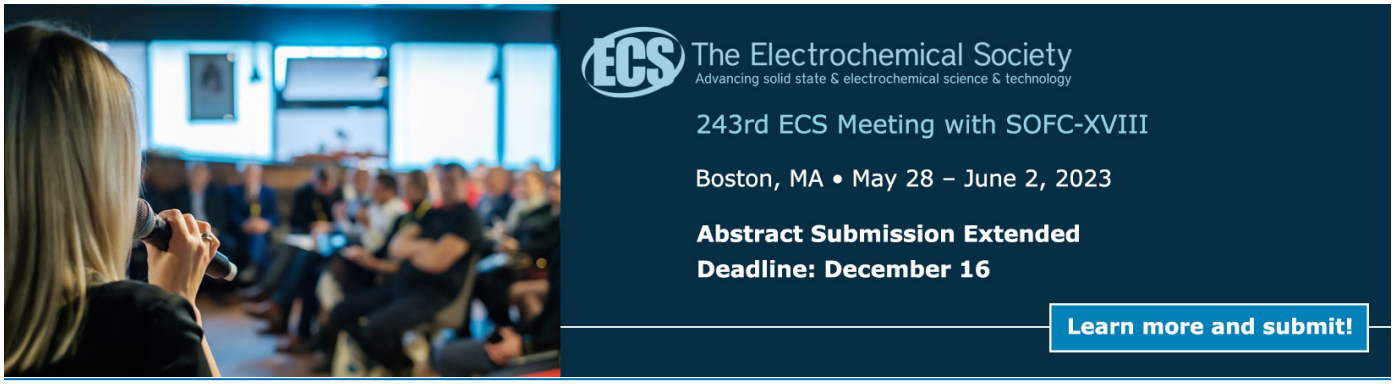
Committee of the 3rd International Conference on Applied Sciences Mathematics and Informatics (3rd ICASMI) 2020



COMMITTEE OF THE 3rd INTERNATIONAL CONFERENCE ON APPLIED SCIENCES MATHEMATICS AND INFORMATICS (3rd ICASMI) 2020

Garantor	: Prof. Dr. Karomani, M.Si. Prof. Dr. Heryandi, S.H., M.S. Dr. dr. Asep Sukohar, M.Kes. Prof. Dr. Yulianto, M.Si. Prof. Suharso, Ph.D.
Director	: Dr. Eng. Suripto Dwi Yuwono, S.Si., M.T. Dr. Eng. Heri Satria, S.Si., M.Si. Dr. Muslim Ansori, S.Si., M.Si. Dr. rer. nat. Roniyus Marjunus. S.Si., M.Si. Dr. Lusmeilia Afriani, D.E.A. Mulyono, Ph.D. Drs. M. Kanedi, M.Si. Prof. Dra. Wamiliana, M.A., Ph.D. Arif Surtono, S.Si., M.Si., M.Eng. Didik Kurniawan, S.Si., M.T. Rudy, S.H., L.L.M., L.L.D.
Chief Committee	: Prof. Dr. Rudy Situmeang, M.Sc.
1st Secretary	: Favorisen R. Lumbanraja, S.Kom., M.Si., Ph.D.
2nd Secretary	: Dewi Asiah Shofiana, M.Kom.
1st Treasurer	: Dr. Mita Rilyanti, M.Si.
2nd Treasurer	: Gina Dania Pratami, S.Si., M.Si.
3rd Treasurer	: Eka Waryanto

Division of Secretarial

Coordinator	: Agus Riyanto, S.Si., M.Sc.
Members	: Dr. Fitriani, S.Si., M.Sc. Yunda Heningtyas, S.Kom., M.Kom. Hapin Afriyani, M.Si. Lili Chrisnawati, S.Pd. M.Si.

Division of Papers and Review

Coordinator	: Prof. Wasinton Simanjuntak, M.Sc., Ph.D.
Members	: Dr. Junaidi, S.Si., M.Sc. Dr. Asmiati, M.Si. Dr. Bambang Irawan, M.Sc. Dr. rer. nat. Akmal Junaidi, M.Sc.

Division of Program

Coordinator	: Dr. Nurhasanah, M.Si.
Members	: Humairoh Ratu Ayu, S.Pd., M.Si. Anie Rose Irawati, S.T., M.Cs. Dr. Endang Nurcahyani, M.Si. Dr. Khoirin Nisa, S.Si., M.Si. Fauziah Afra Firdaus, A.Md.

Division of Information System and Publicity

Coordinator	: Ardiansyah, M.Kom.
Member	: Rizky Prabowo, S.Kom., M.Kom.
	Iqbal Firdaus, S.Si., M.Si.
	Priyambodo, S.Pd., M.Sc.
	Yohana Tri Utami, S.Kom., M.Kom.

Division of Paper Publication

Coordinator	: Prof. Dr. Sutopo Hadi, M.Sc.
Member	: Dr. Aang Nuryaman, S.Si., M.Si.
	Pandri Ferdias, S.Si., M.Sc.

