
THE APPLICATION OF TABLE SUGAR AND COCONUT WATER TO ENHANCE THE GROWTH OF POST-ACCLIMATIZED MOON ORCHIDS (PHALAENOPSIS HYBRID)

Dewi Ratna Nurhayati¹, Rika Sita Sari

Universitas Slamet Riyadi, Jawa Tengah, Indonesia

dewiratna201163@gmail.com¹, rikasita12@gmail.com²

ABSTRACT

Research on "The effect of giving granulated sugar and coconut water to increase the growth of moon orchids (*Phalaenopsis hybrids*)" was carried out from October 2022 to December 2022 at Sinoman Tempel, Sidorejo, Salatiga at an altitude of 500 meters above sea level. This research aims to determine the effect of the concentration of coconut water and granulated sugar on the growth of moon orchids (*Phalaenopsis hybrids*). The research method used was factorial with a Completely Randomized Design (CRD) consisting of two factors and including three replications. The data from this research were analyzed using the 5% BNJ test. The parameters observed included the number of Leaves at Last Time, Leaf Width, Leaf Length, Number of New Leaves, Root Length, and Live Percentage. There are two research factors, namely coconut water concentration treatment (A) and granulated sugar (B). The results of this study show that 1) Giving coconut water concentrate affects the number of leaves, leaf width, root length and live percentage; 2) Giving granulated sugar treatment has a significant effect on root length and live percentage; 3) The interaction between coconut water concentrate and granulated sugar has an effect on root length, number of recent leaves, and leaf width. 4) Providing the best treatment in the treatment of 75 ml/L coconut water concentrate and 30 gr granulated sugar, which has an effect on the parameters of root length, number of leaves, and survival percentage.

Keywords: moon orchid, coconut water, granulated sugar, root length, number of leaves at the end, survival percentage.

Corresponding Author: Dewi Ratna Nurhayati

Email: dewiratna201163@gmail.com



INTRODUCTION

In Indonesia, there are many types of orchids. This type of diversity has good potential for growing orchids in Indonesia. The development of orchid seeds in Indonesia still faces many obstacles, such as limited seed sources and low seed quality, because the propagation techniques used are not appropriate (Ayuningtyas et al., 2021). Therefore, it is necessary to multiply orchid plants; one way is by tissue culture. Tissue culture can produce orchid seeds in large numbers and in a relatively short time.

Tissue culture is a vegetative plant propagation technique. In tissue culture, it can also be obtained from shoots; tissue culture can also grow parts that have been separated into a sterile medium containing nutrients and ZPT or Growth Promoter Substances in a closed place or container. Transparent so that plant parts can be taken and reproduced until they continue to regenerate into complete plants (Safitri et al., 2021).

In tissue culture, there are several steps. For example, in the acclimatization phase, acclimatization is the process of adapting plants to the environment from in vitro to ex-vitro. In

orchids, there are three growth phases, namely the seedling phase, juvenile phase, and adult phase (Fatmawati, 2021). In the orchid seedling phase, the age is 2-3 months. That also happens in the growth of moon orchid seedlings. During the post-acclimatization period, moon orchids still grow unstable and lack energy and nutrients. Around us, several substances can boost energy and hormones. The materials used are coconut water (cytokinin) and granulated sugar (sucrose). After the acclimatization process, it's highly necessary to stimulate growth, and one of the methods involves using natural substances such as sugar and coconut water that provide nutritional sources like vitamin B, energy sources like sucrose, and promote plant growth.

The use of coconut water for organic materials is an alternative method as a substitute for synthetic materials used in making culture media, such as Quentin, coconut water can be used. Besides being easily available at a more affordable price, coconut water also contains cytokinin hormones, which are good for growth, as well as adding sugar.

The addition of sugar is needed to provide an energy source during plant growth. Sucrose supply in vitro media functions as a substitute for producing explant photosynthesis as a source of carbohydrates (Wahyurini & Susilowati, 2020). Sucrose has important cellular roles, such as energy production in respiration, regulation of membrane stability, and supporting the process of forming new cells in plants (Heriansyah, 2019); (Karimah et al., 2021).

