



RESPONSE OF LEMON DROP MANGOSTEEN (*Garcinia intermedia*) CUTTINGS AT VARYING PHYSIOLOGICAL AGES TO PLANT GROWTH REGULATORS

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ABSTRACT

This study determined the response of Lemon Drop Mangosteen(LDM) cuttings treated with plant growth regulators (PGR). A factorial experiment was conducted to identify the suitable physiological age (semi-hardwood, softwood) and PGR for the cuttings. Parameters measured includes callus formation performance which was qualitatively assed using a 0-4 scale (4 for the thick callus and 0-3 for no or minimal callus), shoot and leaf development. The PGR applied were Alpha Naphthalene Acetic Acid (ANAA), Indole-3-butyric Acid (IBA), Aloe vera extract(AVLE), banana peel extract(BPE), coconut water, and distilled water as the control. The findings revealed that for shoot development, the the control and coconut water gained the highest shoot emergence with the significant mean of 9.00 and 8.67, and 6.94 and 6.19 for average shoot length, respectively. Leaf emergence shows no significant differences among the treatment but the control and AVLE has the highest number of leaf emerged with both mean of 6.50. Callus formation had been considered in place of root development. LDM treated with IBA and BPE extract had the highest callus formation with both mean of 8.00. For the callus formation scoring, result shows that IBA has the highest score mean of 2.40 followed by coconut water of 2.60. and with the mean of 1.99, semi-hardwood treated with IBA cutting obtained the thickest calli. The return in expenses shows that BPE is the most economical among all the treatment. In conclusion, the treating of semi-hardwood cutting with IBA or coconut water to promote callus formation that will lead to rooting. Further, this study will provide technical framework necessary to introduce lemon drop mangosteen propagation in the locality.

Keywords: callus, semi-hardwood, softwood, physiological age, plant growth regulators

INTRODUCTION

Lemon drop mangosteen (*Garcinia intermedia*) is a tropical plant thriving in humid, tropical areas. *G. Intermedia* belong to Clusiaceae and polygenetically tied with the super fruit, purple mangosteen(*G. Mangostana*). Pharmacologically, LDM has high antioxidant content including polyisoprenylated benzophenones such as guttiferone A, guttiferone E, and xanthochymol, which have shown antiproliferative effects by inhibiting the growth of human colon cancer cells (Einbod et al., 2013). LDM is not listed as endangered plant, however, habitat loss and deforestation in its natural environment pose significant threats to its long-term survival adding the fact that LDM takes at least 4-5 before bearing a fruit (Botanical Realm(2025). LDM is still underutilized and unfamiliar in the locality, but it is gaining international attention due to its possible economic and nutraceutical value.

Vegetative propagation offers a strategic initiative to bypass the longer propagation through seeds in LDM. Botanically, mostly *Garcinia* species are recalcitrant and slow developing, thus, application of plant growth regulator will hasten the the development and progation. The natural

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and synthetic auxin including Indole -3-butyric acid (IBA) and Alpha Naphthalene acetic acid (ANAA) and other plant extracts that contain the same compound will eventually promotes fast cell differentiation when subjected to optimal temperature (28-30°C) and relative humidity (70-80%). (Tanishka 2020)

Considering the multiple choice of PGR and their limited sources as well as the limited data framework in the production of LDM, this study was conducted to determine the most suitable PGR including the physiological age (semi-hardwood, softwood) of the LDM. The parameters gathered were shoot emergence, shoot length, leaf emergence, callus formation and callus scoring.

METHODOLOGY

This study used a factorial experiment to address the abovementioned parameters. The physiological age was the Factor A and the PGR for the Factor B. The PGR used includes T₀(Alpha Naphthalene Acetic Acid (ANAA)), T₁(Indole-3-butyric Acid (IBA)), T₃(Aloe vera extract(AVLE)), T₄(banana peel extract(BPE)), T₅(coconut water(CW)) and T₀(distilled water(cotrol)) will serve as the control.