Division of Equipment

Coordinator	: Tristiyanto, S.Kom., M.I.S., Ph.D.
Member	: Syaiful Bahri, S.Si., M.Si.
	Donni Kis Apriyanto, S.Si., M.Sc.
	Andry Maryanto
	Mustofa Siddiq

Division of Accommodation

Coordinator	: Dr. Yuli Ambarwati, S.Si., M.Si.
Member	Lusi Aprilia, A.Md.
	Umiyati

Division of Documentation

Coordinator	: Ali Suhendra, S.Si.
Member	: Viendira Try Eriza, S.Si.

Antioxidant and Antimicrobial Activity of Endophytyc Fungi Isolated from *Syzygium aqueum* Leaves

Antioxidant and Antimicrobial Activity of Endophytyc Fungi Isolated from *Syzygium aqueum* Leaves

U H Habisukan[1,2], Elfita[3], H Widjajanti[4], A Setiawan[4], A R Kurniawati[2]

[1] Graduate School of Sciences, Faculty of Mathematics and Natural Sciences, University of Sriwijaya, Jl. Padang Selasa,Palembang, South Sumatera,Indonesia
[2] Department of Biology Education, Tarbiyah and Teacher Training Faculty, Islamic State University of Raden Fatah, Jl. Prof. K. H. Zainal Fikri, Palembang, South Sumatera, Indonesia
[3] Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Sriwijaya, Jl. Indralaya-Prabumulih, South Sumatera, Indonesia
[4] Department of Biology, Faculty of Mathematics and Natural Sciences, University of Sriwijaya, Jl. Indralaya-Prabumulih, South Sumatera, Indonesia

email: ummihirash@gmail.com[12], elfita69@gmail.com[3], haryunsri@yahoo.com[3], setiawanarum@gmail.com[4], alfia.kurniawati@gmail.com[2]

Abstract. *Syzygium aqueum* is a widely used medicinal plant species with ethnomedicinal values. Despite the plant, the endophytes are recognized as a rich source of secondary metabolites with potentially useful pharmacological properties. This study was aimed to identify the endophytic fungi from *S.aqueum* leaves and discover their antioxidant and antimicrobial activity. The ethyl acetate extracts of the isolated endophytic fungi were investigated for their antioxidant and antimicrobial activity using 1,1diphenyl-2-picryl hydrazyl (DPPH) method and paper disc diffusion assay, respectively. The antimicrobial activity was evaluated against three pathogen bacteria : *Staphylococcus aureus, Salmonella thypi,* and *Escherichia coli*, and one yeast: *Candida albicans*. Three endophytic fungi were obtained from *S. aqueum* leaves. Based on morphological characteristics, those fungi identified as *Cochliobolus* sp (D22), *Penicillium* sp. (D32), and *Fusarium* sp. (D41). *Penicillium* sp. (code D32) showed significant antioxidant potential activity as an also significant antimicrobial activity with IC50 59,16% and highest zone inhibition against *E. coli* 13.38 ± 0.25 mm. It is worth considering a further investigation of their bioactive secondary metabolites and isolates the bioactive compound for the antioxidant and antimicrobial agents.

Keyword:*Syzygium aqueum*, endophytic fungi, antioxidant, antimicrobial

1. Introduction

Oxidative stress is generally considered the starting point for the onset of several diseases (i.e., tissues, chronic inflammation, cancer) [1]. This oxidative stress could contribute to selecting resistant bacterial strains since reactive oxygen species (ROS) are revealed to be an essential driving force [2,3]. The need for new therapeutic strategies in targeting antioxidant pathways and new antibacterial agents can fight chronic infections [4]. Plant secondary metabolites are commonly used as alternative natural sources of antioxidants, which have industrial usage as food ingredients and dietary supplements [5,6].

Many previous reports indicate that plant extracts have rich antimicrobial and antioxidant properties [7,8]. One of the potential medicinal plants is *Syzygium aqueum*.

Syzygium aqueum is a native plant in Indonesia and Malaysia that belongs to the Myrtaceae family. In Indonesia, *S. aqueum* is well known as water guava. *S. aqueum* have been used as traditional medicine [9]. The leaves have been extensively used to treat, such as antibiotics, anti-inflammation, antioxidant, antityrosinase [10,11,12]. The efficacy of a plant as traditional medicine is related to the bioactive compounds contained in the plant extract. Currently, there is a growing interest to use natural bioactive compounds not just from plant extracts, but also from endophytic fungi[13].

Endophytes fungi live inside the host plant and participate in many biological processes without causing disease or other adverse effects. Endophytic fungi are one of the plant - symbionts that benefit their host's defense from natural enemies [14]. Endophytes fungi are known to be an important resource of various classes of secondary metabolites. Those secondary metabolites can be the same or different from their hosts, and this is very important to increase the adaptability of endophytic fungi and their host plants, such as tolerance to biotic and abiotic stresses [15, 16, 17]. The present study aimed to identify the endophytic fungi from *S.aqueum* leaves and discover their antioxidant and antimicrobial activity.

