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MALAYSIA

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三重大学
MIE UNIVERSITY

2nd International Science, Engineering and Technology Colloquium

(ISETC 2025)

Faculty of Applied Sciences,
Universiti Teknologi MARA,
Perak Branch, Tapah Campus,
35400 Tapah Road, Perak, Malaysia.

Colloquium date: 9th July 2025
Publication date: 9th September 2025

Proceedings of Extended Abstracts

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e-ISBN: 978-629-97630-5-5

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PREFACE

Welcome to the 2nd International Science, Engineering and Technology Colloquium 2025 (ISETC 2025)!

It is with great pleasure that we present this year's colloquium, a distinguished gathering of scholars, researchers, and professionals dedicated to the advancement of applied sciences. Held virtually on 9th July 2025, ISETC 2025 serves as a platform to highlight cutting-edge research, foster meaningful networking, encourage collaborations, and explore innovative solutions to global challenges.

This year's theme, "The Power of Scientific Innovation: Intelligent Solutions for a Sustainable World" highlights our shared goal to solve global challenges through applied science. It celebrates innovation as a key to building a more sustainable and resilient future. We're proud to feature keynote speakers and presenters who bring fresh insights, bold ideas, and breakthroughs shaping tomorrow's world.

We would like to extend our heartfelt appreciation to the Faculty of Applied Sciences, Universiti Teknologi MARA, Perak Branch, Tapah Campus, for their outstanding support and assistance throughout the planning and execution of the event. Their dedication has been instrumental to the success of this colloquium. We would like to sincerely thank all participants and researchers for their valuable contributions. We also appreciate the reviewers for their careful evaluations and helpful feedback. Your hard work and support mean a lot to us.

As editors, we are proud to present this collection of proceedings. It is an honour to bring together the interesting and meaningful work of our speakers and authors. We hope the ideas shared will lead to new discoveries, encourage more research, and help solve global challenges through science and innovation.

Warm regards,

Dr. Emi Norzehan Mohamad Mahbob
Dr. Saiyidah Nafisah Hashim
Ms. Lili Widarti Zainuddin
Ms. Nurul Nazwa Mohammad
Ms. Rozaina Saleh

ISETC 2025 Proceedings Editors

PHYTOCHEMICAL SCREENING OF *Phaleria macrocarpa* FRUIT EXTRACT

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Abstract: *Phaleria macrocarpa* (Scheff.) Boerl, locally known as Mahkota Dewa, is a medicinal plant native to Malaysia and widely recognized for its potential therapeutic properties. This study explored its phytochemical, emphasizing its suitability as a natural alternative to synthetic antioxidants and drugs. Employing a cold ethanol extraction method, significant bioactive compounds including phenols, flavonoids, tannins, alkaloids, and the polyphenolic constituent were successfully isolated from the fruit, achieving an extraction yield of 3.65%. Qualitative phytochemical screening and Fourier Transform Infrared (FTIR) spectroscopy confirmed the presence of functional groups characteristic of these compounds. These findings bridge traditional medicinal knowledge and modern analytical techniques, supporting the formulation of *P. macrocarpa*-based nutraceuticals, functional foods, and herbal supplements.

***Keywords*:** *Phaleria Macrocarpa*, Phytochemical Screening, FTIR Analysis

INTRODUCTION

Numerous types of compound found in plants have potential applications as traditional medicine to treat both acute and chronic conditions. *Phaleria macrocarpa* (Scheff.) Boerl, locally known as Mahkota Dewa, is commonly grown in Malaysia. *P. macrocarpa* long use as a medicinal herb has revealed promising biological and pharmacological potential. It demonstrates high potential for various biological activities, including antioxidants, anti-inflammatory, antibacterial, and anticancer properties (Ahmad et al., 2023). It was documented that *P. macrocarpa* fruits contain various chemical constituents, including saponin, flavonoid, polyphenol and alkaloid, while mangerin was reported as the major compound found in the extract (Abd Gani et al., 2023). Despite its high antioxidant content, the potential of *P. macrocarpa* fruit as a nutraceutical remains underexplored due to limited awareness and underdeveloped extraction method. This study investigates *P. macrocarpa* as a potential medicinal plant due to its high antioxidant and phytochemical content, which is free from toxic compounds. It aims to offer a natural alternative to synthetic antioxidants and pharmaceutical drugs through the preliminary identification of bioactive compounds using phytochemical screening and FTIR-ATR spectroscopy.

