



Journal home page: <http://ajarcde-safe-network.org> ISSN 2581-0405

Empowering Women's Farmer Groups through Household Kitchen Waste Utilization for Sustainable Orchid Cultivation in Ubung Kaja

Made Sri Yuliartini¹, Ni Kadek Desy Andya Dewi¹, I Gusti Bagus Udayana^{1*}, I Gusti Made Arjana¹, Ni Luh Putu Sulis Dewi Damayanti¹, Siti Khairiyah binti Mohd. Hatta, Aida Firdaus Muhammad Nurul Azmi², Ewaldus Adol¹ and Fransisco Mario Namu¹

¹Study Program of Agrotechnology Faculty of Agriculture, Science and Technology, Universitas Warmadewa, Bali, Indonesia

²Faculty of Applied Sciences Universiti Teknologi MARA (UiTM), Malaysia

ARTICLE INFO

Article History:

Received: 22 August 2026

Final Revision: 07 October 2026

Accepted: 09 October 2024

Online Publication: 10 October 2026

KEYWORDS

community empowerment; household kitchen waste;
liquid organic fertilizer; orchid cultivation;
sustainable agriculture

CORRESPONDING AUTHOR

*E-mail: bagusudayana@warmadewa.ac.id

A B S T R A C T

Household kitchen waste is an abundant organic resource that is often discarded without proper utilization, despite its potential to support sustainable agriculture. This community engagement program was conducted to improve the knowledge and practical skills of members of the Werdiguna Women's Farmer Group in Ubung Kaja, Denpasar, in converting household kitchen waste into liquid organic fertilizer for orchid cultivation. Activities included educational sessions, practical training, fertilizer application, and follow-up monitoring. Vegetable scraps and fruit peels were processed into liquid organic fertilizer using simple and affordable techniques that could be easily adopted by the community. Program evaluation showed that participants gained better understanding and confidence in producing and applying liquid organic fertilizer. The activity also encouraged more sustainable household waste management, reduced reliance on inorganic fertilizers, and promoted environmentally friendly orchid cultivation. Beyond improving cultivation practices, the program fostered greater awareness of resource recycling and demonstrated that household organic waste can be transformed into a valuable agricultural input. These findings highlight the importance of community-based initiatives in supporting sustainable horticulture while contributing to waste reduction and environmental conservation.

Contribution to Sustainable Development Goals (SDGs):

SDG 11: Sustainable Cities and Communities

SDG 12: Responsible Consumption and Production

SDG 15: Life on Land

1. INTRODUCTION

1.1. Research Background

Ubung Kaja Village is located in North Denpasar District, Denpasar City, Bali Province, Indonesia. Although classified as an urban area, the village still possesses considerable potential for home-garden agriculture, particularly ornamental plant cultivation. Rapid urban development and population growth have increased domestic activities while simultaneously reducing

the optimal utilization of household resources, including organic waste generated from daily activities [1].

One of the active community organizations in the village is the Women's Farmer Group (Kelompok Tani Wanita, KWT) Werdiguna, which consists primarily of housewives engaged in ornamental plant cultivation, especially orchids. Besides improving household income, the group contributes to urban greening and community empowerment. However, the group still encounters several technical constraints in sustainable cultivation



This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License
Published under licence by SAFE-Network

practices, particularly in nutrient management and fertilizer utilization [2].

Household activities produce substantial amounts of organic kitchen waste, including vegetable residues, fruit peels, leftover food, and other biodegradable materials. Approximately 75% of household solid waste consists of organic materials that are often disposed of without proper segregation or recycling. Poor management of kitchen waste contributes to environmental pollution, unpleasant odors, pest infestations, and declining environmental quality [3,4].

Kitchen waste has considerable potential to be converted into liquid organic fertilizer (LOF), providing an environmentally friendly solution for reducing waste while simultaneously producing valuable agricultural inputs. The production process is relatively simple and can be implemented at the household level using locally available materials. Fresh vegetable residues, fruit peels, rice leftovers, eggshells, and other biodegradable materials are suitable feedstocks because they contain abundant nutrients required for plant growth [5,6].

Liquid organic fertilizer derived from household organic waste contains essential macro- and micronutrients, including nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and several trace elements that support plant growth. Compared with synthetic fertilizers, organic fertilizer is environmentally friendly, economically affordable, and capable of improving soil fertility while reducing dependence on chemical fertilizers [7–9].