2. Material and Methods

2.1. Collecting Plant Sample

S. aqueum leaves obtained from OganIlir Regency, South Sumatra, Indonesia. The samples taken were fresh, healthy, and dark green leaves of the 6-9th sequence. The leaves samples were taken using the hand-picking method, and then they were brought to the laboratory for cleaning and sterilization.

2.2. Isolation of Endophytic Fungi

Leaves of S. aqueum were washed with running tap water and then air-dried. Sample fragments were successively surface sterilized by immersing each sample in 70% alcohol for ± 1 minutes, then immersed in 3% (w / v) sodium hypochloride (NaOCl) for 1 minute. After rinsing in sterile distilled water for ± 1 minute. The leaves are cut aseptically by 2 x 2 cm. The surface-sterilized fragments were placed in Petri dishes containing PDA supplemented with chloramphenicol (0.2 g/L) and then incubated at 30 ± 2oC for seven days under dark condition. The fungal growth from leaves segments, the plates were monitored every day. Individual hyphal tips were transferred onto fresh PDA and incubated at 30^{o}C for seven days. The pure cultures were numbered and maintained in PDA slants and kept at 4^{o}C[18].

2.3. Identification of Endophytic Fungi

Macroscopic and microscopic features carried out the characterization of endophytic fungal isolates morphology. Macroscopic characterization is based on the colony growth pattern, texture, marginal, color, and other features. The microscopic characterization using the slide culture method. The endophytic fungal cultures were put onto slides, then added one drop of lactophenol blue reagent. Furthermore, these slides were examined using a light microscope. The morphological characteristics data are then compared with key identification books for fungi [19, 20].

2.4. Extraction and Cultivation

Each endophytic fungal isolate was cultivated. The inoculum fungi (± 106 spores/ml) were inoculated as much as 5% (v / v) into 300 ml PDB medium placed in 1-liter bottles and incubated at room temperature for 4-8 weeks. The color change indicates that secondary metabolite compounds have been formed. As a comparison, 300 ml of PDB media has been provided during cultivation, which is put into a 1-liter bottle. The medium containing secondary metabolites is partitioned in ethyl acetate and evaporated. Concentrated extract facts to the next stage of antioxidant activity to active extracts [20].

2.5. Antimicrobial activity

Antimicrobial activity was investigated using a paper disc diffusion assay. Each sample was dissolved at dimethyl sulfoxide 10% (DMSO; Merck, Germany). The antibacterial activity was evaluated against one gram-positive bacteria: *Staphylococcus aureus*, then two gram-negative bacteria: *Salmonella thypi* and *Escherichia coli*, then one yeast: *Candida albican*. Organisms were maintained on Muller-Hinton agar (MHA) (Tanaka, 1992). The resulting suspension's turbidity was diluted with sterile aquadest to match with a 0.5 McFarland turbidity standard (1 Macfarland is equivalent to approximately 3.0 x 108 CFU/mL). The extract concentration used for this assay was 1000; 500; 250 and 125 µg/ml. Absorbent disks (Watmann° 3.5mm of diameter) were impregnated with 10µl of the solution then placed on the surface of inoculated plates (90mm). Positive control discs of Ciprofloxacin 10µl/ml were excluded from the assay. Diameters of the growth inhibition zone were measured after incubation at 37° C for 24h. All experiments were performed in triplicate.

2.6. Antioxidant activity

Antioxidant activity was determined by using the DPPH method. Fraction obtained from extraction procedure was dissolved to made 1000; 500; 250; 125; 62.5; 31.25 and 15.625 µg/mL concentration. 0.2 mL of each concentration was added by 3.8 mL DPPH 0,5 mM. As a standard antioxidant ascorbic acid was used, and at least three replicates of each concentration were considered. The mixture was homogenized and left in the dark tube for 30 minutes. The absorption was measured using a UV-Vis spectrophotometer at λmax 517 nm. In this test, ascorbic acid was used as a standard positive control and methanol as a negative control. Antioxidant activity can represent by the detention value of DPPH absorption, which was calculated through absorption inhibiting percentage of DPPH and IC50 value [17, 21, 22].

$$\%Inhibition = \frac{Control\ Abs. - sample\ Abs.}{Control\ Abs.} \times 100$$

3. Result and Discussion

3.1. Endophytic Fungi of Syzygium aqueum leaves

Hyphae's appearance around leaf segments indicated the growth of endophytic fungi (EF) isolates. Fungal colonies that showed different morphological properties (shape, color, and size) were further purified. Three endophytic fungi isolates have been isolated from the leaves of *S. aqueum*, as shown in Figure 1 with isolate code D22, D32, and D41. Mycelia from isolated fungi were then observed macroscopically and microscopically on Potato Dextrose Agar (PDA) medium. Furthermore, this morphology was matched with the fungi identification book [e.g., in 19, 20].