METHOD

This research was carried out at the Green Leaves Orchids Garden, Sinoman Tempel, Sidorejo, Salatiga. This research was carried out from October 19 to December 25 2022. This research used a Completely Randomized Design (Factorial RAL) method with two factors, three replications and one sub-replication. Using coconut water concentration (A) as the first factor, there are four levels, namely: A0 = (control), A1 = 25 ml/litre of distilled water, A2 = 50 ml/litre of distilled water, A3 = 75 ml/litre of distilled water and the second factor is four levels of granulated sugar, namely: B0 = 0 gr (control), B1 = 10 gr, B2 = 20 gr, B3 = 30 gr. Then, the observation data was analyzed using the ANOVA test with a further BNJ test at a 5% level.

Planting was carried out in soft pots measuring 4 x 5 cm, with a total of 96 soft pots. The acclimatization process involves removing the moon orchid plant seeds (Phalaenopsis hybrid) from the bottle by cleaning the remaining planting media attached to the roots by washing them with plain water, then soaking them briefly using an insecticide solution, then preparing the planting media using a combination of ferns and styrofoam placed in the pot. Soft with a size of 8 x 9 cm, orchid seeds (Phalaenopsis hybrid) are planted under the shade for an acclimatization process for two weeks. After that, they are planted in pots using sphagnum media; care is carried out by regular spraying with a concentration of coconut water and granulated sugar when the plants are one week old after planting and given once every seven days by spraying, while fertilizer is only needed to see the conditions. Harvesting is done at 8 WAP.

RESULTS AND DISCUSSION

Table 1. Live percentage of orchid plants with giving concentration of coconut water and granulated sugar

Treatment	B0	B1	B2	B3	TOTAL
A0	100	100	100	100	100
A1	100	100	100	100	100
A2	100	100	100	100	100
A3	100	100	100	100	100
TOTAL	100	100	100	100	100

The survival rate of orchids with the addition of coconut water and granulated sugar gives a result of 100, which means all plants survive 100%. This is because the nutrients are fulfilled, the content of coconut water and granulated sugar can stimulate growth, and the environmental factors are right for the growth of all types of plants—nutrient elements that provide nutrients for plant growth (Nurhayati, 2023). Apart from nutrients, environmental factors have a big influence on plant growth. According to (Dasuha, 2023), good environmental factors will help plants grow well and fertile. Konsentrasi air kelapa mempunyai perbedaan parameter lebar daun yang nyata karena penggunaan air kelapa harus tepat. The reason is that using coconut water with excessively high concentration can disrupt plant growth (Sari et al., 2023). In this study, treatment with a concentration of 75 ml/L of coconut water and 20 grams of granulated sugar showed the best response. The response was observed in root length, the number of new leaves, and leaf width.

Table 2. Average Growth Parameters of Moon Orchid Plants (Phalaenopsis hybrid)

Treatment	AmountLeaf Moment final	WideLeaf	LongLeaf	Number of LeavesNew	LongRoot
A0B0	4.50 b	3.00 a	10.00 a	1.50 a	7.40 b
A0B1	4.33 a	3.00 a	10.67 a	1.67 a	6.33 a
A0B2	4.50 b	3.00 a	7.50 a	2.00 a	6.17 b
A0B3	4.00 a	3.00 a	8.83 a	1.67 a	6.17 b
A1B0	4.00 a	3.50 a	9.50 a	1.67 b	8.17 a
A1B1	4.00 a	3.33 a	10.50 a	1.50 a	8.17 a
A1B2	4.00 a	3.17 a	11.17 b	1.00 a	10.00 b
A1B3	3.83 a	3.67 a	9.67 a	1.67 a	9.00 a
A2B0	4.33 a	3.67 b	8.67 a	1.83 a	8.33 b
A2B1	4.33 a	3.00 a	10.00 a	1.33 a	5.33 a
A2B2	4.33 a	3.83 b	8.83 a	1.67 a	7.33 a
A2B3	4.00 a	3.50 a	9.17 a	1.67 a	10.00 b
A3B0	4.00 a	3.67 a	9.17 a	1.00 a	11.33 b
A3B1	3.83 a	3.50 a	9.83 a	2.33 a	9.33 a
A3B2	4.17 a	3.67 a	8.17 a	2.33 b	8.67 a
A3B3	3.83 a	3.17 a	9.67 a	1.00 a	10.00 a

Note: Numbers followed by the same letter in the same column indicate that the results are not significantly different in the 5% level of the Honest Significant Difference (BNJ) follow-up test.