Liquid organic fertilizer also improves chlorophyll formation, photosynthetic activity, plant vigor, drought tolerance, flower initiation, and fruit development. These beneficial properties are achieved through anaerobic fermentation, during which microorganisms convert complex organic compounds into plant-available nutrients. Successful fermentation is generally characterized by a stable acidic pH, brownish coloration, reduced volume, and the presence of beneficial microbial activity [10,11].

Orchids (Orchidaceae) are among the most economically valuable ornamental plants because of their attractive flowers, long flowering period, and high commercial demand. As epiphytic plants, orchids absorb nutrients predominantly through their leaves; therefore, liquid fertilizer application is considered more efficient than conventional fertilization. Nevertheless, orchid cultivation still relies predominantly on commercial inorganic fertilizers [12,13].

Although previous studies have demonstrated the advantages of organic fertilizers for plant growth, the utilization of household kitchen waste-derived liquid organic fertilizer for orchid cultivation remains limited. Furthermore, integrating household organic waste management with community empowerment programs involving women's farmer groups has received relatively little attention. Therefore, this study aims to evaluate the utilization of kitchen waste as liquid organic fertilizer through community empowerment of KWT Werdiguna to support sustainable orchid cultivation, reduce household organic waste, decrease dependence on inorganic fertilizers, and strengthen environmentally friendly urban agriculture [14,15].

1.2. Literature Review

1.2.1. Household Kitchen Waste as a Resource for Sustainable Agriculture

Household kitchen waste is one of the largest components of municipal solid waste, consisting mainly of biodegradable materials such as vegetable residues, fruit peels, food scraps, and other organic materials. When improperly managed, these wastes contribute to environmental pollution, unpleasant odors, greenhouse gas emissions, and public health problems. However, organic kitchen waste contains valuable organic matter and essential nutrients that can be recycled into agricultural inputs, supporting the principles of circular economy and sustainable waste management [3,4]. Recent studies have demonstrated that kitchen waste can be effectively converted into value-added products, particularly liquid organic fertilizer (LOF), thereby reducing the burden on landfills while creating environmentally friendly fertilizers for crop production.

1.2.2. Liquid Organic Fertilizer Derived from Kitchen Waste

Liquid organic fertilizer (LOF) is produced through biological decomposition or fermentation of organic materials under aerobic or anaerobic conditions. Kitchen waste provides an excellent substrate because of its high moisture content and abundant biodegradable compounds. During fermentation, microorganisms decompose complex organic materials into soluble nutrients that become readily available for plant uptake. The resulting fertilizer contains essential macronutrients, including nitrogen (N), phosphorus (P), and potassium (K), together with calcium, magnesium, micronutrients, amino acids, and beneficial microorganisms that improve plant growth and soil fertility [5–11]. Recent reviews indicate that nutrient composition and fertilizer quality largely depend on feedstock characteristics, microbial inoculants, fermentation duration, and environmental conditions during production. Properly formulated LOF has shown comparable performance to synthetic fertilizers in many cropping systems while providing additional environmental benefits through waste recycling and reduced chemical fertilizer dependency.

1.2.3. Application of Liquid Organic Fertilizer in Orchid Cultivation

Orchids (Orchidaceae) are economically important ornamental plants with high commercial value due to their diverse flower morphology, long flowering period, and aesthetic appeal. As epiphytic plants, orchids absorb nutrients primarily through their aerial roots and leaves; therefore, liquid fertilization is considered more efficient than conventional solid fertilizers. Previous studies have demonstrated that liquid organic fertilizer enhances vegetative growth, including plant height, leaf development, root formation, and shoot production when applied at appropriate concentrations [12–15]. Research on *Dendrobium* orchids has reported that liquid organic fertilizer significantly improves several growth parameters, particularly when combined with suitable growing media, although responses may vary according to fertilizer formulation and application rates.

1.2.4. *Community Empowerment Through Organic Waste Utilization*

Community-based utilization of household kitchen waste provides multiple environmental, economic, and social benefits. Besides reducing household waste generation, the production of liquid organic fertilizer lowers cultivation costs by decreasing dependence on commercial inorganic fertilizers. Women's Farmer Groups (Kelompok Tani Wanita, KWT) play a strategic role in implementing sustainable agricultural practices because they are directly involved in household waste management, home-garden cultivation, and community development. Capacity-building programs through training, demonstrations, and participatory learning have been shown to improve community knowledge and practical skills in organic fertilizer production while encouraging long-term adoption of environmentally friendly agricultural technologies [2,5]. Such empowerment initiatives contribute not only to sustainable agriculture but also to strengthening household resilience and promoting community-based circular economy practices.