EF isolate with code D22 shown in Figure 1A;1D. The colony has a cotton-like surface with white color and a dark reverse color. Microscopically, the hyphae with septic form and conidiophores upright, brown, branched, straight or curved, porous, subellipsoidal, mostly 4-cell, darker brown at 2-cell center, larger middle at peripheral cells, with indistinct hilar at the base. Characteristics of the isolates code D22 compared with the literature [19] closest to *Cochliobolus* sp.

Macroscopic feature of isolate code D32 (shown in Figure 1B) have spread out colony with dark green and white edges. The reverse colony is yellowish white. Microscopically shown in Figure 1E have upright hyaline conidiophores, branched with 2-3 metulas, each metula contains fialid verticillate, each fialid dangle conidia, conidia round green. Isolates code D22 compared with fungi key identification book [19] approaching to *Penicillium*sp

The isolate EF code D41 close identified as *Fusarium* sp. The colony is white with a more yellowish back color, cotton-like surface with a flowering pattern (Figure 1C). Conidiophores are erect, branched, elongate primary and secondary branches, carrying spore masses in the fialidbranches, with stalk and terminal vesicles: cylindrical vesicles. Phialosporous conidia, cylindrical (Figure 1F).

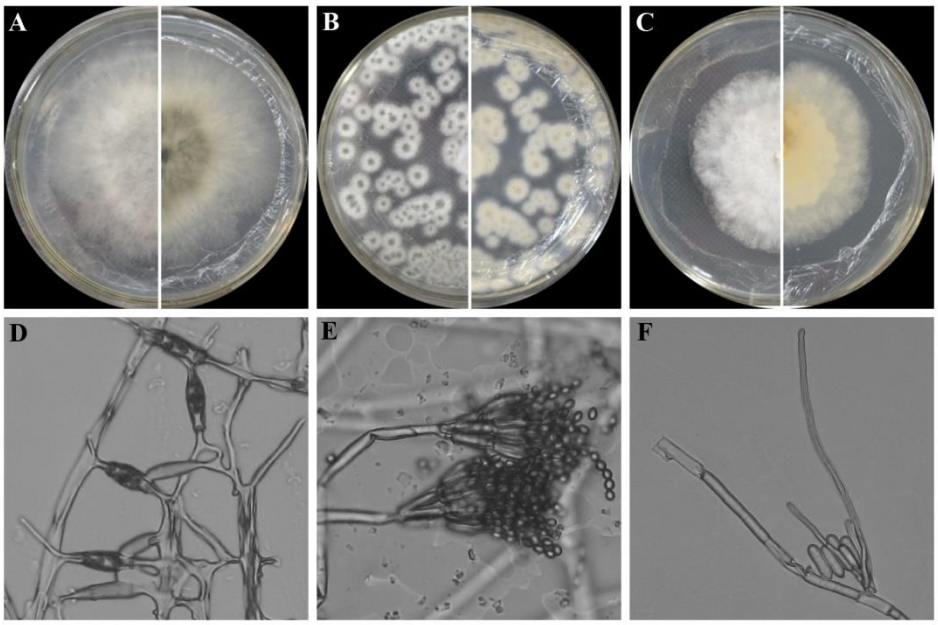


Figure 1. Morphology of Endophytic Fungi Isolates from *S. aqueum* Leaves. (A-C) Macroscopic morphology (D-F), macroscopic morphology of isolate D22, D32 and D41 respectively.

3.2. Antibacterial Activityof Endophytic Fungi Extract

The antimicrobial activity of the endophytic fungi from *S. aqueum* leaves was assessed using the paper disc agar diffusion method by measuring the diameter of growth inhibition zones (IZ) at different concentrations level. The results of antimicrobial activity are presented in Table 1. These results showed that the endophytic fungi extract had inhibition effect on the growth of three bacterial species, but low effect on yeast species (C.albican) with average IZ > 2 mm.

The antimicrobial activity corresponds to the concentration level of the extract, where the mean zone of inhibition decreases when the concentration is low from 1000 to 125 µg/ml (Table 1). *Penicillium*sp (code D32) have strong inhibition to *E. coli* and *S. thypi* with IZ 13,38 mm and 10,33 mm, but moderate inhibition against *S. aureus* with IZ 8,33 mm. The inhibition zone shows with clear zone arounds paper disc (Figure 2). Fusarium sp (code 41) also have strong antibacterial activity against *S. aureus* (IZ 11,27 mm) and E. coli (IZ 12,63 mm). The lowest antimicrobial activity shows i*n Cochliobolus* sp. (Code 22).