This shows that the concentration of coconut water used is significantly different from the parameters of the final number of leaves because coconut water contains the cytokinin hormone,

which plays an important role in cell division for plant growth. The cytokinin hormone works with the auxin hormone and quickly analyzes the process of cell division in shoots and leaf tips in moon orchid plants. The number of leaves at the end of each week is not uniform; there is a fixed average return. According to (Kaka et al., 2015), coconut water is an endosperm fluid that contains diphenylurea, which allows it to stimulate cell division. Coconut water can also help the process of cell division and cell differentiation and encourage plant growth. In coconuts, there is endosperm fluid, namely the liquid and its sediments that stick to the inner walls of the shell, and the component found in coconut water is diphenylurea, namely the cytokinin phenylurea and a plant hormone that can induce flower development.

The concentration of coconut water has a significant difference in leaf width parameters because the use of coconut water must be appropriate. After all, if you use coconut water with too high a concentration, it can disrupt plant growth (Setiawan et al., 2019). In this study, treatment with 75 ml/L concentrate and 20 gr granulated sugar showed the best response.

The leaf width observed every week does not increase evenly; there is a constant average yield, which is in line with the opinion (Kaka et al., 2015). It is said that the growth hormone in coconut water can increase plant growth by 20-70%. To accelerate the growth of moon orchids, because coconut water is rich in minerals that are good for plant growth and provide sufficient nutrition for the substrate, coconut water depends on concentration and treatment for best results. Provides a supportive environment and maintains temperature.

The lack of interaction between the two treatments is thought to require endogenous cytokinins for leaf elongation. (Pranata et al., 2015) States that the interaction and development between growth regulatory substances supplied to the medium and those produced by endogenous cells determine the direction of growth. The addition of exogenous auxin and cytokinin alters the levels of endogenous cellular regulators.

Each treatment has a different average yield per week; some are constant, and some increase per week. This is due to differences in individual plant sensitivity, and the addition of granulated sugar also has a different effect. The leaves are long because granulated sugar contains sucrose, which is beneficial for plants. This is the same as (Sitanggang et al., 2015) in (Saleh et al., 2022) stated that sucrose plays an important role in plant vegetative growth, including the development of new roots, leaves and stems. This happens because, during the division of new cells, large amounts of carbohydrates are needed to build cell walls, which contain protoplasm and cellulose. In contrast, cellulose and protoplasm consist mostly of sugar.

In the number of new leaves, there was an interaction that was not significantly different according to (Pratama & Nilahayati, 2018); (Pranata et al., 2015); adding coconut water with a concentration of 15% produced an average number of shoots of 3-4 shoots in 2 months and decreased with increasing concentration—coconut water.

This shows that the concentration of coconut water and granulated sugar influences root length parameters because coconut water contains several minerals such as amino acids, organic acids, nucleic acids, purines, sugar, alcohol, vitamins, minerals and growth. Coconut water contains growth regulators in the form of auxin hormones and cytokinin hormones, which can stimulate shoot formation (Setiawan et al., 2019).

CONCLUSION

This research indicates that the administration of coconut water concentrate significantly affects the number of leaves, leaf width, root length, and plant survival rate. The application of granulated sugar treatment has also been proven to affect root length and plant survival rate. Moreover, the interaction between the concentration of coconut water and the application of granulated sugar also demonstrates its impact on root length, the number of leaves at the end of the observation period, and leaf width. This signifies the complexity of the relationship between these two factors in influencing plant growth and survival. This study provides a deeper understanding of how the administration of coconut water and granulated sugar affects plant growth parameters. This understanding could serve as a crucial foundation for the development of more effective and efficient agricultural techniques in the future.

