Biointerface Research in Applied Chemistry
Platinum Open Access Journal (ISSN: 2069-5837)

Article
Volume 12, Issue 6, 2022, 7584 - 7595
https://doi.org/10.33263/BRIAC126.75847595

Secondary Metabolite and Antioxidant Activity of Endophytic Fungi Isolated from *Syzygium aqueum* Leaves Stalk

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Scopus Author ID 55532411800
Received: 23.10.2021; Revised: 19.11.2021; Accepted: 21.11.2021; Published: 25.11.2021

Abstract: Medicinal plants are a promising host for endophytic fungi to produce secondary metabolites relevant for food and health. In this study, we evaluate antioxidant activity to determine the species of endophytic fungi isolated from *Syzygium aqueum*. Endophytic fungi were isolated from leaf stalks through surface sterilization. The fungi's isolate was identified with morphology and molecular analysis (ITS-rDNA). The pure fungi strain was cultivated on PDB media for 4 weeks, and metabolites were extracted using ethyl acetate. The crude extract of endophytic fungi was examined for its antioxidant activity using 2,2-diphenyl-1-picrylhydrazyl (DPPH). The pure compound was isolated using the chromatography method, and its structure was determined using spectroscopy analysis involving NMR 1D and 2D. In total, four obtained endophytic fungi were isolated from leaf stalks. The fungi with good antioxidant activity (IC_{50} 59.2 µg/mL) were identified as *Beltrania rhombica*. The characteristics of the pure compound are white-yellowish powder with IC_{50} 44.2 µg/mL. Based on spectroscopy analysis, the pure compound was identified as 3-(hydroxyl(3,4,5-trihydroxylphenyl)methyl)-3,4-dihydro-2H-pyran-4,5,6-triol.

Keywords: secondary metabolite; endophytic fungi; *Beltrania rhombica;* antioxidant; *Syzygium aqueum.*

1. Introduction

Antioxidants play an important role in hindering or preventing degenerative diseases caused by free radicals [1,2]. At the normal limit, the body has natural defenses to help it overcome the rise of free radicals [3,4]. Superoxide compounds can be pressed by antioxidants [5]. Antioxidants have become an interesting topic nowadays because of their ability to protect the human body from various diseases caused by free radical reactions and reduce oxidative stress [6]. Antioxidants are compounds that are widely used as industrial resources in the food and health fields. The use of synthetic antioxidants to protect against free radical damage has been reported to cause harmful effects [7,8]. Therefore, it is necessary to find a safer source of

antioxidants from natural ingredients, such as jambu air (*Syzygium aqueum*), which has been reported to contain active antioxidant compounds, especially in their leaves [9].

In various parts of the world, including Indonesia, *Syzygium aqueum* has been used as medicine for its antioxidant activity [10,11]. The most abundant chemical compounds in *Syzygium aqueum* are flavonoids and phenols, which are found in almost all parts, such as leaves, flowers, fruit, seeds, roots, and bark. They have been reported to have antioxidant, antibacterial, antiviral, anti-inflammatory, anti-allergic, and antidiabetic activities and play a role in cancer prevention [12,13]. Currently, the search for natural bioactive is not only from plants but also from their endophytic fungi.

Endophytic fungi are microscopic living organisms that live in plant tissues (leaves, fruit, seeds, stems, and roots) at certain periods and form colonies without harming their hosts, even maintaining mutually beneficial relationships [14,7]. Endophytic fungi have been identified as a source of secondary metabolites, such as antioxidants, antibiotics, antivirals, antiprotozoal, antidiabetic, and anticancer agents. These compounds include alkaloids, terpenoids, steroids, isocoumarin derivatives, lactones, quinones, flavonoids, phenols, indole derivatives, lignins, tannins, anthraquinones, xanthones, phenylpropanoids, phenolic acids, and peptide peptides [15-17]. Natural products derived from endophytic fungi are considered as one of the most relevant sources of discovery and molecular diversity for new drugs. This is due to the large diversity of endophytic fungi species that can produce secondary metabolites with biological activity, plus the ease of cultivating endophytic fungi in large quantities and in a short time. [18-20]. Therefore, research on endophytic fungi that produce antioxidant compounds needs to be carried out on the host plant *S. aqueum*.