For the preparation of materials, the plant extract including the aloe vera leaf extract and banana peel extraxt was chopped and blended. Coconut water, ANAA, IBA and distilled water were purchased from the local market. Cuttings were collected from multiple mother plant, semi-hardwood cutting diameter ranges from 1.0- 1.5cm and for softwood was 0.5- 1.5 cm with 12-15 cm length and with at least 3 nodes and was cut slanting on the proximal end just below the lower node and a smooth distal or flat cut on the other end. These cuttings was immersed first on distilled water before dipping the proximal ends on every 210ml of the prepared plant growth regulators. After planting, the samples were observed weekly to collect data on the abovementioned parameters. Shoot emergence was calculated by counting the shoot emerged 20 days after planting (DAP) while shoot length was obtained through measuring the shoot from the base to the tip using a ruler. Leaf emergence was determined by counting the leaf emerged and callus formation was also recorded and scored using the Gurel et al. (2001) method of 0-4 sacale where 4 is equivalent to 10mm thickness in callus ang 0 with no callus.

Table 1. Callus formation scoring (Gurel *et al.*, 2001).

Score	Description
0	No visible callus
1	Small proliferation at cut ends only
2	5mm callus at cut ends
3	4-10mm callus at the end of the cutting
4>	10 mm callus at the end of the cutting

Data gathered were analyzed using analysis of variance (ANOVA) to determine if there are significant differences among treatments. To compare the the significant differences, Tukey's Honestly Significant Difference (HSD) was used.

RESULTS AND DISCUSSION

Shoot emergence



The cuttings under propagation were regularly observed to gather the data on which among the treatments would be the most efficient on promoting shoot emergence during the expected date of shoot emergence which is at 20 days after planting (DAP).

Table 2. Mean Number of Shoot Emerged 20 DAP of Lemon Drop Mangosteen (*Garcinia intermedia*) Cuttings at Varying Physiological Ages and Different Plant Growth Regulators

Physiological Ages		Plant Growth Regulator(PGR)		Physiological Ages x Rooting Hormones	
S ₁ (semi-hardwood)	4.83	T ₀ (Control)	9.00 ^a	S ₁ T ₀	8.00
S ₂ (softwood)	6.39	T ₁ (Alpha Naphthalene Acetic Acid (ANAA))	2.33 ^{bc}	S ₁ T ₁	1.67
		T ₂ (Indole-3-butyric Acid)	1.33 ^c	S ₁ T ₂	1.00
		T ₃ (Aloe Vera Leaf Extract (AVLE))	6.00 ^{ab}	S ₁ T ₃	5.00
		T ₄ (Banana Peel Extract (BPE))	6.33 ^{ab}	S ₁ T ₄	5.00
		T ₅ (Coconut Water (CW))	8.67 ^a	S ₁ T ₅	8.33
				S ₂ T ₀	10.00
				S ₂ T ₁	3.00
				S ₂ T ₂	1.67
				S ₂ T ₃	7.00
				S ₂ T ₄	7.67
				S ₂ T ₅	9.00
Result	ns		**		ns
CV (%)	47.03				
Tukey's HSD = 4.58		**significant at 1% level		ns not significant	

The Table 2 shows that show that the physiological age (semi-hardwood and softwood) of the cutting obtained no significance on the shoot emergence. Although, it should be noted that softwood cuttings had a higher numerical mean (6.39) than semi-hardwood (4.83). The result was supported by the study of Kouakou et al. (2016) on *Garcinia kola* states that sprouting in softwood cutting is higher than in semi-hardwood since they are more succulent and has active meristematic tissue.

Further, the result shows that the T₀(Control) and T₅(coconut water) gained significant difference and the highest mean score of 9.00 and 8.67, respectively while T₁(ANAA) and T₂(IBA) treatments (2.33 and 1.33) has the lowest shoot emergence. This suggests that while these PGRs are meant for rooting, they may initially inhibit shoot development in this species. As stated by Hartmann et al. (2011) that while exogenous auxin such as IBA triggers root primordia, the application on high concentration can stimulate the production of ethylene which could act as growth inhibitor that suppresses the elongation of axillary buds, delaying or preventing shoot emergence while the plant prioritizes on production of roots. In fact, the study of Harahap et al.



(2014) on Mangosteen (*Garcinia mangostana* L.) it was observed that although auxin is clearly necessary for bud induction and root growth, at higher concentration auxin can actually disrupt and inhibit growth.

Shoot length

Shoot length was obtained by measuring the base up to the tip of the shoot using a ruler in centimeter unit.