Table 1. Antimicrobial Activity of Endophytic Fungi from *S. aqueum* Leaves

Samples	Concentration (µg/ml)	Growth Inhibition Zone diameter [a](mm)			
		E.coli	*S. aureus*	*S.thypi*	*C.albican*
D22	1000	3.67 ± 0.15	4.57 ± 0.21	3.43 ± 0.06	1.80 ± 0.20
	500	5.37 ± 0.15	2.40 ± 0.10	3.10 ± 0.20	1.12 ± 0.06
	250	1.67 ± 0.38	2.07 ± 0.21	2.67 ± 0.06	0.70 ± 0.10
	125	1.37 ± 0.15	1.63 ± 0.15	2.43 ± 0.06	0.87 ± 0.12
D32	1000	13.38 ± 0.25	8.33 ± 0.15	10.33 ± 0.32	1.83 ± 0.06
	500	9.47 ± 0.15	7.83 ± 0.35	9.37 ± 0.21	0.77 ± 0.06
	250	5.30 ± 0.10	3.77 ± 0.06	5.03 ± 0.21	0.33 ± 0.06

	125	2.93 ± 0.32	2.10 ± 0.10	2.87 ± 0.15	0.23 ± 0.06
D41	1000	12.63 ± 0.55	11.27 ± 0.40	4.77 ± 0.61	1.23 ± 0.06
	500	6.60 ± 0.26	6.10 ± 0.46	4.97 ± 0.31	1.00 ± 0.10
	250	5.27 ± 0.83	5.53 ± 0.06	6.70 ± 0.44	1.33 ± 0.06
	125	0.90 ± 0.36	4.27 ± 0.45	3.63 ± 0.45	0.30 ± 0.10
Ciproflox acin	30	31.37 ± 0.51	21.17 ± 0.15	30.17 ± 2.07	0.00 ± 0.00

[a] Inhibition zone exclude the diameter of paper disc (6 mm)

Potential antimicrobial from *S. aqueum*leaves was reported to be able to inhibit the growth of clinical isolates such as *Staphylococcus aureus, Shigella dysenteriae, Escherichia coli, Salmonella thypi,* and *Vibrio cholerae* [23]. The in vitro antibacterial activity of several classes of polyphenols can be caused by direct action against bacteria, viruses and fungi, as well as suppression of microbial virulence factors [24].

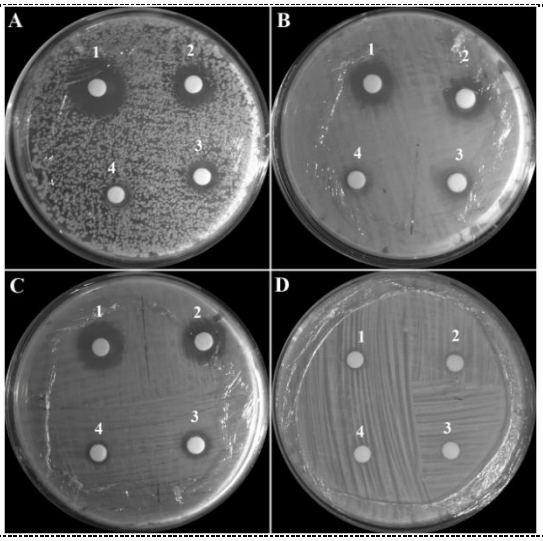


Figure 2. Inhibition zone of Penicillium sp (isolate code D32) against E. coli (A), *S. aureus* (B),*S. thypi* (C) and *C. albicans* (D) with concentration 1000; 500; 250 and 125 µg/ml (shown in number 1; 2; 3; and 4 respectively)

3.3. Antioxidant Activity of Endophytic Fungi from S. aqueum Leaves

Three endophytic Fungi were isolated from *S. aqueum* leaves and were labeled as D22, D32 and D41. Each ofthem had been extracted with ethyl acetate after the fungi isolating compounds from the *S. aqueum* leaves extract. Three fungi extracts were tested for antioxidant activity with DPPH method, which the result of reduction DPPH radicals cause discoloration from purple to yellow pale colour/colourlessand the absorbancewas measure with UV-Vis spectrophotometer at 515 nm [25]. The interaction of antioxidant compound with DPPH based on statement [25] is transfer of electron or hydrogen atom to DPPH radical and convert it to 1-1,diphenyl-2-picrylhydrazil (Figure 3). The IC50value is use as parameter to measure antioxidant activity in this research which the IC50 value of ethyl acetate of endophytic fungi is display in Table 2 .

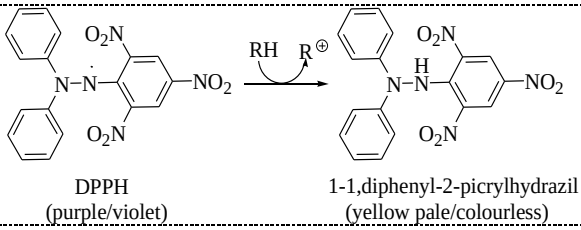


Figure 3. Reaction of DPPH method [26].

These potential of *S. aqueum*supported by the bioactive compound. Phenolic and flavonoid compounds are the dominant compounds in the S.aqueum plant which have strong antioxidant activity [27, 28, 29]. The 5,7-dihidroxy, 6,8-dimethylflavone (demethoximatikinol) compounds isolated from the leaves of *S. aqueum* are known to have antioxidant activity [30].