2. Materials and Methods

2.1. Plant material.

The plant material is *Syzygium aqueum* leaf stalk taken in the Sriwijaya University area, Indralaya, Ogan Ilir, South Sumatera, and identified at the Biosystematics Laboratory, Biology, FMIPA, Sriwijaya University, with certificate number: 329//UN9.1.7/4/EP/2020.

2.2. Isolation and identification of endophytic fungi.

The leaf stalks of *S. aqueum* were washed with running tap water and then dried. Fragments of it were surface-sterilized by immersing each sample in 70% alcohol for 1 min, then in 3% sodium hypochlorite (NaOCl) for 1 min. After rinsing with sterile distilled water for 1 min, the outer tissue was removed with a sterile scalpel. Small pieces of leave stalks were placed in a Petri dish containing PDA media supplemented with chloramphenicol (0.2 g/L) then incubated for 7 d at 30 ± 2^{o}C. All experiments were carried out in triplicate. Fungal growth from the leaf stalk segments was monitored every day. The individual hyphae tips were transferred to fresh PDA and incubated at 30^{o}C for 7 d. Pure cultures were numbered and maintained in a PDA slope and stored at 4^{o}C.

Identification of endophytic fungi through molecular analysis followed the procedure described [21], which was based on partial genetic analysis at the Internal Transcribed Spacer (ITS) ribosomal DNA of fungi. The phylogenetic tree construction was carried out using several applications: Clustal W, SEQBOOT, DNA dist, Neighbor, CONSENSE, and FigTree.

2.3. Cultivation and extraction.

Endophytic fungal cultures were prepared on PDB media by placing 6 cm diameter agar blocks of pure culture into five 1 L Erlenmeyer flasks containing 300 mL of medium each. The flasks were incubated under static conditions at room temperature for 4 weeks. The culture was filtered through filter paper to separate the mycelium. The liquid broth was collected and extracted with ethyl acetate (1:1) in a separating funnel with vigorous shaking for 1 hour, then filtered. Extraction was carried out with two repetitions. The ethyl acetate extract was evaporated with a rotary evaporator to produce a concentrated extract [3,22,23].

2.4. Antioxidant activity assay.

The antioxidant activity assay used the DPPH method [24]. A 0.05 mM solution of DPPH in methanol was prepared, and 3.8 mL of this solution was mixed with 0.2 ml of the test sample in methanol at a series concentration. 200, 100, 50, 25, 12.5, 6.75, and 0 µg/mL were prepared. The reaction mixture was thoroughly vortexed and left in the dark for 30 min. The absorbance of the mixture was measured spectrophotometrically (Shimadzu, Uv-1900) at a wavelength of 517 nm. Gallic acid is used as a standard antioxidant. The percentage of DPPH radical scavenging activity was calculated using the formula:

$$\% \text{ Inhibition} = \frac{\text{Control Absorbance-Sample Absorbance}}{\text{Control Absorbance}} \times 100\%$$

2.5. Isolation and identification of secondary metabolites.

The active extract (selected by IC_{50} highest value) was analyzed by thin-layer chromatography (TLC) of silica gel G-60 F 254 using solvents with various eluents to see the staining pattern. Column chromatography extract used a stationary phase such as silica gel. Samples that have been prepared by pre-absorption are fed into the chromatographic column evenly and eluted with a gradient system. The eluate was collected in vials every 10 ml, and each had a chromatographed thin layer to be grouped into column fractions based on the staining pattern. The visible stains were UV lamp at 254 nm and cerium sulfate spray reagent. Fractions containing potential compounds in column chromatography were used to obtain pure compounds. Identification of the chemical structure was carried out by spectroscopic analysis, which included ^{1}H-NMR, ^{13}C-NMR, DEPT 135, HMQC, HMBC, and COSY (Agilent DD2 500 MHz (^{1}H) dan 125 MHZ (^{13}C)).