Table 3. Mean Average Shoot Length (cm) of Lemon Drop Mangosteen (*Garcinia intermedia*) Cuttings at Varying Physiological Ages and Different Plant Growth Regulators

Physiological Ages		Rooting Hormones		Physiological Ages x Rooting Hormones	
S ₁ (semi-hardwood)	5.75	T ₀ (Control)	6.94 ^a	S ₁ T ₀	7.46
S ₂ (softwood)	5.30	T ₁ (Alpha Naphthalene Acetic Acid (ANAA))	4.16 ^{bc}	S ₁ T ₁	4.58
		T ₂ (Indole-3-butyric Acid)	3.73 ^c	S ₁ T ₂	3.69
		T ₃ (Aloe Vera Leaf Extract (AVLE))	5.74 ^{ab}	S ₁ T ₃	5.35
		T ₄ (Banana Peel Extract (BPE))	5.92 ^{ab}	S ₁ T ₄	6.42
		T ₅ (Coconut Water (CW))	6.19 ^{ab}	S ₁ T ₅	6.98
				S ₂ T ₀	6.42
				S ₂ T ₁	3.73
				S ₂ T ₂	3.76
				S ₂ T ₃	6.13
				S ₂ T ₄	5.40
				S ₂ T ₅	5.40
Result	ns		*		ns
CV (%)	29.35				
Tukey's HSD = 2.68		*significant at 5% level		ns not significant	

The Table 3 indicate that the physiological age of the cutting obtained no significant difference on the average shoot length. While semi-hardwood cuttings showed a slightly higher mean, the difference was not statistically large enough to be attributed to create a significance. This means that the physiological age behave consistently regardless of the PGR applied.

Consistently, the T₀(control) and T₅(coconut water) obtained the high significant mean score in shoot length with 6.94 and 6.19 mean, respectively. In comparison of the synthetic and natural PGRs, T₄ (Banana peel extract) with 5.92 mean and T₃(AVLE) with 5.74 means performs relatively well. T₂(IBA) and T₁(ANAA) resulted in the shortest average shoot lengths. This suggests that at these specific concentrations, synthetic hormones may have hindered shoot elongation in this species by which supported by Hartmann et al. (2011). Additionally, Setyowati et al.(2023) states that the cytokinin content of coconut water performs efficiently in conjunction with auxin to promote bud formation and cell division and it can trigger budding by increasing nucleic acid metabolism and protein synthesis.



Leaf emergence

Shoot length was obtained by measuring the base up to the tip of the shoot using a ruler in centimeter unit.

Table 4. Mean Number of Leaves Developed by Lemon Drop Mangosteen (*Garcinia intermedia*) Cuttings at Varying Physiological Ages and Different Plant Growth Regulators

Physiological Ages	Rooting Hormones		Physiological Ages x Rooting Hormones	
S ₁ (semi-hardwood)	5.33	T ₀ (Control)	6.50	S ₁ T ₀ 6.67
S ₂ (softwood)	5.94	T ₁ (Alpha Naphthalene Acetic Acid (ANAA))	5.33	S ₁ T ₁ 5.33
		T ₂ (Indole-3-butyric Acid)	4.17	S ₁ T ₂ 4.00
		T ₃ (Aloe Vera Leaf Extract (AVLE))	6.50	S ₁ T ₃ 6.00
		T ₄ (Banana Peel Extract (BPE))	5.67	S ₁ T ₄ 5.00
		T ₅ (Coconut Water (CW))	5.67	S ₁ T ₅ 5.00
				S ₂ T ₀ 6.33
				S ₂ T ₁ 5.33
				S ₂ T ₂ 4.33
				S ₂ T ₃ 7.00
				S ₂ T ₄ 6.33
				S ₂ T ₅ 6.33
Result	ns		ns	ns
CV (%)	29.20			

^{ns}not significant

The result show no significant difference on the leaf emergence, however, T₀(control) and T₃(AVLE) produced the most cuttings with leaves with both mean of 6.50. This result suggests that leaf emergence in *G. intermedia* cuttings could be due to an endogenous process. As observed on the propagation of related specie *Garcinia kola*, that cuttings rely on the mobilization of stored carbohydrate reserves rather than exogenous hormonal stimulation for initial leaf flushing. This explains the consistent leaf counts observed across all treatments. The numerical decrease in leaf emergence in the T₂(IBA) treatment likely reflects a physiological trade-off where high auxin levels prioritize basal callus formation over apical vegetative growth, a phenomenon frequently attributed to auxin-induced ethylene production (Kouakou et al., 2016).

