

Morphological Characterization and Phytochemical Profiling of *Vanda tricolor* Lindl. var. *suavis* forma Bali

I Putu Benny Santika¹, Ida Ayu Putri Darmawati², Rindang Dwiyani³

¹Student in Agroecotechnology Master Program, Faculty of Agriculture, Udayana University, Denpasar, Bali, Indonesia

^{2,3}Lecturer of Agroecotechnology Master Program, Faculty of Agriculture, Udayana University, Denpasar, Bali, Indonesia

ABSTRACT: *Vanda tricolor* Lindl. var. *suavis* forma Bali is a wild orchid with high ornamental value and considerable potential as a source of bioactive compounds. However, information regarding its morphological characteristics and phytochemical composition remains limited, highlighting the need for further research to support its conservation and sustainable utilization. This study aimed to characterize the morphology and identify the phytochemical profile of *V. tricolor* var. *suavis* forma Bali. Morphological characterization was conducted by observing quantitative and qualitative traits based on orchid morphological descriptors, while phytochemical profiling was performed using Gas Chromatography–Mass Spectrometry (GC–MS) analysis of leaf extracts. Morphological data were analyzed descriptively using mean values for quantitative traits and descriptive assessments for qualitative characteristics. The results revealed that *V. tricolor* var. *suavis* exhibited a monopodial growth habit, with an average plant height of 39.3 cm, leaf length of 24.7 cm, leaf width of 3.53 cm, flower diameter of 4.57 cm, and an average of 11 flowers per inflorescence. The flowers were star-shaped with a white background and purplish-red spots, a purple labellum, a fragrant aroma, and were arranged in racemose inflorescences emerging from the leaf axils. GC–MS analysis identified several major phytochemical constituents, including Butylated Hydroxytoluene (BHT), tetradecanoic acid, pentadecanoic acid, *n*-hexadecanoic acid, hexadecanoic acid ethyl ester, octadecanoic acid, heptadecanoic acid, phytol, and 9,12,15-octadecatrienoic acid (α -linolenic acid). Previous studies have reported that these compounds possess various biological activities, including antioxidant, antibacterial, antimicrobial, anti-inflammatory, cardioprotective, and neuroprotective properties. The findings indicate that *V. tricolor* var. *suavis* forma Bali possesses distinctive morphological characteristics and contains diverse bioactive compounds with promising potential for pharmaceutical, healthcare, and cosmetic applications. Furthermore, this study provides valuable scientific information to support the conservation and sustainable utilization of this native Indonesian orchid.

KEYWORDS: *Vanda tricolor* var. *suavis* forma Bali; morphological characterization; GC–MS; phytochemical profiling; bioactive compounds.

INTRODUCTION

Indonesia is recognized as one of the world's megabiodiversity countries, harboring one of the richest orchid floras globally (Harniati & Jamil, 2020). It is estimated that more than 5,000 orchid species are distributed across diverse ecosystems, ranging from lowland tropical forests to mountainous regions (Nugroho et al., 2018). This remarkable diversity makes orchids an invaluable genetic resource with significant ecological, conservation, horticultural, and economic importance, as well as considerable potential for applications in the pharmaceutical and industrial sectors (Hidayat & Pancoro, 2016; Co'o et al., 2026). Among the numerous orchid species found in Indonesia, *Vanda tricolor* Lindl. var. *suavis* forma Bali represents a unique genetic resource distinguished by its distinctive morphological characteristics and its status as one of Bali's characteristic floral identities.

V. tricolor var. *suavis* forma Bali is characterized by white flowers adorned with purple to brownish spots, a distinctive fragrant aroma, and excellent adaptation to its natural habitat (Dwiyani et al., 2026). These unique characteristics make this orchid highly valuable as an ornamental plant and a promising genetic resource for orchid breeding programs. However, excessive exploitation of natural habitats, land-use change, and increasing pressure on forest ecosystems have resulted in a continuous decline in wild orchid populations (Ilgiansyah et al., 2026). Consequently, effective conservation strategies require comprehensive scientific information regarding the morphological characteristics and biological potential of this species. Morphological characterization is a fundamental step in the identification, documentation, and management of plant genetic resources (Suryani

Morphological Characterization and Phytochemical Profiling of *Vanda tricolor* Lindl. var. *suavis* forma Bali

& Owbel, 2019). Both vegetative and reproductive characteristics can be used to distinguish taxa, assess phenotypic variation, and provide essential information for conservation, cultivation, and plant breeding programs (Arrufitasari et al., 2025). Furthermore, morphological characterization contributes to taxonomic documentation, thereby facilitating species identification in both natural habitats and germplasm collections.