3. Results and Discussion

The isolation of endophytic fungi from leaf stalks of *S. aqueum* obtained four isolates, three of which were the same as endophytic fungi obtained from leaves: *Cochliobolus* sp., *Penicillium* sp., and *Fusarium* sp. The difference was one fungus labeled B52. The results of the molecular identification of Sequence Assembly 572 bp are

CGTAGGTGAACCTGCGGAGGGATCATTACAGAGTTTTCTAAACTCCCAAACCCAT
GTGAACTTACCATTGTTGCCTCGGCGGAGCCTACCCTGTAGCTACCCTATAAGGT
GGTACCCTGTAGCGCCCCGCCGGTGGATTTTCAAACTCTTGTTATTTATAGTAATC
TGAGAGTCTTATTTTAAATAAGTCAAAACTTTCAACAACGGATCTCTTGGCTCTG
GCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCA

GTGAATCATCGAATCTTTGAACGCACATTGCGCCCATTAGTATTCTAGTGGGCAT
GCCTGTTCGAGGTCATTTCAACCCTTAAGCCTAGCTTAGTGTTGGGAGTCTACGA
GTGGGCCACGTTACCCTGTAGCGTGGTTACCCTGTAGTTCCTGAAAATCAACGGC
GGATTTACAGTATCCTCTGAGCGTAGTAATTCTTTATCTCGCTTCTGTTTAGGTGC
TGTGACTTCGGCCGCTAAACCCCACAATTTTTTTGTGGTTGACCTCGGATCAGGT
AGGAATACCCGCTGAACTTAAGCAT

The strain B52 has accession number OK376219. The results of the B52 endophytic fungal phylogeny tree construction are shown in Figure 1. The B52 phylogenetic tree showed that the isolate sequence was in the same branch as *Beltrania rhombica*. Phylogenetic analysis indicated that isolate B52 was *Beltrania rhombica*. It was carried out using Clustal W, Seqboot, DNA dist, Neighbor, Consense, and FigTree.

The endophytic fungus isolate culture B52 in 5 Erlenmeyer flasks containing 300 mL PDB medium was incubated for 4 weeks at room temperature and dark conditions. Extraction of endophytic fungi using ethyl acetate solvent, after evaporation, produces a concentrated extract of ethyl acetate 6.2 g. The antioxidant activity test gave IC_{50} a value of 59.2 µg/mL, while the IC_{50} values for the other three endophytic fungi were 98.26 g/mL (*Cochliobolus* sp.), 92.3 g/mL (*Penicillium* sp.), and 64.33 g/mL (*Fusarium* sp.).