Callus formation

The callus formation was obtained by counting the cuttings with callus formed

Table 5. Mean Number of Cuttings with Callus Formed of Lemon Drop Mangosteen (*Garcinia intermedia*) Cuttings at Varying Physiological Ages and Different Plant Growth Regulators

Physiological Ages	Rooting Hormones		Physiological Ages x Rooting Hormones	
S ₁ (semi-hardwood)	7.61	T ₀ (Control)	6.00 ^b	S ₁ T ₀ 7.67

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S ₂ (softwood)	7.00	T ₁ (Alpha Naphthalene Acetic Acid (ANAA))	6.17 ^{ab}	S ₁ T ₁	6.00
		T ₂ (Indole-3-butyric Acid)	8.00 ^a	S ₁ T ₂	8.00
		T ₃ (Aloe Vera Leaf Extract (AVLE))	7.83 ^a	S ₁ T ₃	8.00
		T ₄ (Banana Peel Extract (BPE))	8.00 ^a	S ₁ T ₄	8.00
		T ₅ (Coconut Water (CW))	7.83 ^a	S ₁ T ₅	8.00
				S ₂ T ₀	4.33
				S ₂ T ₁	6.33
				S ₂ T ₂	8.00
				S ₂ T ₃	7.67
				S ₂ T ₄	8.00
				S ₂ T ₅	7.67
Result	ns		**		Ns
CV (%)	14.60				
Tukey's HSD = 1.76 **significant at 1% level ns not significant					

Although adventitious roots had not yet emerged by the date of termination of the study, the high incidence of callus formation serves as a critical physiological marker for propagation success. As noted by Osterc and Štampar (2011), callus induction represents the successful dedifferentiation of stem tissues into meristematic cells, a necessary prerequisite for root primordia development in woody *Garcinia* species. The significant effect of PGRs on callusing demonstrates that these treatments effectively initiated the callus proliferation, even while vegetative shoot growth is on process. The treatments T₂(IBA) and T₄(Banana peel extract) tied for the highest success rate, with an average of 8.00 cuttings forming calli followed by T₃(AVLE) and T₅(Coconut water) at both 7.83 mean.

As observed by Hartmann et al. (2011), that there is a contrast relationship of shoot and root formation on auxin such as in IBA. Often, IBA focuses on primordial formation rather than bud and leaf formation as discussed above.

The interaction between age and hormone was not significant, which means that the PGRs worked consistently across physiological ages of the cuttings.

Callus formation scoring

The callus mean score was base on the method of Gurel et al.(2001).

Table 6. Mean Number of Callus Formation Score of Lemon Drop Mangosteen (*Garcinia intermedia*) Cuttings at Varying Physiological Ages and Different Plant Growth Regulators

Physiological Ages		Rooting Hormones		Physiological Ages x Rooting Hormones	
S ₁ (semi-hardwood)	1.99 ^a	T ₀ (Control)	1.33 ^c	S ₁ T ₀	1.83
S ₂ (softwood)	1.48 ^b	T ₁ (Alpha Naphthalene Acetic Acid (ANAA))	1.25 ^c	S ₁ T ₁	1.38



T ₂ (Indole-3-butyric Acid)	2.40 ^a	S ₁ T ₂	2.63
T ₃ (Aloe Vera Leaf Extract (AVLE))	1.67 ^{bc}	S ₁ T ₃	1.88
T ₄ (Banana Peel Extract (BPE))	1.77 ^b	S ₁ T ₄	1.75
T ₅ (Coconut Water (CW))	2.06 ^{ab}	S ₁ T ₅	2.54
		S ₂ T ₀	0.83
		S ₂ T ₁	1.13
		S ₂ T ₂	2.17
		S ₂ T ₃	1.46
		S ₂ T ₄	1.79
		S ₂ T ₅	1.58
Result	**	**	Ns
CV (%)	17.30		
Tukey's HSD = 0.43 **significant at 1% level ^{ns} not significant			

Unlike shoot and leaf emergence, callus formation is highly influenced by the physiological age of the wood. S₁(semi-hardwood) cuttings achieved a significantly higher mean score of 1.99 compared to S₂(softwood cuttings), which achieved 1.48. This indicates that semi-hardwood tissues possess a superior capacity for callus induction. According to Hartmann et al. (2011), this is likely due to the higher concentration of stored carbohydrates and a more robust cambium layer in more mature wood, which provides the metabolic energy and cellular framework necessary for rapid cell dedifferentiation.