In addition to morphological traits, information on the phytochemical composition of orchids remains relatively limited, particularly for *V. tricolor* var. *suavis* forma Bali. Previous studies have demonstrated that members of the family Orchidaceae produce a wide range of secondary metabolites, including alkaloids, flavonoids, tannins, saponins, steroids, terpenoids, and phenolic compounds, many of which exhibit important biological activities such as antioxidant, antimicrobial, anti-inflammatory, and anticancer properties (Safitri et al., 2025). Characterizing the phytochemical profile of orchids not only provides insight into their potential as natural sources of bioactive compounds but also supports the development of pharmaceutical products, cosmetics, and functional foods (Parwito & Sumartono, 2025). To date, studies on *V. tricolor* var. *suavis* forma Bali have primarily focused on conservation, cultivation, and general morphological descriptions. Research integrating comprehensive morphological characterization with phytochemical profiling remains scarce. This lack of information has limited the understanding and utilization of the biological and economic potential of this native orchid. Therefore, a comprehensive study integrating morphological characterization with phytochemical analysis is necessary to systematically document its morphological features while identifying its secondary metabolite composition.

The present study aimed to characterize the morphology and analyze the phytochemical profile of *V. tricolor* var. *suavis* forma Bali. The findings are expected to provide valuable scientific information on the phenotypic characteristics and bioactive compounds of this orchid, thereby supporting conservation efforts, germplasm development, orchid breeding programs, and future research on the utilization of this species as a valuable source of natural compounds with potential pharmaceutical and economic applications.

RESEARCH METHOD

The study was conducted from August to December 2025 at a private orchid collection garden in Bali, Indonesia. Morphological characterization was performed in situ on living orchid specimens at the study site. Phytochemical analysis was conducted at the Forensic Laboratory of the Denpasar Police Department (Polres Denpasar), Bali, Indonesia, using Gas Chromatography–Mass Spectrometry (GC–MS) to identify the phytochemical constituents of *Vanda tricolor* Lindl. var. *suavis* forma Bali.

Materials And Methods

Three flowering individuals of *Vanda tricolor* Lindl. var. *suavis* forma Bali were used as the plant materials in this study. Fresh leaf samples were collected for phytochemical analysis. The equipment used included a digital camera, a digital caliper (0.01 mm precision), a ruler, a measuring tape, an analytical balance, a scalpel, forceps, beakers, test tubes, micropipettes, a mortar and pestle, Whatman No. 1 filter paper, and other standard laboratory equipment.

Morphological Characterization

Morphological characterization was conducted descriptively based on the orchid descriptor developed by Kartikaningrum (2004). Both vegetative and reproductive morphological traits were observed. The vegetative characters included growth habit, plant height, stem diameter, internode length, number of leaves per stem, leaf length, leaf width, leaf shape, leaf color, leaf surface texture, leaf apex shape, leaf margin, leaf symmetry, and leaf cross-section. The reproductive characters comprised inflorescence type, inflorescence position, peduncle length, peduncle diameter, number of flowers per inflorescence, flower diameter, flower shape, flower color, floral fragrance, sepal shape, petal shape, labellum shape, column morphology, color pattern of the sepals and petals, cross-sectional shape of the sepals and petals, and other reproductive characteristics. Quantitative measurements were performed on three flowering plants. Each quantitative character was measured three times, and the mean value was calculated to obtain representative data.

Phytochemical Analysis

Sample Preparation

Fresh leaves of *V. tricolor* var. *suavis* forma Bali were washed thoroughly with running water to remove impurities and air-dried to reduce moisture content. The samples were then cut into small pieces and ground using a blender. Approximately 100 g of powdered sample was extracted by maceration with 96% ethanol at a sample-to-solvent ratio of 1:10 (w/v) for 72 h at room temperature with occasional stirring. The extract was filtered through Whatman No. 1 filter paper, and the filtrate was concentrated using a rotary evaporator at 40–50°C to obtain a crude extract.