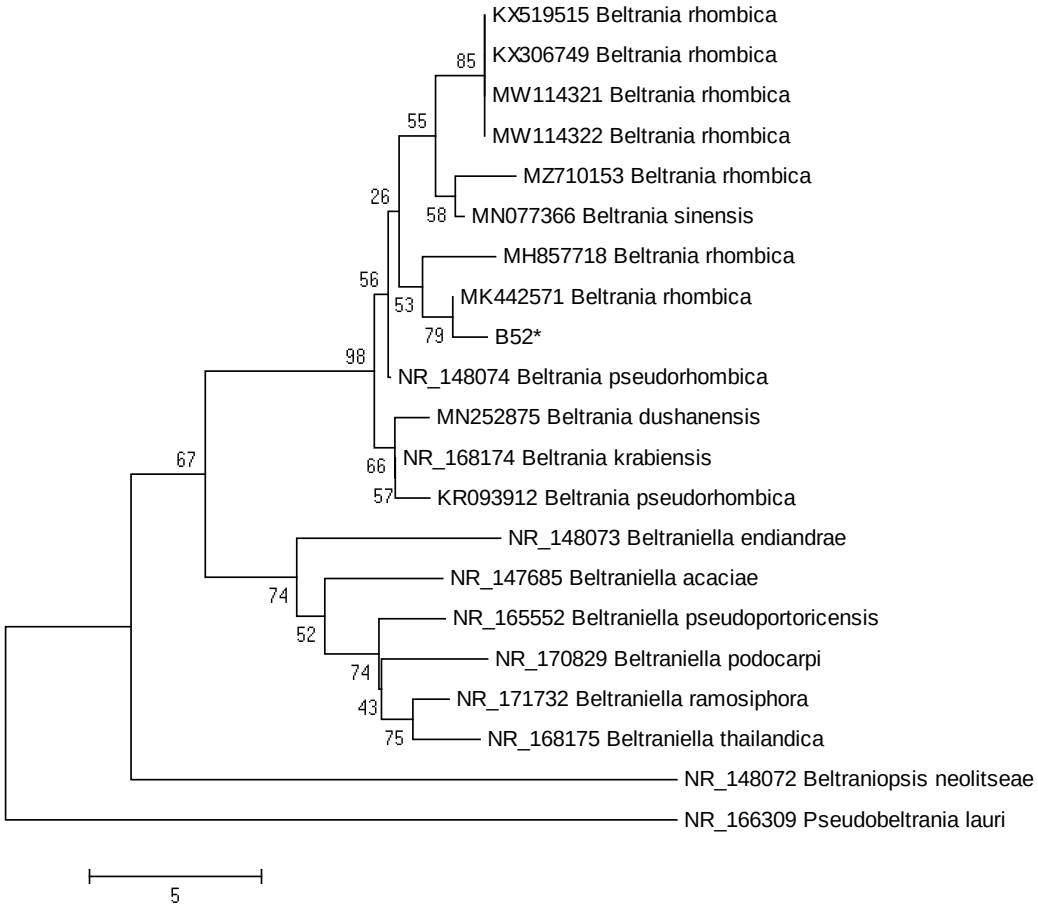

Figure 1. Phylogenetic tree of the endophytic fungal B52 was carryout using applications: Clustal W, Seqboot, DNA dist, Neighbor, Consense, and Fig Tree.

The results of the TLC analysis of the concentrated ethyl acetate extract showed that there was a major purple stain at Rf 0.55, with n-hexane:ethyl acetate as the eluent (2:8). Therefore, the eluent to be used in column chromatography can use a stepwise system. Ethyl acetate extract 2 g was pre-absorbed with silica gel as stationary phase 70–230 nesh in a ratio

(1:1). Separation of pure compounds was carried out by column chromatography, which was eluted with a mixture of n-hexane and ethyl acetate (10:0–0:10), and a mixture of ethyl acetate and methanol (9:1). The eluate was collected every 10 mL in the vial until 65 vials were obtained. Based on TLC analysis, four subfractions (F1–F4) were obtained. Subfraction F3 showed major stains and continued purification by column chromatography until pure compound (compound 1) was obtained in the form of a yellowish-white solid (44 mg). The antioxidant activity test gave an IC_{50} value of 44.2 µg/mL.

3.1. Determination of chemical structure.

The ^{1}H-NMR spectrum of compound 1 (Fig. 2) shows the presence of 11 proton signals, including two doublet signals, in the aromatic chemical shift region, namely, at δ_H 7.70 and 8.19 ppm, each of which has a double integration and coupling constant of J=8.5 Hz. This indicates that compound 1 has a para-substituted aromatic structure, with two pairs of equivalent protons. Five other signals appear in the sp3 proton region, namely, two oxygenated methine signals, namely, at δ_H 5.33 (1H, m); 6.37 (1H, s); and two oxygenated methylene proton signals that appear at different chemical shifts, namely, at δ_H 3.70 (1H, m) and 3.79 ppm (1H, m), while the other sp3 signal is proton methine at δ_H 4.16 ppm (1H, m). In addition, there are four proton signals that, after being confirmed with the HMQC spectrum (Fig. 4), turn out not to be bound to the carbon atom. This indicates that these signals are proton signals bound to heteroatoms, such as hydroxyl protons.

The ^{13}C-NMR spectrum of compound 1 (Fig. 3) showed 10 signals: four sp3 carbon signals and six other signals that appeared in the sp2 carbon region. After confirmation with DEPT 135 spectrum, it was found that the four sp3 carbon signals were two oxygenated methine carbon signals (δ_C 71.2 and 67.5 ppm), one oxygenated methylene carbon signal (δ_C 62.2 ppm), and one tertiary carbon signal (δ_C 58.0 ppm). Two high-intensity signals in the sp2 carbon region indicate that compound 1 has two pairs of equivalent aromatic carbons (δ_C 123.9 and 128.2 ppm). Four other sp2 carbon signals were at δ_C 148.1, 151.5, 164.4, and 164.5 ppm, respectively, after being confirmed with DEPT 135 spectrum. It is known that the four carbons are quaternary.