LITERATURE REVIEW

Phaleria macrocarpa is a medicinal plant from the Thymelaeaceae family, commonly used to treat illnesses like diabetes, kidney disease, cancer, heart problems, and more (Mia et al., 2025). The healing potential of *P. macrocarpa* is linked to compounds like polyphenols and flavonoids, especially mangiferin, which has been found to have antioxidant, anticancer, anti-inflammatory, and antidiabetic properties (Lim et al., 2019). This plant is now widely used in herbal teas, cosmetics, foods, and traditional medicine (Ahmad et al., 2023). Cold extraction is a common method used to isolate bioactive compounds from the fruit. It involves soaking the plant in a solvent for a few days at room temperature (Ahmad et al., 2023). Although this method is simple and cost-effective, it has drawbacks such as long extraction time, low efficiency, and possible residue of organic solvents. In phytochemical screening, the presence of key compounds like flavonoids, tannins, phenols, and alkaloids was confirmed using standard chemical tests such as Alkaline reagent test for flavonoids, Ferric chloride test for phenolics and tannins, and Mayer's test for alkaloids (Ahmad et al., 2023).

MATERIALS AND METHODS

112 g of dried *Phaleria macrocarpa* fruits were chopped, ground, and soaked using 1L of ethanol. The beaker was sealed and left at room temperature for three days with occasional stirring. The ethanol extract was filtered, and the filtrate was concentrated using a rotary evaporator at 60 °C. The concentrated extract was then dried in an oven at 50–60 °C for three days to produce its crude extract. Phytochemical screening was conducted using standard methods. Phenol was tested by mixing 0.5 g of crude extract with 2 mL of distilled water and 2 mL of 5% ferric chloride. The presence of dark green indicated the presence of phenols. For flavonoids, 0.5 g of extract was mixed with 0.5 mL of 20% sodium hydroxide. The formation of an intense yellow color indicated the presence of flavonoids. Saponins were tested by mixing 0.5 g of extract with 5 mL of distilled water and shaking the mixture. Foam formation indicated the presence of saponins. Tannins were identified by mixing 0.5 g of extract with 2 mL of ethanol and 3 mL of 5% ferric chloride. A blue-black or greenish-black color indicated the presence of tannins. For alkaloids, 0.5 g of extract was mixed with two drops of Wagner's reagent. The formation of a reddish-brown precipitate indicated the presence of alkaloids. Terpenoids were tested by mixing 0.5 g of extract with 2 mL of chloroform and 3 mL of sulphuric acid. A reddish-brown color at the interface confirmed the presence of terpenoids. For steroids, 0.5 g of extract was mixed with 2 mL of chloroform, 2 mL of acetic acid, and 1 mL of sulphuric acid. The formation of a blue-green color indicated the presence of steroids. Triterpene glycosides were tested by mixing 0.5 g of extract with 2 mL of chloroform and 2 mL of acetic acid. The formation of a green mixture indicated the presence of triterpene glycosides. The crude extract was further analyzed using FTIR to identify the functional groups present in the extract.

RESULTS

Mass of sample (g) = 112.31 ± 0.01 g
Mass of crude sample extraction (g) = 4.9014 ± 0.001 g
Extraction Yield (%) = 3.65%

The 3.65% extraction yield and 4.0914 g of extract indicate that the cold extraction method successfully extracted significant bioactive content from *P. macrocarpa* fruits. This percentage reflects successful extraction of ethanol-soluble phytochemicals. The result for phytochemical screening test was tabulated in table 1 and table 2 below.

Table 1. Positive results from phytochemical screening test

Phytochemical test	Results
Phenol	Color changed to dark green solution
Flavonoids	Color changed to intense yellow solution
Tannins	Color changed to blue-black solution
Alkaloids	Formation of reddish-brown precipitate

Table 2. Negative results from phytochemical screening test

Phytochemical	Results
Saponins	No formation of froth/foam
Terpenoids	No formation of reddish brown at interface
Steroids	No formation of blue-green mixture
Triterpenes glycosides	No formation of green mixture

Phytochemical screening of *Phaleria macrocarpa* extract confirmed the presence of four key bioactive compounds which contribute to various biological effects, according to Ahmad et al. (2023). On the other hand, saponins, terpenoids, steroids, and triterpenes were not detected.