Morphological Characterization and Phytochemical Profiling of *Vanda tricolor* Lindl. var. *suavis* forma Bali

GC–MS Analysis

The phytochemical profile of the leaf extract was determined using Gas Chromatography–Mass Spectrometry (GC–MS). Prior to analysis, the concentrated extract was filtered through a 0.22 µm membrane filter. A volume of 1 µL of the filtered extract was injected into the GC–MS system. Compound separation was carried out using a non-polar capillary column with helium as the carrier gas. The analysis was performed under a programmed oven temperature according to the operating conditions of the instrument. The mass spectra corresponding to each chromatographic peak were compared with the National Institute of Standards and Technology (NIST) Mass Spectral Library for compound identification. The compound with the highest similarity index was assigned as the identified constituent.

Data Analysis

Quantitative morphological data were analyzed descriptively by calculating the mean values and are presented in tabular form. Qualitative morphological characters were described based on direct observations of plant morphology. The GC–MS results were analyzed descriptively and presented as a table containing the identified phytochemical constituents, including their retention times, peak areas, molecular formulas, and reported biological activities based on relevant scientific literature.

RESULTS

Morphological Characterization of *Vanda tricolor* Lindl. var. *suavis*



Figure 1. Morphological features of *Vanda tricolor* Lindl. var. *suavis* forma Bali. (A) Flowering plant habit. (B) Characteristic leaf apex. (C) Racemose inflorescence with multiple flowers. Scale bar = 3 cm.



Figure 2. Floral morphology of *Vanda tricolor* Lindl. var. *suavis* forma Bali showing the (A) frontal view and (B) lateral view of the flower. Scale bar = 7 mm.

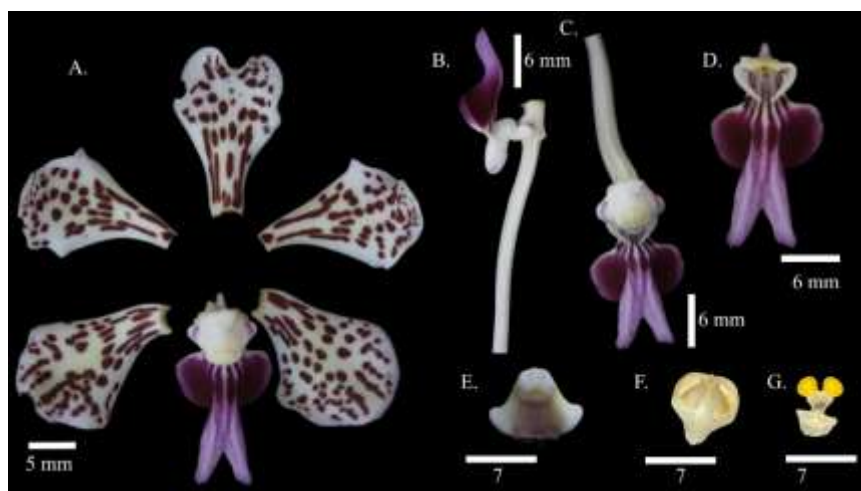


Figure 3. Floral dissection of *Vanda tricolor* Lindl. var. *suavis* forma Bali. (A) Separated floral structures, including the dorsal sepal, two lateral sepals, two petals, column, and labellum. (B) Lateral view of the column and labellum. (C) Frontal view of the column and labellum. (D) Frontal view of the labellum. (E) Anther cap. (F) Pollinia. (G) Viscidium attached to the stipe.

Table 1. Quantitative Morphological Characteristics of *Vanda tricolor* Lindl. var. *suavis* forma Bali

Character	Mean Value
Plant height (cm)	39.3
Internode length (cm)	1.17
Stem diameter (cm)	1.6
Number of leaves per stem	19
Leaf length (cm)	24.7
Leaf width (cm)	3.53
Flower diameter (cm)	4.57
Number of flowers per inflorescence	11
Peduncle diameter (cm)	0.34
Peduncle length (cm)	4.9

Note: The mean values were calculated from measurements of three flowering individuals of *Vanda tricolor* Lindl. var. *suavis* forma Bali collected from the study site.