The application of PGRs also exerted a highly significant impact on callus development. T₂(Indole-3-butyric Acid) produced the highest callus score mean of 2.40, which is consistent with its role as an efficient auxin. As noted by Osterc and Štampar (2011), IBA(Indole-3-butyric Acid) is specifically formulated to trigger the callus formation by stimulating the division of parenchyma cells at the basal end of the cuttings. Among the natural treatments, T₅(Coconut Water) performed exceptionally well with a score of 2.06. The T₀(Control) recorded a mean score of 1.33, suggesting that while *Garcinia intermedia* has some capacity for natural regeneration, it requires hormonal stimulation to achieve substantial structural development.

To summarize, for the structural development and eventual rooting using semi-hardwood cuttings treated with Indole-3-butyric Acid or Coconut water is the most effective strategy. While IBA is the strongest for callus, Coconut water remains the most balanced and efficient treatment for both shoots and callus.

CONCLUSION AND RECOMMENDATIONS

Based on the result obtained, lemon drop mangosteen cuttings has the highest callusing and survival rate in IBA as synthetic auxin, however, the natural PGR—coconut water has performed excellently.

Therefore, it is concluded that IBA and Coconut water is favorable for the development of lemon drop mangosteen cutting.

Recommendations



Upon the observation and analysis of the results, the following are recommended:

1. The application and use of IBA and coconut water promotes faster development for lemon drop mangosteen semi-hardwood cutting.
2. The use of closed container or covering the cuttings with plastic sheet can promote faster shoot development when compared to cuttings exposed to light and air.
3. Conduct disbudding to let the cuttings prioritize on the shoot and root development.
4. To maximize and fully observe the root development, allot a longer period of observation since *Garcinia* species takes time to develop its roots.

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Score	Description
0	No visible callus
1	Small proliferation at cut ends only
2	5mm callus at cut ends
3	4-10mm callus at the end of the cutting
4>	11 mm callus at the end of the cutting

TABLES

Table 1. Callus formation scoring (Gurel *et al.*, 2001).

Table 2. Mean Number of Shoot Emerged 20 DAP of Lemon Drop Mangosteen (*Garcinia intermedia*) Cuttings at Varying Physiological Ages and Different Plant Growth Regulators

Physiological Ages	Plant Growth Regulator(PGR)	Physiological Ages x Rooting Hormones
S ₁ (semi-hardwood)	T ₀ (Control)	S ₁ T ₀ 8.00
S ₂ (softwood)	T ₁ (Alpha Naphthalene Acetic Acid (ANAA))	S ₁ T ₁ 1.67
	T ₂ (Indole-3-butyric Acid)	S ₁ T ₂ 1.00
	T ₃ (Aloe Vera Leaf Extract (AVLE))	S ₁ T ₃ 5.00
	T ₄ (Banana Peel Extract (BPE))	S ₁ T ₄ 5.00
	T ₅ (Coconut Water (CW))	S ₁ T ₅ 8.33
		S ₂ T ₀ 10.00
		S ₂ T ₁ 3.00
		S ₂ T ₂ 1.67
		S ₂ T ₃ 7.00
		S ₂ T ₄ 7.67
		S ₂ T ₅ 9.00
Result	ns	**
CV (%)	47.03	ns



Table 3. Mean Average Shoot Length (cm) of Lemon Drop Mangosteen (*Garcinia intermedia*) Cuttings at Varying Physiological Ages and Different Plant Growth Regulators

Physiological Ages		Rooting Hormones		Physiological Ages x Rooting Hormones	
S ₁ (semi-hardwood)	5.75	T ₀ (Control)	6.94 ^a	S ₁ T ₀	7.46
S ₂ (softwood)	5.30	T ₁ (Alpha Naphthalene Acetic Acid (ANAA))	4.16 ^{bc}	S ₁ T ₁	4.58
		T ₂ (Indole-3-butyric Acid)	3.73 ^c	S ₁ T ₂	3.69
		T ₃ (Aloe Vera Leaf Extract (AVLE))	5.74 ^{ab}	S ₁ T ₃	5.35
		T ₄ (Banana Peel Extract (BPE))	5.92 ^{ab}	S ₁ T ₄	6.42
		T ₅ (Coconut Water (CW))	6.19 ^{ab}	S ₁ T ₅	6.98
				S ₂ T ₀	6.42
				S ₂ T ₁	3.73
				S ₂ T ₂	3.76
				S ₂ T ₃	6.13
				S ₂ T ₄	5.40
				S ₂ T ₅	5.40
Result	ns		*		ns
CV (%)	29.35				