Table 2.IC50 values of ethyl acetate extracts of endhophytic fungi isolated from *S. aqueum*leaves on antioxidant activity test using DPPH method.

Test sample	IC_{50}(μg/mL)
Ethyl acetate D22	168.14
Ethyl acetate D32	59.16
Ethyl acetate D41	384.05
Ascorbic acid[a]	22.23

IC_{50} values atTable 2. Confirm that the extract endhophytic fungi in ethyl acetate D32 have lowest value than other extract fungi. Fadhillah*et al*. [31] said that the lower IC_{50} value corresponds with a higher antioxidant ability. From that statement we conclude that D32 is the greatest activity antioxidant and more active to scavenging free radical than others. Endhophytic ethyl acetate D32 have a great activity because they have more secondary metabolites compound with many hydroxyl group such as polyphenols and flavonoidwhich they can be hydrogen-donating property of their hydroxyl group [32]. The 5,7-dihidroxy, 6,8-dimethylflavone (demethoximatikinol) compounds isolated from the leaves of *S. aqueum* are known to have antioxidant activity [30].

4. Conclusion

This study has shown that endophytic fungi isolated from *S. aqueum* leaves obtained isolate and identified as *Cochliobolus*sp (D22), *Penicillium* sp. (D32) and *Fusarium* sp. (D41). All endophytic fungi have antioxidant and antimicrobial activity. *Penicillium* sp. (code D32) showed significant antioxidant potential activity as also significant antimicrobial activity with IC50 59,16% and highest zone inhibition against *E. coli* 13.38 ± 0.25mm . It is worth considering further investigation of their bioactive secondary metabolites and isolate the bioactive compound for antioxidant and antimicrobial agent.

5. References

[1] Valko M, Leibfritz D, Moncol J, Cronin M T, Mazur M, and Telser, J 2007 Free radicals and antioxidants in normal physiological functions and human disease. *The International Journal of Biochemistry & Cell Biology*, **39**(1), 44-84.

[2] Aragon M, O H Martinez, Morales F, Isiordia-Espinoza, M A Contreras, D L Morales, J. R. Z., and Gonzalez-Rivera M L 2017 Bacterial resistance and failure of clinical cure could be

produced by oxidative stress in patients with diabetes or cardiovascular diseases during fluoroquinolone therapy. *Medical Hypotheses*. **103**, 32-34.
[3] Grant S S and Hung D T 2013 Persistent bacterial infections, antibiotic tolerance, and the oxidative stress response. *Virulence*. **4**(4), 273-283.
[4] Martelli G and Giacomini D 2018 Antibacterial and antioxidant activities for natural and synthetic dual-active compounds. *European Journal of Medicinal Chemistry*. **158**, 91-105.
[5] Tiwari B K, Valdramidis V P, O'Donnell C P, Muthukumarappan K, Bourke P and Cullen P J 2009 Application of natural antimicrobials for food preservation. *Journal of Agricultural And Food Chemistry*. **57**(14), 5987-6000.
[6] Voon H C, Bhat R and Rusul G 2012 Flower extracts and their essential oils as potential antimicrobial agents for food uses and pharmaceutical applications. *Comprehensive Reviews in Food Science and Food Safety*. **11**(1), 34-55.
[7] Shyu Y S, Lin J T, Chang Y T, Chiang C J and Yang D J 2009 Evaluation of antioxidant ability of ethanolic extract from dill (*Anethumgraveolens* L.) flower. *Food Chemistry*. **115**(2), 515-521.
[8] Jo Y H, Seo G U, Yuk H G and Lee S C 2012 Antioxidant and tyrosinase inhibitory activities of methanol extracts from *Magnolia denudata* and *Magnolia denudata* var. purpurascens flowers. *Food Research International*. **47**(2), 197-200.
[9] Cock I E and Cheesman M 2018 Plants of the genus Syzygium (Myrtaceae): A review on ethnobotany, medicinal properties and phytochemistry. *Bioactive Compounds of Medicinal Plants: Properties and Potential for Human Health; Goyal, MR, Ayeleso, AO,* Eds, 35-84.
[10] Panggabean G 1992 *Syzygiumaqueum, SyzygiummalaccenseandSyzygiumsamarangense*: *Edible Fruits and Nuts, 2nd ed* (Indonesia: Prosea Foundation Bogor) pp 292–294.
[11] Osman H, Rahim A A, Isa N M and Bakhir N M 2009 Antioxidant activity and phenolic content of Paederiafoetida and Syzygiumaqueum. *Molecules*. **14**(3), 970-978.
[12] Palanisamy U D, Ling L T, Manaharan T, Sivapalan V, Subramaniam T, Helme M H and Masilamani T 2011 Standardized extract of *Syzygiumaqueum*: a safe cosmetic ingredient. *International Journal of Cosmetic Science.* **33**(3), 269-275.
[13] Elfita E, Munawar M, Muharni M, and Suprayetno S 2013 New pyran of an endophytic fungus *Fusarium* sp. isolated from the leaves of brotowali (*Tinasporacrispa*). *Indo. J. Chem*. **13** (3), 209 – 215.
[14] Faeth S H and Fagan W F 2002 Fungal endophytes: common host plant symbionts but uncommon mutualists. *Integrative and Comparative Biology.* **42**(2), 360-368.
[15] Jumpathong J, Abdalla, M A, Lumyong S and Laatsch H 2010 Stempholgalactoside, a new stemphol derivative isolated from the tropical endophytic fungus Gaeumannomycesamomi. *Natural Product Communications*. **5**(4), 1934578X1000500415.
[16] Elfita E, Munawar M, MuharniM, andSudrajat, M A 2014 Identification of new lactone derivatives isolated from *Trichoderma* sp., an endophtic fungus of brotowali (*Tinasporacrispa*)., *Hayati Journal of Biosciences*. **21**(1), 15-20.
[17] Budiono B, Elfita E, Muharni M, Yohandini H and Widjajanti H 2019 Antioxidant activity of *Syzygiumsamarangense* L. and their endophytic fungi. *Molekul*. **14**(1), 48-55.
[18] Elfita E, Mardiyanto M, Fitrya F, Larasati J, Julinar J, Widjajanti H, and Muharni M 2019 Antibacterial activity of Cordyline fruticosa leaf extracts and its endophytic fungi extracts. *Biodiversitas.***20**(12), 3804-3812.
[19] Watanabe T 2002 *Pictorial Atlas of Soil and Seed Fungi : Morphologies of Cultured Fungi and Key to Species 2nd ed* (Florida: CRC Press LLC).
[20] Pitt J I and A D Hocking 2009 *Fungi and Food Spoilage* (New York: Springer Science + Business Media)
[21] Muharni M, Elfita E, Yohandini H, Julinar J, Yasrina Y, and Miranti M 2019 Chemical constituents from stem bark of *Flacourtiarukam*Zoll. & Mor. and their antioxidant activities. *Sains Malaysiana*. **48**, 1899–1906.
[22] Elfita E, Muharni M, Munawar M and Rizki R 2012 Isolation of antioxidant compound from endophytic fungi *Acremonium* sp. from the twigs of Kandis Gajah. *Makara Seri Sains.* **16**(1), 46-50.