Table 2. Qualitative Morphological Characteristics of *Vanda tricolor* Lindl. var. *suavis* forma Bali

Character	Description
Growth habit	Monopodial
Leaf cross-section	Asymmetrical (zygomorphic)
Leaf shape	Oblong
Leaf margin	Entire
Leaf apex	Three-toothed (tridentate)
Leaf surface texture	Glabrous
Leaf symmetry	Asymmetrical
Leaf color	Green
Flower shape	Star-shaped
Inflorescence type	Raceme
Inflorescence position	Lateral (arising from the leaf axils)
Flower color	White with purple and purplish-red markings
Peduncle orientation	Erect
Character	Description

Morphological Characterization and Phytochemical Profiling of *Vanda tricolor* Lindl. var. *suavis* forma Bali

Floral fragrance	Fragrant
Sepal shape	Lateral
Dorsal sepal color pattern	Spotted
Lateral sepal color pattern	Spotted
Petal shape	Lateral
Petal color pattern	Spotted
Sepal and petal cross-section	Concave
Sepal and petal apex	Obtuse, slightly emarginate
Labellum groove position	Median groove
Labellum cross-section	Curved forward with a recurved apex

Table 3. Major Phytochemical Compounds Identified in the Leaf Extract of *Vanda tricolor* Lindl. var. *suavis* forma Bali

No.	Phytochemical Compound	Compound Class	Reported Biological Activities
1	Butylated Hydroxytoluene (BHT)	Phenolic compound	Antioxidant; protects cells against oxidative stress; enhances resistance to pathogens
2	Tetradecanoic acid (Myristic acid)	Saturated fatty acid	Antibacterial, anti-inflammatory, and emollient properties in cosmetic applications
3	Pentadecanoic acid	Saturated fatty acid	Supports cardiovascular health by increasing HDL cholesterol and reducing LDL cholesterol
4	<i>n</i> -Hexadecanoic acid (Palmitic acid)	Saturated fatty acid	Antioxidant, antimicrobial, and anti-inflammatory activities
5	Hexadecanoic acid ethyl ester	Fatty acid ester	Potential anti-inflammatory therapeutic agent
6	Octadecanoic acid (Stearic acid)	Saturated fatty acid	Involved in lipid metabolism, cellular protection, and exhibits potential anticancer activity
7	Heptadecanoic acid (Margaric acid)	Saturated fatty acid	Contributes to lipid metabolism, cellular protection, and exhibits potential anticancer activity
8	Phytol	Diterpenoid alcohol	Antioxidant, antimicrobial, neuroprotective, and a precursor of vitamins E and K ₁
9	9,12,15-Octadecatrienoic acid (α -Linolenic acid, ALA)	Unsaturated fatty acid (Omega-3)	Promotes cardiovascular health, supports brain function, and protects the skin against premature aging

DISCUSSION

Morphological characterization

Morphological characterization is an important step in the identification, classification, and conservation of orchid genetic resources. The observation of quantitative and qualitative characteristics of *Vanda tricolor* Lindl. var. *suavis* showed that this species possesses distinctive morphological traits that are consistent with the general characteristics of the genus *Vanda*, particularly in terms of growth habit, leaf morphology, and floral characteristics, which serve as major distinguishing features among species.

Based on the quantitative characteristics (Table 1), *V. tricolor* var. *suavis* had an average plant height of 39.3 cm, a stem diameter of 1.6 cm, and an internode length of 1.17 cm. These values indicate a monopodial stem growing upright with relatively short internodes, resulting in densely arranged leaves along the stem. Such dense leaf arrangement represents an adaptation of epiphytic plants to improve light interception efficiency while reducing water loss in their natural habitat. The leaves had an average length of 24.7 cm, a width of 3.53 cm, and approximately 19 leaves per stem. The relatively long and thick leaves reflect the plant's ability to store water reserves, which is one of the adaptive traits of epiphytic orchids under fluctuating water availability. In addition to functioning as photosynthetic organs, the leaves also serve as water-storage organs that help the plant survive during dry periods. Reproductive characteristics showed that the flowers had an average diameter of 4.57 cm, with

Morphological Characterization and Phytochemical Profiling of *Vanda tricolor* Lindl. var. *suavis* forma Bali

approximately 11 flowers produced on each inflorescence. The peduncle had an average length of 4.9 cm and a diameter of 0.34 cm. The relatively large number of flowers within a single raceme enhances the ornamental value of the plant and may also increase pollination opportunities. Sequential flowering within a raceme allows the blooming period to be prolonged.