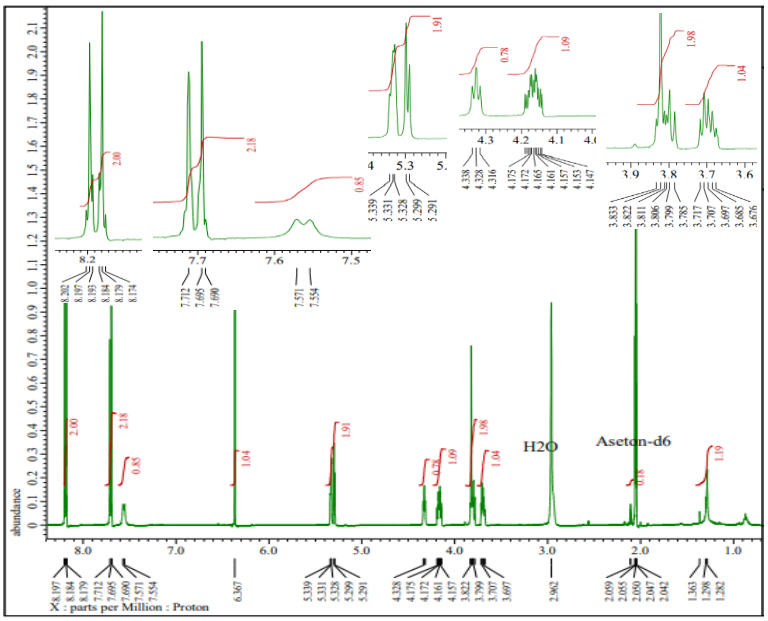

Figure 2. The ^{1}H-NMR spectra of compound 1.

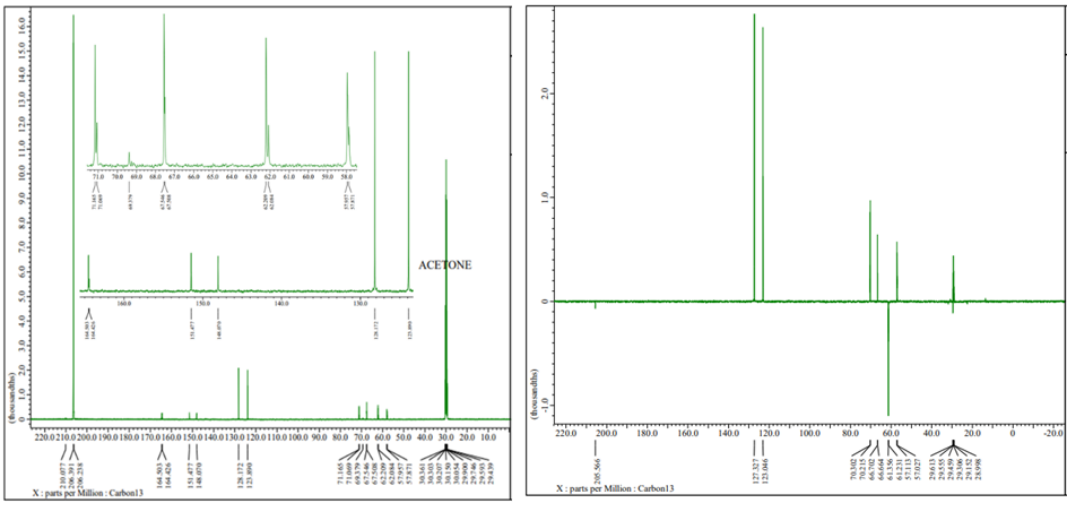

Figure 3. The ^{13}C-NMR (A) DEPT 135 (B) spectra of compound 1.

The analysis of the proton and carbon NMR spectra is confirmed by the data on the HMQC spectrum (Fig. 4) the ^{1}H-^{13}C correlation through one bond. The HMQC spectrum showed six correlations consisting of two ^{1}H-^{13}C correlations on the aromatic ring, three correlations on oxygenated ^{1}H-^{13}C, and one ^{1}H-^{13}C correlation for methine. Thus, the 11 signals that appear on proton NMR consist of seven signals bound to the carbon atom (two non-equivalent methylene proton signals) and four protons bound to the heteroatom.