[23] Hariyati T, Soelistya D, Jekti D S D and Andayani Y 2015 Pengaruhekstraketanoldaunjambu air (*Syzygiumaqueum*) terhadapbakteriisolatklinis. *Journal Penelitian Pendidikan IPA*. **1**(2), 31–38.
[24] Daglia M 2012 Polyphenols as antimicrobial agents. *Current Opinion In Biotechnology*. **23**(2), 174-181.
[25] Fitriana W D, Ersam T, Shimizu K and Fatmawati S 2016 Antioxidant activity of *Moringa oleifera* extract. *Indonesia J. Chem*. **16**(3), 297-301.
[26] Nithiya P and Khan F R N 2014 Antioxidant studies of 3-arylidene-4-4-piperidones by DPPH assay. *Journal of Taibah University of Science*. 1-13.
[27] Tehrani M, Sharif Hossain A B M and Nasrulhaq-Boyce A 2011 Postharvest physico-chemical and mechanical changes in'Jambu Air (*Syzygiumaqueum* Alston) fruits. *Australian Journal of Crop Science*. **5**(1), 32.
[28] Palanisamy U D, Ling L T, Manaharan T and Appleton D 2011 Rapid isolation of geraniin from Nepheliumlappaceum rind waste and its anti-hyperglycemic activity. *Food Chemistry*. **127**, 21–27.
[29] Marinova D, Ribarova F and Atanassova M 2005 Total phenolics and total flavonoids in Bulgarian fruits and vegetables. *Journal of The University of Chemical Technology and Metallurgy*. **40**(3), 255-260.
[30] Insanu M, Ramadhania Z M, Halim E N, Hartati R and Wirasutisna K R 2018 Isolation of 5, 7-dihydroxy, 6, 8-dimethyl flavanone from *Syzygiumaqueum* with its antioxidant and xanthine oxidase inhibitor activities. *Pharmacognosy research.***10**(1), 60.
[31] Fadhillah F, Elfita E, Muharni M, Yohandini H, and Widjajanti H 2019 Chemical compound isolated from antioxidant active extract of endophytic fungus *Cladosporium tenuissimumin* in *Swieteniamahagoni* leaf stalks. *Biodiversitas*. **20**(9), 2645-2650.
[32] Mahdi-Pour B, Jothy S L, Latha L Y, Chen Y and Sasidharan S 2012 Antioxidant activity of methanol extract of different parts of *Lantana camara*. *Asian Pac J Trop Biomed*. **2**(12), 960-965

Acknowledgments
The authors are thankful to Sriwijaya University, who have funded this research.