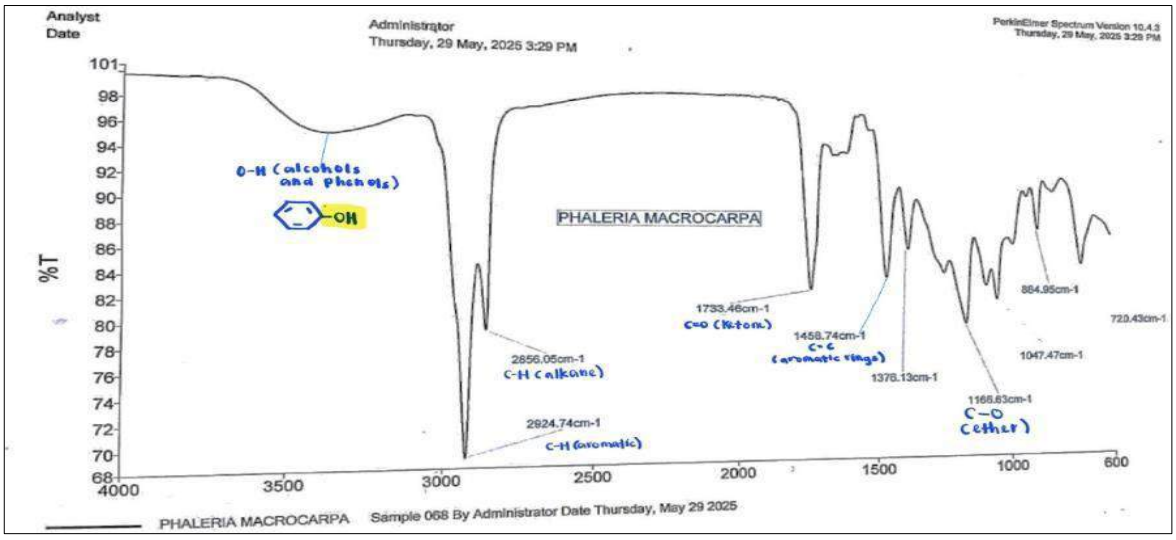


Figure 1. The FTIR spectrum of the *Phaleria macrocarpa* crude extract. The summary of the FTIR absorption is listed in Table 3.

Table 3. FTIR Spectrum analysis of *Phaleria macrocarpa* crude extract

Frequencies (cm^{-1})	Functional group
3300 (broad)	O-H (alcohols and phenol)
2856.05	C-H sp^3
2924.74	C-H aromatic
1733.46	C=O ketone
1458.74 and 1376.13	C=C aromatic ring
1166.63	C-O ether

DISCUSSION/ANALYSIS

In this study, the use of ethanol as the solvent has been effective for extracting polar compounds like flavonoids, tannin and phenolic compounds. Easmin et al. (2016) stated that ethanol is less polar than water. Therefore, ethanol recovers the more lipophilic compounds, and water recovers the more hydrophilic compounds. Bitwell et al., 2023 stated that the procedure has the underlying disadvantage of low efficiency and long duration of extraction. However, optimized conditions may attribute significant efficiency to this technique as high phenolic compounds yield. The extraction time taken of *P. macrocarpa* was for three days. A recent review on the extraction of polyphenols and the determination of antioxidant activity emphasizes that particle size can greatly affect the recovery and extraction yields of bioactive compounds from plants (Sridhar et al., 2021). Smaller and fine particles enhance extraction yields by increasing contact between plant material and solvent. The study by Ahmad et al. in 2023 reported that the plant extract contains important classes of bioactive compounds which include phenols, flavonoids, tannins, and alkaloids.

These compounds are well known for their strong antioxidant, antimicrobial, and anti-inflammatory effects. Alkaloids are also associated with analgesic properties, which adds to the potential therapeutic value of the extract. It shows that these findings align with the literature review. Phenols, indicated by a dark green color, are strong antioxidants and anti-inflammatory agents. Flavonoids produce an intense yellow color and are known for antimicrobial and antioxidant activities. Tannins gave a blue-black solution, suggesting astringent and antibacterial properties. Alkaloids, detected by reddish-brown precipitate, are pharmacologically active with potential neuroactive and analgesic effects. The presence of these compounds strongly supports the plant's traditional medicinal use. It also indicates that the extract could be developed into natural health products, such as herbal remedies, antioxidant supplements, or even cosmetics.

FTIR spectroscopy is one of the advanced techniques used for analysis of functional group present in bioactive occuring compounds (Easmin et al., 2016). Figure 1 demonstrate the FTIR analysis of *Phaleria macrocarpa* fruit extract which the key peaks similar with the functional groups reported in the major compound named as mangerin (O. Alara et al., 2017). A broad band at 3400–3200 cm^{-1} suggests O–H groups, while peaks at 2924.74 and 2856.05 cm^{-1} indicate C–H bonds typical of flavonoids. The peak at 1733.46 cm^{-1} corresponds to a carbonyl (C=O) group, and those at 1458.74 and 1376.13 cm^{-1} confirm aromatic C=C bonds. The 1166.83 cm^{-1} peak reflects C–O stretching from glycosidic bonds. These findings support the presence of abundant compounds similar with mangiferin , a polyphenol with antioxidant properties in the extract. However, the analysis did not focus solely on mangiferin but other compounds such as gallic acid, icariside C3, phalerin, and macronone were also detected, indicating a diverse phytochemical profile. These findings support the traditional medicine use of *P.macrocarpa* and highlight its potential as a rich source of natural antioxidants and therapeutic agents.