Qualitative characteristics (Table 2) indicated that *V. tricolor* var. *suavis* exhibits a monopodial growth habit, in which growth occurs from a single main stem that continuously elongates without forming pseudobulbs. This is one of the defining characteristics of the genus *Vanda*. The leaves are oblong, glabrous, green, and have entire margins with a characteristic three-toothed (tridentate) apex. This tridentate leaf apex is a diagnostic feature commonly found in several *Vanda* species and is frequently used as a distinguishing character in morphological identification. In the reproductive organs, the flowers are star-shaped (stellate) and arranged in lateral racemose inflorescences emerging from the leaf axils. This inflorescence position is typical of monopodial orchids, in which flower stalks develop from mature leaf axils. The erect peduncle allows the flowers to be well displayed and easily visible to pollinating insects. Flower color is one of the most striking characteristics of *V. tricolor* var. *suavis*. The flowers have a white background with purplish-red spots on the sepals and petals, while the labellum is purple. The spotted pattern on the sepals and petals creates a distinctive floral display that enhances ornamental value and may also function as a visual cue for pollinators. In addition, the flowers emit a pleasant fragrance that serves as an important attractant for pollinating insects, particularly bees and other diurnal insects.

Other floral characteristics include concave sepals and petals with obtuse, slightly emarginate apices. The labellum has a median groove and is curved forward with a recurved apex. This structure functions as a landing platform for pollinators and helps guide them toward the column, thereby increasing the efficiency of pollinia transfer. Therefore, floral shape and structure are important not only for taxonomic identification but also for the reproductive mechanism of the species. The combination of quantitative and qualitative characters demonstrates that *V. tricolor* var. *suavis* possesses distinctive vegetative and reproductive morphology. Vegetative characters indicate adaptation to an epiphytic habitat through a monopodial stem and thick leaves, whereas the star-shaped flowers with spotted patterns, fragrant aroma, and characteristic labellum structure provide high ornamental value while supporting successful pollination. This morphological information provides an important basis for species identification, germplasm conservation, and the utilization of *V. tricolor* var. *suavis* as a genetic resource in orchid breeding programs.

Phytochemical profile analysis

Phytochemical profile analysis of *Vanda tricolor* var. *suavis* forma Bali revealed the presence of various secondary metabolites with potential biological activities. The identified compounds included Butylated Hydroxytoluene (BHT), tetradecanoic acid (myristic acid), pentadecanoic acid, n-hexadecanoic acid (palmitic acid), hexadecanoic acid ethyl ester, octadecanoic acid (stearic acid), heptadecanoic acid (margaric acid), phytol, and 9,12,15-octadecatrienoic acid (α -linolenic acid, ALA). The presence of these compounds suggests that *V. tricolor* var. *suavis* forma Bali has potential not only as an ornamental plant but also as a valuable source of bioactive compounds.

Butylated Hydroxytoluene (BHT) is known for its antioxidant activity, which inhibits free-radical formation and protects cells from oxidative damage (Pangestu et al., 2018). BHT has also been reported to enhance plant resistance to pathogens through cellular protective mechanisms. The presence of this compound indicates the potential antioxidant activity of *V. tricolor* var. *suavis* forma Bali. Several saturated fatty acids, including tetradecanoic acid (myristic acid), pentadecanoic acid, n-hexadecanoic acid (palmitic acid), octadecanoic acid (stearic acid), and heptadecanoic acid (margaric acid), were identified as major components of the extract. Myristic acid has been reported to possess antibacterial and anti-inflammatory activities and is widely used as an emollient in cosmetic formulations (Hartanto & Silitonga, 2018). Pentadecanoic acid has been associated with cardiovascular health by increasing HDL cholesterol and reducing LDL cholesterol levels (Lestari, 2023). Palmitic acid exhibits antioxidant, antimicrobial, and anti-inflammatory activities, whereas stearic acid and margaric acid contribute to lipid metabolism, cellular membrane protection, and have been reported to possess potential anticancer properties (Bayaq, 2025).