1.3. *Research Objective*

This study aimed to enhance the capacity and self-reliance of the Women's Farmer Group (KWT) Werdiguna through the utilization of household kitchen waste as an environmentally friendly alternative fertilizer for sustainable orchid cultivation.

2. MATERIALS AND METHODS

2.1. *Study Area and Participants*

This community empowerment program was conducted from May to July 2026 in Ubung Kaja Village, North Denpasar District, Denpasar City, Bali, Indonesia. The study involved the Women's Farmer Group (Kelompok Tani Wanita, KWT) Werdiguna as the primary partner. The group consists of housewives engaged in home-garden agriculture, particularly orchid cultivation. Participants were selected based on their active involvement in the group and willingness to participate throughout the entire program.

2.2. *Program Design*

The program employed a participatory community empowerment approach designed to improve participants' knowledge, practical skills, and self-reliance in utilizing household kitchen waste as liquid organic fertilizer (LOF) for sustainable orchid cultivation. The implementation consisted of six sequential stages: (1) preliminary assessment, (2) education and socialization, (3) hands-on training in liquid organic fertilizer production, (4) fertilizer application in orchid cultivation, (5) mentoring and monitoring, and (6) program evaluation. During the preliminary assessment, field observations and interviews were conducted to identify existing waste management practices, orchid cultivation techniques, fertilizer use, and participants' training needs. The information obtained served as the basis for developing educational materials and practical training modules.

2.3. *Preparation of Liquid Organic Fertilizer*

Household kitchen waste consisting of vegetable residues, fruit peels, leftover rice, and other biodegradable materials was collected from participating households. The organic materials were chopped into small pieces before being mixed with brown sugar, Effective Microorganisms (EM4), and clean water in a closed plastic container. The mixture was fermented anaerobically for approximately 14–21 days at ambient temperature. The container was opened periodically to release fermentation gases. After fermentation, the liquid fraction was filtered and stored in clean containers until application.

2.4. *Training and Fertilizer Application*

Training activities combined interactive lectures, group discussions, demonstrations, and hands-on practice. Participants learned waste sorting techniques, fertilizer preparation, fermentation procedures, storage methods, and proper fertilizer application. The produced liquid organic fertilizer was diluted with water before application to orchid plants following the recommended concentration. Fertilizer was applied through foliar spraying and root-zone watering at regular intervals throughout the observation period. Participants were also trained in proper fertilizer dosage, application frequency, and general orchid maintenance practices.

2.5. *Monitoring and Evaluation*

Continuous mentoring was conducted throughout the program to ensure correct implementation of fertilizer production and application techniques. Regular monitoring focused on participants' ability to independently produce liquid organic fertilizer, apply the fertilizer correctly, and maintain orchid plants. Program effectiveness was evaluated using three indicators: Changes in participants' knowledge and practical skills before and after the training, adoption of household kitchen waste utilization for liquid organic fertilizer production. Initial responses of orchid plants following fertilizer application, including leaf color, root development, emergence of new shoots, and overall plant vigor.

2.6. *Data Collection and Analysis*

Data were collected through field observations, participant interviews, documentation, and pre- and post-training questionnaires. Descriptive analysis was used to summarize improvements in participants' knowledge and skills, adoption of liquid organic fertilizer technology, and initial responses of orchid plants after fertilizer application. The findings were presented descriptively using tables, figures, and percentage values where appropriate.

3. RESULT AND DISCUSSION

Community empowerment activities were successfully implemented in collaboration with the Women's Farmer Group (KWT) Werdiguna, Ubung Kaja Village, Denpasar, through a participatory approach emphasizing knowledge enhancement, practical skills, and the utilization of locally available resources. The program integrated household kitchen waste management with sustainable orchid cultivation through a series of educational sessions, practical training, field application, and continuous

mentoring. Active participation from all members throughout the program reflected their strong interest in adopting environmentally friendly technologies that could simultaneously reduce household waste and improve orchid cultivation practices.