REFERENCES

- Ayuningtyas, U., Budiman, B., & Azmi, T. K. K. (2021). Pengaruh pupuk daun terhadap pertumbuhan bibit anggrek Dendrobium Dian Agrihorti pada tahap aklimatisasi. *Jurnal Pertanian Presisi (Journal of Precision Agriculture)*, 4(2), 148–159.
- Dasuha, D. R. (2023). Penerapan Media MS Secara In Vitro Terhadap Konsentrasi Air Kelapa dan Hormon Kinetin Pertumbuhan Planlet Tanaman Anggrek (Orchidaceae). *Jurnal Ilmiah Mahasiswa Pertanian [JIMTANI]*, 3(1), 28–40.
- Fatmawati, L. (2021). *TA: Metode Pembesaran Anggrek Dendrobium antennatum Fase Individual Di Pt. Wahana Insan Kemilau*. Politeknik Negeri Lampung.
- HERIANSYAH, P. (2019). Multiplikasi embrio somatis tanaman anggrek (Dendrobium sp) dengan pemberian kinetin dan sukrosa secara in-vitro. *Jurnal Ilmiah Pertanian*, 15(2), 67–78.
- Kaka, A. N., Prasetyo, I. K., & Mardjajani, S. (2015). Pengaruh Air Kelapa Hijau Terhadap Pertumbuhan dan Produksi Tanaman Sawi Putih (Brassica chinensis L.). *Jurnal Primordia*, 11(2), 43–60.
- Karimah, N., Kusmiyati, F., & Anwar, S. (2021). Pengaruh penggunaan sukrosa dan iba terhadap induksi akar eksplan tunas anggrek (Dendrobium sp.) secara in vitro. *AGROTEK: Jurnal Ilmiah Ilmu Pertanian*, 5(1), 34–44.
- Nurhayati, D. R. (2023). Effect of Biotogrow Dosage on Black and White Sesame Varieties Quality. *Journal of Social Science*, 4(1), 1–15.
- Pranata, M. G., Yunus, A., & Pujiasmanto, B. (2015). Pengaruh konsentrasi naa dan air kelapa terhadap multiplikasi temulawak (curcuma xanthorrhiza roxb.) secara in vitro. *Caraka Tani: Journal of Sustainable Agriculture*, 30(2), 62–68.
- Pratama, J., & Nilahayati, N. (2018). Modifikasi media MS dengan penambahan air kelapa untuk subkultur I anggrek Cymbidium. *Jurnal Agrium*, 15(2), 96–109.
- Safitri, F. O. N., Teristiandi, N., Kusumah, A., & Apriliani, M. (2021). Aklimatisasi Tanaman Anggrek Dendrobium sp Hasil Perbanyakan Subkultur Dengan Media Sabut Kelapa Dan Akar Pakis. *Prosiding Seminar Nasional Biologi*, 1(1), 423–431.
- Saleh, R., Heriansyah, P., & Nopsagiarti, T. (2022). Pengaruh Berbagai Konsentrasi Sukrosa Dan Nicotinic Acid Terhadap Pertumbuhan Subkultur Tanaman Anggrek Dendrobium sp. *Jurnal Agro Indragiri*, 7(2), 9–21.
- Sari, R. S., Nurhayati, D. R., & Siswadi, S. (2023). Pengaruh Pemberian Gula Pasir Dan Air Kelapa Untuk Meningkatkan Pertumbuhan Anggrek Bulan (Phalaenopsis hibrida) Pasca Aklimatisasi.: Kata kunci: Anggrek bulan, air kelapa, dan gula pasir, panjang akar, jumlah daun saat terakhir. presentase hidup. *Innofarm: Jurnal Inovasi Pertanian*, 25(1).

Setiawan, A., Hasibuan, S., & Gunawan, H. (2019). Pengaruh Pemberian Air Kelapa dan GA3 terhadap Perkecambahan Biji Anggrek Lidah Ular (*Cymbidium dayanum*) Secara in Vitro. *Bernas: Jurnal Penelitian Pertanian*, 15(1), 126–133.

Sitanggang, A., Islan, I., & Saputra, S. I. (2015). *Pengaruh pemberian pupuk kandang ayam dan zat pengatur tumbuh giberelin terhadap pertumbuhan bibit kopi arabika (Coffea arabica L.)*. Riau University.

Wahyurini, E., & SUSILOWATI, S. (2020). *Kultur Jaringan Tanaman Garut*. LPPM UPN Veteran Yogyakarta.



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