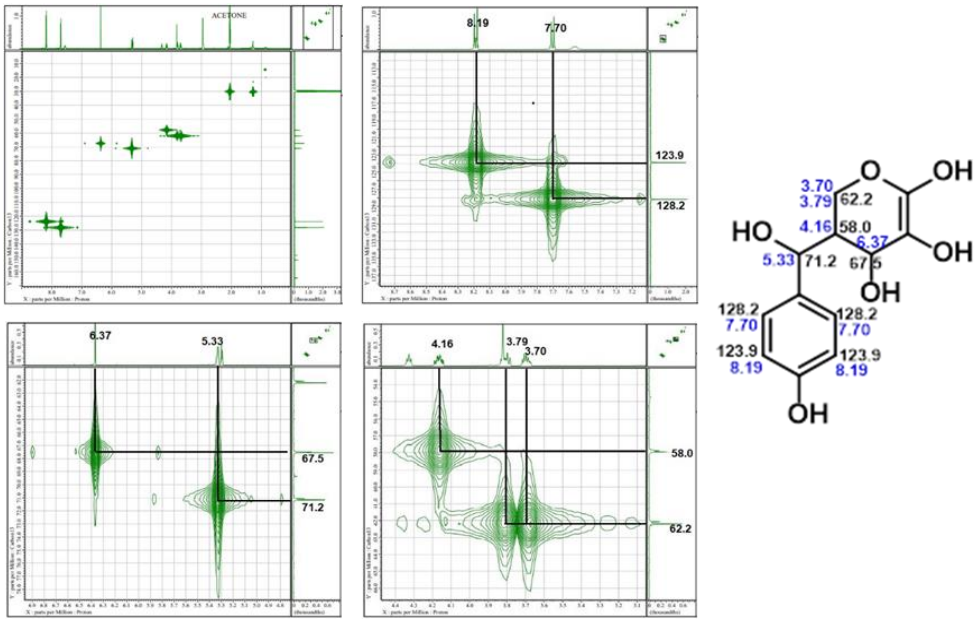

Figure 4. The HMQC spectra of compound 1.

The HMBC spectrum (Fig. 5) showed a ^{1}H-^{13}C correlation through two or three bonds. The aromatic proton signal at H 8.19 ppm showed three correlations: a correlation each with ortho aromatic carbon (δ_C 128.2 ppm), its equivalent aromatic carbon (δ_C 123.9 ppm), and quaternary aromatic carbon (δ_C 148.1 ppm). Another aromatic proton at H 7.70 ppm has four correlations: a correlation each with ortho aromatic carbon (δ_C 123.9 ppm), its equivalent aromatic carbon (δ_C 128.2 ppm), quaternary aromatic carbon (δ_C 148.1 ppm), and oxygenated side-chain carbon (δ_C) 71.2 ppm.

Furthermore, oxygenated methine protons at δ_H 5.33 ppm have three ^{1}H-^{13}C correlations via three bonds: aromatic carbon (δ_C 128.2 ppm) and oxygenated carbon (δ_C 58.0

and 62.2 ppm). The correlation indicates that the oxygenated methine group at δ_H 5.33 ppm is directly attached to the aromatic ring and is para-substituted with a hydroxyl group. The oxygenated methylene proton (δ_H A= 3.70; B= 3.79 ppm) had two ^{1}H-^{13}C correlations with two bonds with oxygenated methine carbon at δ_C 58.0 ppm and a triple correlation with oxygenated methine carbon at δ_C 71.2 ppm. The 1D and 2D NMR spectral data for compound 1 are shown in Table 1.