Initial field observations and direct discussions with participants indicated that household kitchen waste, including vegetable residues, fruit peels, leftover rice, and rice washing water, was generally discarded together with other household waste without prior separation or utilization. Although members of KWT Werdiguna had considerable experience in cultivating ornamental plants, fertilization practices still depended primarily on commercial inorganic fertilizers. This condition resulted in relatively high production costs while limiting opportunities to utilize locally available organic resources. Furthermore, participants had limited practical knowledge regarding the production of liquid organic fertilizer from household waste and its application in orchid cultivation. These findings confirmed the need for technology transfer focusing on sustainable waste management and environmentally friendly fertilization practices.



Fig. 1. Socialization and educational activities on household kitchen waste utilization and sustainable orchid cultivation.

Educational activities introduced participants to the environmental impacts of unmanaged household organic waste and the potential benefits of transforming kitchen waste into liquid organic fertilizer through simple fermentation techniques. Interactive discussions encouraged participants to exchange experiences regarding household waste management and orchid cultivation while identifying practical solutions that could be implemented using materials readily available in their homes. Participants actively asked questions concerning raw material

selection, fermentation duration, nutrient availability, fertilizer application, and storage methods, indicating a high level of enthusiasm toward adopting the introduced technology. Similar community empowerment programs have reported that participatory education effectively improves environmental awareness and encourages behavioral changes toward sustainable waste management practices [3,4].

Following the educational sessions, participants attended practical training on the production of liquid organic fertilizer using household kitchen waste. Fresh vegetable residues, fruit peels, leftover rice, rice washing water, brown sugar, and EM4 bioactivator were used as the primary materials. Participants directly practiced sorting organic waste, preparing fermentation mixtures, maintaining anaerobic fermentation conditions, and identifying indicators of successful fermentation. The fermentation process was conducted using simple household containers for approximately two weeks until the fertilizer exhibited a brownish color, a mildly acidic aroma, and stable liquid characteristics indicating complete decomposition.

Hands-on training provided participants with direct experience throughout every stage of fertilizer production, allowing them to better understand the fermentation process compared with classroom-based instruction alone. The technology introduced during the program proved practical because all raw materials originated from household waste that had previously been discarded, while the required equipment consisted only of inexpensive containers and commonly available household tools. Participants expressed confidence that the fertilizer production process could easily be continued independently after completion of the program. Previous studies similarly reported that practical demonstrations significantly improve community capacity and increase the adoption of household organic fertilizer technology because participants acquire both theoretical knowledge and technical competence through direct practice [5–11].



Fig.2. Practical training on the preparation of liquid organic fertilizer from household kitchen waste.

Liquid organic fertilizer produced during the training was subsequently applied to orchid plants cultivated by members of KWT Werdiguna through foliar spraying and root-zone watering using the recommended dilution ratio. Initial observations conducted during the mentoring period showed encouraging vegetative responses. Orchid leaves appeared greener and healthier, root systems developed more actively, and several plants produced new shoots, indicating improved plant vigor following fertilizer application. Although quantitative growth parameters were not measured because the program emphasized community empowerment, visual observations consistently demonstrated positive plant responses after the introduction of liquid organic fertilizer.

Regular monitoring activities were conducted to ensure that participants correctly implemented fermentation techniques, fertilizer storage procedures, dilution methods, and fertilizer application schedules. Continuous discussions enabled participants to solve technical problems encountered during fertilizer production while strengthening their confidence in independently producing and utilizing liquid organic fertilizer. By the completion of the program, all participants successfully demonstrated their ability to produce fertilizer using household kitchen waste generated from their own homes and to apply it appropriately to orchid cultivation.

Previous studies have demonstrated that liquid organic fertilizer contains essential macro- and micronutrients capable of improving chlorophyll formation, nutrient uptake, vegetative growth, and overall plant vigor. Because orchids absorb nutrients efficiently through leaves and aerial roots, liquid organic fertilizer provides an effective nutrient delivery system while simultaneously improving the biological quality of the growing medium. Replacing part of the inorganic fertilizer requirement with organic fertilizer also contributes to more environmentally sustainable cultivation practices and reduces production costs for small-scale ornamental plant growers [12–14].

Knowledge improvement resulting from the community empowerment program was evaluated using pre-test and post-test questionnaires consisting of ten questions related to household kitchen waste management, liquid organic fertilizer production, and sustainable orchid cultivation. Results presented in Table 1 indicate that the overall average knowledge score increased from 83.0% before the implementation of the program to 100.0% after the completion of all educational and practical activities.