Journal of Physics: Conference Series

COUNTRY

United Kingdom

Universities and research institutions in United Kingdom

SUBJECT AREA AND CATEGORY

Physics and Astronomy
Physics and Astronomy (miscellaneous)

PUBLISHER

IOP Publishing Ltd.

H-INDEX

85

PUBLICATION TYPE

Conferences and Proceedings

ISSN

17426588, 17426596

COVERAGE

2005-2021

INFORMATION

Homepage

How to publish in this journal

jpcs@ioppublishing.org

SCOPE

The open access Journal of Physics: Conference Series (JPCS) provides a fast, versatile and cost-effective proceedings publication service.

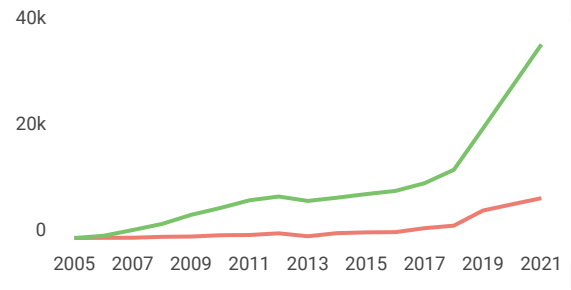
Join the conversation about this journal

Quartiles

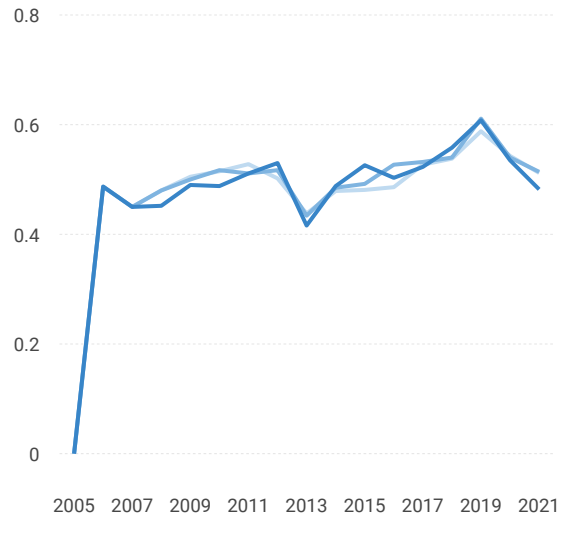
SJR

Total Documents

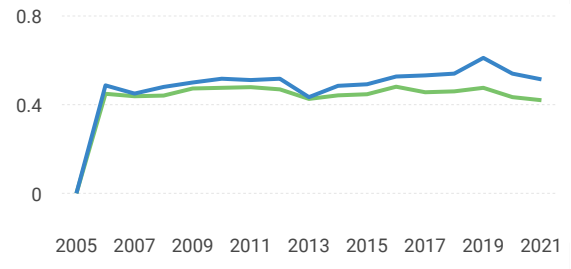
Total Cites Self-Cites



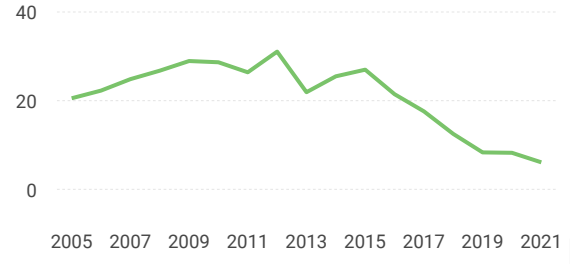
Citations per document



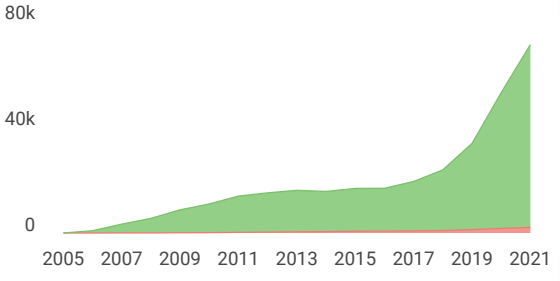
External Cites per Doc Cites per Doc



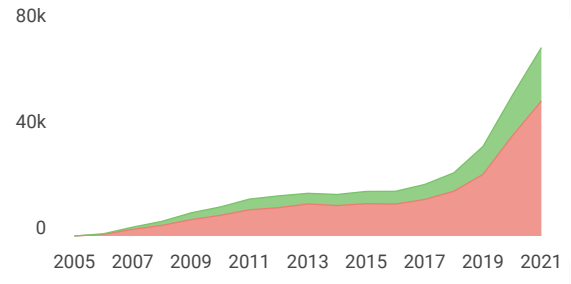
% International Collaboration



Citable documents Non-citable documents



Cited documents Uncited documents



Journal of Physics: Conference Series

Not yet assigned quartile

SJR 2021
0.21

powered by scimagojr.com

← Show this widget in your own website

Just copy the code below and paste within your html code:

```
<a href="https://www.scimag
```

SCImago Graphica

Explore, visually communicate and make sense of data with our **new data visualization tool**.