CONCLUSION

Extraction of the *Phaleria macrocarpa* fruit extract has yielded 4.9014 g (3.65%) of ethanol crude extract. The phytochemical screening on the crude extract has successfully confirmed the presence of key phytochemicals such as phenols, flavonoids, tannins and alkaloids which known for its antioxidant and therapeutic properties. FTIR analysis supported these findings with identification of few related functional group in comparison with the major product found in this species, known as mangiferin. Theoretically, the study supports the plant's medicinal value, while practically, it offers potential for use in herbal or nutraceutical products. Further research is recommended to isolate individual compound using a column chromatography method, conduct in vivo safety studies to assess biological effects and toxicity, and optimize extraction methods for better yield on application.

REFERENCES

Abd Gani, S. S., Noor Ezzuddin, N. N., Zaidan, U. H., Halmi, M. I. E., & Abd Halim, A. N. (2023). Flavonoid Content of *Phaleria macrocarpa* Fruit and Its Proximate Compositions. *Malaysian Applied Biology*, *52*(4), 119–125.

Ahmad, R., Khairul Nizam Mazlan, M., Firdaus Abdul Aziz, A., Mohd Gazzali, A., Amir Rawa, M. S., & Wahab, H. A. (2023). *Phaleria macrocarpa* (Scheff.) Boerl.: An updated review of pharmacological effects, toxicity studies, and separation techniques. In *Saudi Pharmaceutical Journal* (Vol. 31, Issue 6, pp. 874–888). Elsevier B.V.

Alara, O., Mudalip, S. A., & Olalere, O. (2017). Optimization of mangiferin extrated from *Phaleria macrocarpa* fruits using response surface methodology. *Journal of Applied Research on Medicinal and Aromatic Plants*, *5*, 82–87.

Bitwell, C., Indra, S. S., Luke, C., & Kakoma, M. K. (2023). A review of modern and conventional extraction techniques and their applications for extracting phytochemicals from plants. *Scientific African*, *19*, e01585.

Easmin, S., Sarker, M. Z. I., Ghafoor, K., Ferdosh, S., Jaffri, J., Ali, M. E., Mirhosseini, H., Al-Juhaimi, F. Y., Perumal, V., & Khatib, A. (2016b). Rapid investigation of α-glucosidase inhibitory activity of *Phaleria macrocarpa* extracts using FTIR-ATR based fingerprinting. *Journal of Food and Drug Analysis*, *25*(2), 306–315.

Easmin, S., Sarker, Z. I., Khatib, A., Ferdosh, S., Jaffri, J., Uddin, A. H., Murugesu, S., Balan, T., & Perumal, V. (2024). Metabolomics combined with chemometric analysis to identify α-glucosidase inhibitors in *Phaleria macrocarpa* fruit extracts and its molecular docking simulation. *South African Journal of Botany*, *168*, 352–359.

Lim, Y. P., Pang, S. F., Yusoff, M. M., Abdul Mudalip, S. K., & Gimbun, J. (2019). Correlation between the extraction yield of mangiferin to the antioxidant activity, total phenolic and total flavonoid content of *Phaleria macrocarpa* fruits. *Journal of Applied Research on Medicinal and Aromatic Plants*, *14*.

Mia, M. A. R., Ahmed, Q. U., Ferdosh, S., Helaluddin, A. B. M., Azmi, S. N. H., Al-Otaibi, F. A., Parveen, H., Mukhtar, S., Ahmed, M. Z., & Sarker, M. Z. I. (2023). Anti-obesity and antihyperlipidemic effects of *Phaleria macrocarpa* fruit liquid CO_2 extract: In vitro, in silico and in vivo approaches. *Journal of King Saud University – Science, 35*(8), Article 102865.

Mia, M. A. R., Ahmed, Q. U., Ferdosh, S., Islam, M. S., Samdani, M. S., & Sarker, M. Z. I. (2025). Antidiabetic potential of *Phaleria macrocarpa* fruit liquid CO_2 extract: Bioactivity, cytotoxicity, phytochemicals and molecular targets. *Phytomedicine Plus*, *5*(3).

Mia, M. A. R., Ahmed, Q. U., Helaluddin, A. B. M., Ferdosh, S., Siddique, M. M., Azmi, S. N. H., Ahmed, J., & Sarker, M. Z. I. (2022). Acute and subacute toxicityassessment of liquid CO_2 extract of *Phaleria macrocarpa* fruits flesh in mice model. *Journal of King Saud University- Science*, *34*(4).

Sridhar, A., Ponnuchamy, M., Kumar, P. S., Kapoor, A., Vo, D.-V. N., & Prabhakar, S. (2021). Techniques and modeling of polyphenol extraction from food: A review. *Environmental Chemistry Letters, 19*, 3409–3443.

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