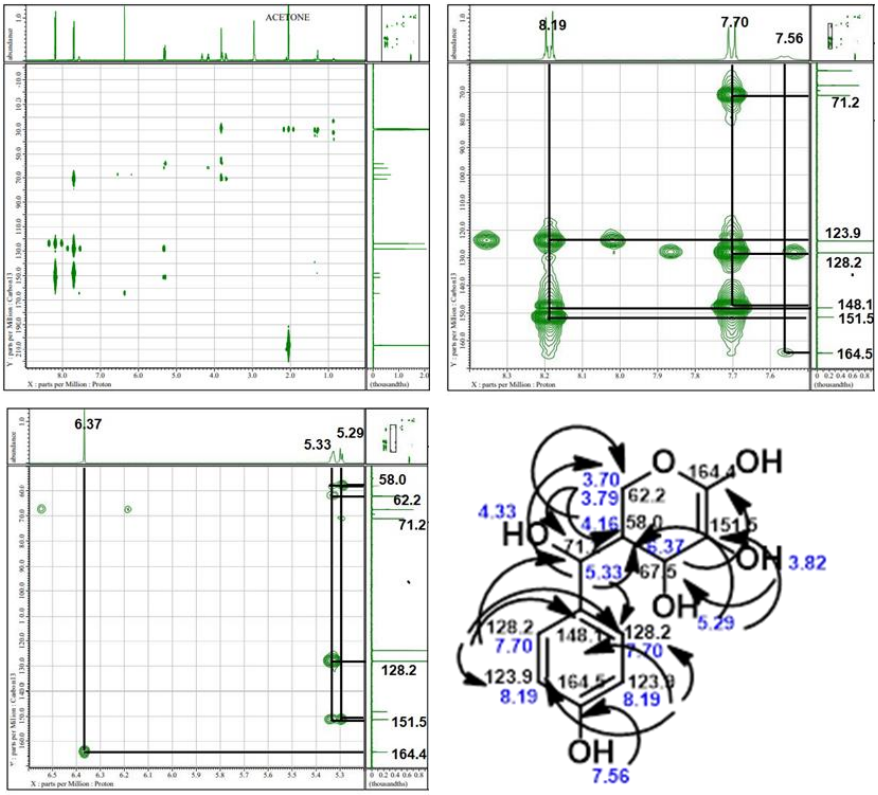

Figure 5. The HMBC spectra of compound 1.

Table 1. The NMR data of Compound 1.

No. C	δ_C ppm	DEPT 135	δ_H ppm (ΣH. multiplicity. *J* (Hz))	HMBC	COSY
2	62.2	CH_2	A= 3.70 (1H, m) B= 3.79 (1H, m)	58.0; 71.2 58.0; 71.2	4.16 4.16
3	58.0	CH	4.16 (1H, m)	62.2	5.33; 3.70; 3.79
4	67.5	CH	6.37 (1H, s)	164.4	-
5	151.5	C	-	-	-
6	164.4	C	-	-	-
1’	148.1	C	-	-	-
2’	128.2	CH	7.70 (1H, d, J=8.5)	71.2; 128.2; 148.1; 123.9	8.19
3’	123.9	CH	8.19 (1H, d, J=8.5)	123.9; 148.1; 128.2	7.70
4’	164.5	C	-	-	-
5’	123.9	CH	8.19 (1H, d, J=8.5)	123.9; 148.1; 128.2	7.70
6’	128.2	CH	7.70 (1H, d, J=8.5)	71.2; 128.2; 148.1; 123.9	8.19
7’	71.2	CH	5.33 (1H, m)	128.2; 58.0; 62.2	4.16; 7.70
OH	-		3.82	67.5	-
OH	-		4.33	-	-
OH	-		5.29	58.0; 151.5	-
OH	-		7.56	164.5	-

The COSY spectrum in Figure 6 appears to show that the aromatic proton at δ_H 7.70 ppm has a ^{1}H-^{1}H correlation through three bonds with an aromatic proton δ_H 8.19 ppm and a ^{1}H-^{1}H correlation through more than three bonds with the oxygenated sp3 methine proton at δ_H 5.33 ppm bound to an aromatic ring. The methine proton at δ_H 4.16 ppm, part of the side chain, has a ^{1}H-^{1}H correlation through three bonds with the oxygenated sp3 methine proton (δ_H

5.33 ppm) and oxygenated methylene proton (δ_H 3.70 and 3.79 ppm). This ^{1}H-^{1}H correlation of the COSY spectrum indicates that the two aromatic equivalent protons are in the ortho position. This strengthens the proposed structure: compound 1 is a benzene ring directly bonded to the oxygenated methine carbon at the para position with a hydroxyl group.

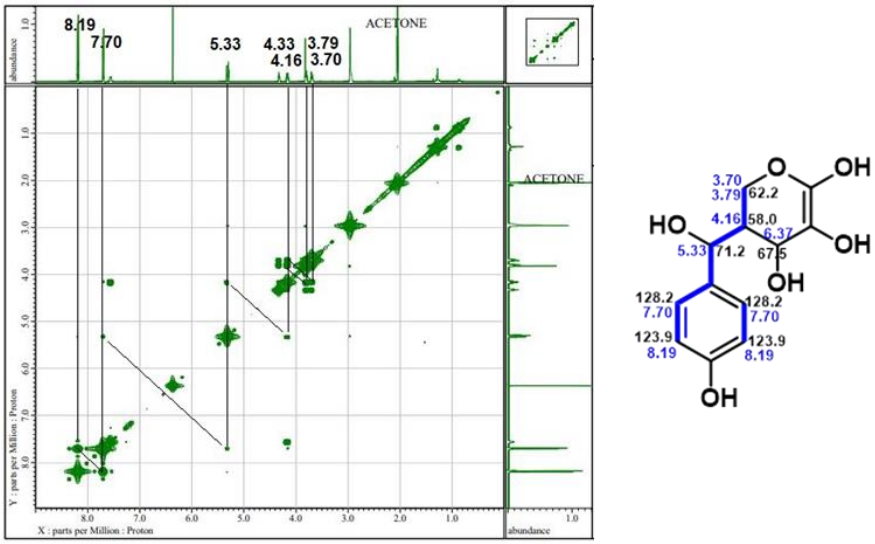

Figure 6. The COSY spectra of compound 1.