The most notable improvements were observed in participants' understanding of the utilization of rice washing water for plant growth, the role of kitchen waste in reducing household waste generation, the production of liquid organic fertilizer from vegetable and fruit residues, and the importance of processing kitchen waste before its application as fertilizer. Correct responses to these questions increased from 60–70% during the pre-test to 100% during the post-test. Participants had already demonstrated strong baseline knowledge regarding the utilization of banana peels as organic fertilizer, orchid fertilizer requirements, the environmental benefits of organic fertilizers,

and the economic potential of orchid cultivation, as indicated by the perfect pre-test scores obtained for these questions. Nevertheless, the overall improvement confirmed that combining educational sessions with practical demonstrations effectively strengthened participants' understanding of sustainable household waste utilization and environmentally friendly orchid cultivation.



Fig. 3. Application of liquid organic fertilizer to orchid plants and monitoring and evaluation of fertilizer production and orchid growth.

The improvement in participants' knowledge reflects the effectiveness of the participatory learning approach adopted throughout the program. Interactive discussions increased participants' awareness of environmental issues associated with household organic waste, whereas practical activities enabled them to directly apply the acquired knowledge during fertilizer production and orchid cultivation. Direct involvement throughout the training process also increased participants' confidence to independently implement the introduced technology within their households. Such findings are consistent with previous studies indicating that community participation and experiential learning are essential factors supporting successful technology adoption and the sustainability of community empowerment programs.

Table 1. Pre-test and post-test knowledge scores of participants.

No.	Question	Correct Answer	Pre-test (%)	Post-test (%)
1	Can household kitchen waste be utilized for orchid cultivation?	Yes	80%	100%
2	Can banana peels be processed into organic fertilizer?	Yes	100%	100%
3	Is plastic classified as organic kitchen waste?	No	100%	100%
4	Do orchids require fertilizer for optimum growth?	Yes	100%	100%
5	Is rice washing water beneficial for plant growth?	Yes	70%	100%
6	Can kitchen waste utilization reduce household waste generation?	Yes	60%	100%
7	Can liquid organic fertilizer be produced from vegetable and fruit residues?	Yes	60%	100%
8	Is organic fertilizer more environmentally friendly than chemical fertilizer?	Yes	100%	100%
9	Should kitchen waste be processed before being applied as fertilizer?	Yes	60%	100%
10	Does orchid cultivation have economic potential for improving household income?	Yes	100%	100%
Overall average knowledge score			83.0%	100.0%

Beyond improvements in knowledge and technical capacity, the program generated broader environmental, economic, and social benefits. Household kitchen waste that had previously been discarded was successfully converted into valuable liquid organic fertilizer, thereby reducing the amount of organic waste entering the municipal waste stream while promoting environmentally responsible waste management. Independent fertilizer production also reduced dependence on commercial inorganic fertilizers, potentially lowering production costs associated with orchid cultivation. Furthermore, collaborative participation throughout the activities strengthened cooperation among members of KWT Werdiguna and reinforced the important role of women in promoting sustainable agriculture and community-based environmental management. Collectively, these findings demonstrate that integrating household kitchen waste utilization with orchid cultivation represents an effective community empowerment strategy capable of simultaneously supporting environmental conservation, sustainable agriculture, and household economic resilience.

4. CONCLUSION

Community empowerment activities successfully improved the knowledge and practical skills of KWT Werdiguna members in utilizing household kitchen waste as liquid organic fertilizer for orchid cultivation. Average knowledge scores increased from 83.0% in the pre-test to 100.0% in the post-test, indicating that educational and practical training activities effectively enhanced participants' understanding. Utilization of household kitchen waste as liquid organic fertilizer offers a simple, environmentally friendly, and sustainable alternative to support orchid cultivation, reduce dependence on inorganic fertilizers, and encourage better household waste management.

