriSearch*, **10(3)**, 168-172.

Sunita, M.L., Choudhary A., Nagori A. and Nishad U. (2022). Impact of plant growth regulator on development of dragon fruit cutting [*Hylocereus costaricensis* (WEB.) britton and rose]. *Annals of Horticulture*, **15(2)**, 162-167.

Tanwar, D.R., Bairwa H.L., Lakhawat S.S., Mahawer L.N. and Choudhary R.C. (2020). Effect of IBA and rooting media on hardwood cuttings of pomegranate (*Punica granatum* L.) cv. Bhagwa. *International Journal of Environment and Climate Change*, **10(12)**, 609-617.

Trivellini, A., Lucchesini M., Ferrante A., Massa D., Orlando M., Incrocci L. and Mensuali-Sodi A. (2020). Pitaya, an attractive alternative crop for Mediterranean region. *Agronomy*, **10(8)**, 1065.

Viñas, M., Fernández-Brenes M., Azofeifa A. and Jiménez V.M. (2012). *In vitro* propagation of purple pitahaya (*Hylocereus costaricensis* [FAC Weber] Britton & Rose) cv. Cebra. *In Vitro Cellular & Developmental Biology-Plant*, **48(5)**, 469-477.

Vijay, J. and Dorajeerao A.V.D. (2024). Shoot growth and success of propagation through terminal cuttings as influenced by rooting media in marigold. *Plant Archives*, **24(2)**, 259-268.

Vishnupriya, J., Thamaraiselvi S.P., Hemaprabha K. and Kavitha C. (2019). Influence of growth regulators on in vitro seed germination of dragon fruit (*Hylocereus undatus*). *International Journal of Chemical Studies*, **7(3)**, 3313-15.

Wang, M., Hu J., Guo G., Park Y.G. and Jeong B.R. (2021). Effect of auxins and their concentrations, immersion time, and rooting substrate on rooting of cutting-propagated Pyracantha angustifolia CK Schneid. *Propagation of Ornamental Plants*, **21(1)**, 3-10.

Yesuf, F., Mohammed W. and Woldetsadik K. (2021). Effect of rooting media and number of nodes on growth and leaf yield of chaya (*Cnidoscolus aconitifolius* McVaugh) at Dire Dawa, Eastern Ethiopia. *Cogent Food & Agriculture*, **7(1)**, 1914383.

Zheng, L., Gao C., Zhao C., Zhang L., Han M., An N. and Ren X. (2019). Effects of brassinosteroid associated with auxin and gibberellin on apple tree growth and gene expression patterns. *Horticultural Plant Journal*, **5(3)**, 93-108.