This study also identified hexadecanoic acid ethyl ester, an ester derivative of palmitic acid that has been reported to exhibit anti-inflammatory activity (Rifdah, 2024). This compound may contribute to the development of plant-derived therapeutic agents for inflammatory conditions. Phytol, a diterpenoid alcohol commonly found in plants, possesses various biological activities, including antioxidant, antimicrobial, and neuroprotective effects (Rahmawati et al., 2021). Phytol is also a precursor in the biosynthesis of vitamins E and K₁, which play important roles in maintaining physiological functions (Handoyo et al., 2022). The presence of phytol further supports the potential of *V. tricolor* var. *suavis* forma Bali as a source of pharmaceutically valuable natural compounds. Another identified compound was α -linolenic acid (ALA), an omega-3 unsaturated fatty acid. ALA is known to support cardiovascular health, maintain brain function, and exert antioxidant and anti-inflammatory activities that help protect

Morphological Characterization and Phytochemical Profiling of *Vanda tricolor* Lindl. var. *suavis* forma Bali

cells from oxidative damage (Djaja et al., 2025). ALA is also widely utilized in functional foods and cosmetic products because of its beneficial effects on skin health.

Overall, the presence of these bioactive compounds indicates that *Vanda tricolor* var. *suavis* forma Bali possesses a diverse phytochemical profile with promising potential for pharmaceutical, healthcare, and cosmetic applications. Although this study was limited to compound identification, the findings provide a scientific basis for future research involving quantitative metabolite analysis, biological activity assays, and the isolation of active compounds to further evaluate their therapeutic potential.

CONCLUSION

V. tricolor Lindl. var. *suavis* forma Bali exhibits distinctive morphological characteristics, including a monopodial growth habit, an average plant height of 39.3 cm, oblong leaves with entire margins, a tridentate apex, and a glabrous surface, as well as star-shaped flowers arranged in racemose inflorescences. The flowers are characterized by a white background with purplish-red spots on the sepals and petals, a purple labellum, a pleasant fragrance, and floral structures that serve as diagnostic characteristics of this taxon. These vegetative and reproductive traits support the taxonomic identification of *V. tricolor* var. *suavis* forma Bali and demonstrate its adaptation to an epiphytic habitat.

Phytochemical profiling using GC–MS revealed the presence of several bioactive compounds, including Butylated Hydroxytoluene (BHT), tetradecanoic acid (myristic acid), pentadecanoic acid, *n*-hexadecanoic acid (palmitic acid), hexadecanoic acid ethyl ester, octadecanoic acid (stearic acid), heptadecanoic acid (margaric acid), phytol, and α -linolenic acid (ALA). These compounds have been reported to possess diverse biological activities, including antioxidant, antibacterial, antimicrobial, anti-inflammatory, neuroprotective, and cardioprotective properties. Therefore, *V. tricolor* var. *suavis* forma Bali has considerable potential as a natural source of bioactive compounds for future applications in the pharmaceutical, healthcare, and cosmetic industries.

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to all individuals and institutions that provided support and assistance throughout this study. Special appreciation is extended to the laboratory that facilitated the phytochemical analysis using Gas Chromatography–Mass Spectrometry (GC–MS) and provided the necessary facilities for this research. The authors also gratefully acknowledge their academic supervisors for their valuable guidance, constructive suggestions, and continuous encouragement throughout the research process and the preparation of this manuscript. Their support and contributions were instrumental to the successful completion of this study.

REFERENCES

- 1) Arrufitasari, P. N., Wahditiya, A. A., Firdhausi, N. F., Sa'diyah, J., Setiowati, A., Maulana, M., et al. 2025. *Genetika Tanaman*. CV. Gita Lentera.
- 2) Bayaq, Y. 2025. Potensi α -Tokoferol sebagai antioksidan pada sediaan krim dari fraksi non-polar crude palm oil (CPO) dengan metode DPPH (1,1-diphenyl-2-picrylhydrazyl). Undergraduate Thesis.
- 3) Co'o, K. V., Purnama, M. M., Sinaga, P. S., and Sipayung, R. H. 2026. Studi Keanekaragaman Spesies Anggrek (Orchidaceae) pada Blok Pemanfaatan Resort Konservasi Wilayah III Taman Wisata Alam Ruteng. *Wahana Forestra: Jurnal Kehutanan* 21(1), 61–76.
- 4) Djaja, N., Soekiono, C. J., and Vanessa, I. 2025. Efek asam lemak omega-3 pada pemulihan dari prosedur kardiovaskular. *Jurnal Sains dan Kesehatan* 6(3), 176–187.
- 5) Dwiyani, R., Wirya, G. N. A. S., Sudiarta, I. P., Darmawati, I. A. P., Fitriani, Y., Selangga, D. G. W., ... dan Santika, I. P. B. (2026). Anggrek Vanda. Universitas Brawijaya Press.
- 6) Handoyo, M. O. M., Yuliani, Y., and Purnama, E. R. 2022. Uji *in silico* senyawa phytol hasil ekstrak daun zodia (*Evodia suaveolens*) sebagai antikanker. *Berkala Ilmiah Pendidikan Biologi (BioEdu)* 11(2), 368–373.
- 7) Harniati, H. and Jamil, A. S. 2020. Tingkat keunggulan komparatif dan kompetitif anggrek Indonesia di Pasar Jepang. *AgriHumanis* 1(1), 18–27.
- 8) Hartanto, E. S. and Silitonga, R. F. 2018. Ekstraksi asam miristat asal biji pala (*Myristica fragrans* Houtt.) dan limbah industri olahannya. *Indonesian Journal of Industrial Research* 35(1), 38–45.
- 9) Hidayat, T. and Pancoro, A. 2016. Ulasan kajian filogenetika molekuler dan peranannya dalam menyediakan informasi dasar untuk meningkatkan kualitas sumber genetik anggrek. *Jurnal AgroBiogen* 4(1), 35–40.
- 10) Ilgiansyah, Y., Sukma, R., Amelia, H. R., and Pelly, D. A. 2026. Dampak kerusakan hutan bagi keberlangsungan hidup flora dan fauna di Indonesia. *Al-Furqan: Jurnal Agama, Sosial, dan Budaya* 5(3), 1322–1336.