Tukey's HSD = 2.68

*significant at 5% level

^{ns}not significant

Table 4. Mean Number of Leaves Developed by Lemon Drop Mangosteen (*Garcinia intermedia*) Cuttings at Varying Physiological Ages and Different Plant Growth Regulators

Physiological Ages		Rooting Hormones		Physiological Ages x Rooting Hormones	
S ₁ (semi-hardwood)	5.33	T ₀ (Control)	6.50	S ₁ T ₀	6.67
S ₂ (softwood)	5.94	T ₁ (Alpha Naphthalene Acetic Acid (ANAA))	5.33	S ₁ T ₁	5.33
		T ₂ (Indole-3-butyric Acid)	4.17	S ₁ T ₂	4.00
		T ₃ (Aloe Vera Leaf Extract (AVLE))	6.50	S ₁ T ₃	6.00
		T ₄ (Banana Peel Extract (BPE))	5.67	S ₁ T ₄	5.00



T ₅ (Coconut Water (CW))		5.67	S ₁ T ₅	5.00
			S ₂ T ₀	6.33
			S ₂ T ₁	5.33
			S ₂ T ₂	4.33
			S ₂ T ₃	7.00
			S ₂ T ₄	6.33
			S ₂ T ₅	6.33
Result	ns	ns	ns	
CV (%)	29.20			

^{ns}not significant

Table 5. Mean Number of Cuttings with Callus Formed of Lemon Drop Mangosteen (*Garcinia intermedia*) Cuttings at Varying Physiological Ages and Different Plant Growth Regulators

Physiological Ages		Rooting Hormones		Physiological Ages x Rooting Hormones	
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S ₂ (softwood)	7.00	T ₁ (Alpha Naphthalene Acetic Acid (ANAA))	6.17 ^{ab}	S ₁ T ₁	6.00
		T ₂ (Indole-3-butyric Acid)	8.00 ^a	S ₁ T ₂	8.00
		T ₃ (Aloe Vera Leaf Extract (AVLE))	7.83 ^a	S ₁ T ₃	8.00
		T ₄ (Banana Peel Extract (BPE))	8.00 ^a	S ₁ T ₄	8.00
		T ₅ (Coconut Water (CW))	7.83 ^a	S ₁ T ₅	8.00
				S ₂ T ₀	4.33
				S ₂ T ₁	6.33
				S ₂ T ₂	8.00
				S ₂ T ₃	7.67
				S ₂ T ₄	8.00
				S ₂ T ₅	7.67
Result	ns	**		Ns	
CV (%)	14.60				
Tukey's HSD = 1.76		**significant at 1% level		nsnot significant	

Table 6. Mean Number of Callus Formation Score of Lemon Drop Mangosteen (*Garcinia intermedia*) Cuttings at Varying Physiological Ages and Different Plant Growth Regulators

Physiological Ages		Rooting Hormones		Physiological Ages x Rooting Hormones	
S ₁ (semi-hardwood)	1.99 ^a	T ₀ (Control)	1.33 ^c	S ₁ T ₀	1.83



S ₂ (softwood)	1.48 ^b	T ₁ (Alpha Naphthalene Acetic Acid (ANAA))	1.25 ^c	S ₁ T ₁	1.38
		T ₂ (Indole-3-butyric Acid)	2.40 ^a	S ₁ T ₂	2.63
		T ₃ (Aloe Vera Leaf Extract (AVLE))	1.67 ^{bc}	S ₁ T ₃	1.88
		T ₄ (Banana Peel Extract (BPE))	1.77 ^b	S ₁ T ₄	1.75
		T ₅ (Coconut Water (CW))	2.06 ^{ab}	S ₁ T ₅	2.54
				S ₂ T ₀	0.83
				S ₂ T ₁	1.13
				S ₂ T ₂	2.17
				S ₂ T ₃	1.46
				S ₂ T ₄	1.79
				S ₂ T ₅	1.58
Result	**		**		Ns
CV (%)	17.30				
Tukey's HSD = 0.43 **significant at 1% level ^{ns} not significant					