REFERENCE

- [1] Desa Ubung Kaja. *Profil Desa Ubung Kaja*. 2025. Available: <https://www.ubungkaja.denpasarkota.go.id/>
- [2] Anonymous. 2026. Direct interview with the Women's Farmer Group (KWT) Werdiguna, Ubung Kaja Village, Denpasar, Indonesia.
- [3] A. D. T. Gau, S. Z. N. Mutmainnah, and S. N. Qadri, "Pemanfaatan Limbah Rumah Tangga Sebagai Pupuk Organik Cair Ramah Lingkungan," *Mallomo: Journal of Community Service*, vol. 3, no. 1, pp. 37–42, Dec. 2022.
- [4] M. Astriana, A. Ainaya, M. N. I. Hanif, M. Idris, and N. Hariyana, "Inovasi Pengelolaan Sampah Dapur menjadi Pupuk Organik Cair di Desa Kepanjen, Kecamatan Gumukmas, Jember," *Jurnal Pengabdian kepada Masyarakat Nusantara (JPkMN)*, vol. 5, no. 4, pp. 4616–4623, 2024. doi:10.55338/jpkmn.v5i4.4183.
- [5] F. Kurniawan, "Pupuk Organik Cair: Keunggulan dan Kekurangan," 2022. Available: <https://sibakuljogja.jogjaprov.go.id/blog/pupuk-organik-topdwe/pupuk-organik-cair-keunggulan-kekurangan/>
- [6] D. Asmawanti, M. H. Riski, R. J. Cibro, and F. R. Ilahi, "Pemanfaatan Limbah Dapur Sebagai Pupuk Organik Cair (POC) untuk Budidaya Tanaman di Lingkungan Pekarangan Masyarakat Kelurahan Surabaya Kecamatan Sungai Serut," *Tribute: Journal of Community Services*, vol. 3, no. 2, pp. 101–107, 2022.
- [7] N. Aprianti and B. Supeno, "Optimization of the Use of Kitchen Waste as Liquid Organic Fertilizer (POC) for the Agricultural Environment in Mujur Village, Praya Timur District, Central Lombok Regency," *Jurnal Wicara Desa*, vol. 2, no. 6, 2024. Available: <https://journal.unram.ac.id/index.php/wicara>
- [8] Q. M. S. Anggraeni and Sani, "Pengolahan Limbah Dapur Menjadi Pupuk Organik Cair Sebagai Sumber Nutrisi Bagi Tanaman di Kelurahan Urangagung," *Jurnal Pengabdian Masyarakat Teknik Mesin (Abdi-Mesin)*, vol. 5, no. 1, pp. 44–51, 2025.
- [9] Zulkipli, R. R. S. Astuti, and F. N. Sadiyah, "Perception of Farmer Women Groups Towards the Use of Household Waste as Liquid Organic Fertilizer (POC): A Case Study of KWT Anggrek, East Barito Regency," *Proceedings of Politeknik Pembangunan Pertanian Yogyakarta-*

Magelang, 2024.
Available: <https://journal.polbangtanyoma.ac.id/pros2024yoma>

- [10] H. Netti, S. Eri, N. Khoirin, S. Saidi, A. Sutirno, and D. Aziz, "Pembuatan Pupuk Cair Organik Bersama Kelompok Wanita Tani Padang Manis," *Jurnal Pengabdian Kepada Masyarakat*, vol. 3, no. 1, pp. 63–67, 2023.
- [11] S. T. T. Panjaitan, F. R. Siahaan, H. L. Nainggolan, P. Lumbanraja, and F. Tindaon, "Pembuatan Pupuk Organik Cair (POC) dari Limbah Rumah Tangga untuk Tanaman di Pekarangan," *Jurnal Pengabdian Kepada Masyarakat*, vol. 5, no. 2, pp. 530–539, 2022.
- [12] E. D. Sulichantini and A. Q. Primawati, "Growth Response of *Dendrobium* Orchid Seedlings (*Dendrobium Ira Veronica*) to Foliar Fertilizer and Organic Fertilizer in Fertilizer Composition," *Jurnal Agroekoteknologi Tropika Lembab*, vol. 6, no. 2, pp. 45–53, 2024.
- [13] L. A. Nadhiroh, H. Herastuti, and T. Setyaningrum, "Penggunaan Berbagai Macam Pupuk Daun dan Media Tanam pada Tanaman Anggrek *Dendrobium* sp.," *Agrivest*, vol. 28, no. 1, pp. 27–35, 2022.
- [14] N. A. Fadhila, D. Nurul, A. Jurusan, B. Pertanian, F. Pertanian, U. Brawijaya, J. Veteran, and J. Timur, "Pengaruh Waktu Aplikasi dan Komposisi Nutrisi terhadap Pertumbuhan Vegetatif Tanaman Anggrek *Dendrobium* (*Dendrobium* sp.)," *Jurnal Produksi Tanaman*, vol. 8, no. 1, pp. 93–98, 2020.