Morphological Characterization and Phytochemical Profiling of *Vanda tricolor* Lindl. var. *suavis* forma Bali

- 10) Kartikaningrum., Suskandari., Widiastoety, D., dan Effendie, K. 2004. Panduan Karakterisasi Tanaman Hias: Anggrek dan Anthurium. *Badan Penelitian dan Pengembangan Pertanian Komisi Nasional Plasma Nutfah* 35.
- 11) Lestari, H. F. 2023. Pengaruh ekstrak etanol kulit salak terhadap profil lipid, IL-6, dan MDA serum: Studi eksperimental pada tikus jantan galur Wistar yang diinduksi diet tinggi lemak. Master's Thesis. Universitas Islam Sultan Agung.
- 12) Nugroho, A. S., Rita, E., and Ulfah, M. 2018. Manajemen Konservasi Anggrek Gunung Ungaran Berbasis Masyarakat sebagai Laboratorium Alam Pembelajaran Biologi Tahun ke-1 dari Rencana 3 Tahun. Technical Report.
- 13) Pangestu, A. R., Hadi, H., and Saebani, S. 2018. Pengaruh pemberian Butylated Hydroxytoluene (2,6-di-tert-butyl-4-methylphenol) per oral dosis bertingkat terhadap gambaran histopatologis paru tikus Wistar. Doctoral Thesis. Faculty of Medicine.
- 14) Parwito, P. and Sumartono, E. 2025. Analisis kandungan fitokimia dan potensi antioksidan ekstrak tanaman obat Nusantara sebagai dasar pengembangan sediaan farmasi modern dan peningkatan nilai ekonomi produk herbal. *Journal of Economics, Management, and Accounting* 1(2), 27–34.
- 15) Rahmawati, R., Astuti, P., and Wahyuono, S. 2021. Profil fitokimia dan multipotensi dari *Coleus amboinicus* (Lour.). *JPSCR: Journal of Pharmaceutical Science and Clinical Research* 6(2), 158–188.
- 16) Rifdah Maghfira, A. 2024. Isolasi senyawa kimia dari ekstrak etil asetat alga coklat (*Sargassum polycystum*) serta uji bioaktivitas sebagai antibakteri dan antiinflamasi. Doctoral Thesis. Universitas Hasanuddin.
- 17) Safitri, N., Hidayah, R., and Triadisti, N. 2025. Literature review: Skrining fitokimia pada berbagai tanaman obat sebagai sumber senyawa bioaktif. *Jurnal Riset Multidisiplin Edukasi* 2(7), 1150–1162.
- 18) Suryani, R. and Owbel, O. 2019. Pentingnya eksplorasi dan karakterisasi tanaman pisang sehingga sumber daya genetik tetap terjaga. *Agro Bali: Agricultural Journal* 2(2), 64–76.



There is an Open Access article, distributed under the term of the Creative Commons Attribution – Non Commercial 4.0 International (CC BY-NC 4.0) (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits remixing, adapting and building upon the work for non-commercial use, provided the original work is properly cited.