Based on the spectrum analysis of ^{1}H-NMR, ^{13}C-NMR, DEPT 135, HMQC, HMBC, and COSY, it can be explained that compound 1 has a para-substituted frame on the benzene ring. It was identified from the presence of two aromatic proton signals with the integration of two protons. The multiplicity of the two signals is doublet with the same coupling constant (J = 8.5 Hz). This indicates that the two protons bound to the aromatics are in the ortho position, and the two substituents are bound to para (Fig. 2). One of the substituents is a hydroxyl group, which is characterized by a chemical shift value of oxyaryl carbon at δ_C 164.5 ppm, while the second substituent is carbon methine sp3 (δ_C 71.2 ppm), which has a hydroxyl group and a pyran-4,5,6-triol group (Fig. 3). Furthermore, the three hydroxyl groups attached to the pyran ring can be validated from the HMBC spectrum in the presence of a ^{1}H-^{13}C correlation through two or three bonds. In addition, the binding of the pyran group to C methine (C-7') can be identified from the COSY spectrum (Fig. 6) through the ^{1}H-^{1}H three-bond correlation.

The proton at δ_H 6.37 ppm appears singlet, possibly due to the transposition with the proton at δ_H 4.16 ppm, as shown in Figure 7, so the distant position does not cause cleavage. Thus, the proposed chemical structure of compound 1 is 3-(hydroxy(4-hydroxyphenyl)methyl)-3,4-dihydro-2H-pyran-4,5,6-triol, as shown in Figure 7.

Compound 1 has good antioxidant activity due to the easy abstraction of hydroxyl protons by DPPH free radicals and generates new free radicals that can be stabilized by radical delocalization in the compound. Compounds with 1,2-dihydroxy units in the C=C bond are more susceptible to proton abstraction by free radicals to form more stable free radicals. This stability is due to the free radicals produced, forming intramolecular hydrogen bonds with the adjacent hydroxyl group and a diketone. Likewise, compounds with a hydroxyl group at the para position are prone to proton abstraction by free radicals to form new, more stable free radicals. This stability is due to the distribution and delocalization of electrons [25-27].

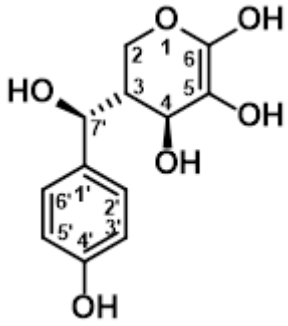

Figure 7. Compound 1 as 3-(hydroxy(4-hydroxyphenyl)methyl)-3,4-dihydro-2H-pyran-4,5,6-triol.

The antioxidant activity of compound 1 can be increased by carrying out a semisynthetic reaction similar to the position of the hydroxyl group on gallic acid (antioxidant standard). The OH group on the aromatic ring of compound 1 is ortho directive so that with the electrophilic substitution reaction, Nitration (2 mol $HNO_3/H2SO_4$), followed by a reduction of the nitro group (Fe/HCl), will produce two amine groups at C3 and C5. The next step is transforming the amine functional group into aryldiazonium chloride (ArN_2^+ Cl^-) and its final replacement by -OH through the reaction between the diazonium salt and hot aqueous acid [28]. Through this series of reactions, it is expected to produce 3-(hydroxyl (3,4,5-trihydroxyphenyl)methyl)-3,4-dihydro-2H-pyran-4,5,6-triol compounds with antioxidant activity close to gallic acid, where gallic acid has a strong antioxidant with an IC_{50} value of 11.4 µg/mL. The production of compound 1 can be carried out within 4 weeks of incubation, and the enrichment technique needs to be investigated further so that it can be produced as needed.

Endophytic fungi from the Beltraniaceae family can produce a variety of bioactive compounds [29]. Beltrania species is one of the rare endophytic fungi that are rarely found [30]. From the ethyl acetate extract of the culture broth of *Beltrania rhombica*, two new eudesmane sesquiterpenes, named rhombidiol and rhombitriol, were isolated. These secondary metabolites have antibacterial and antifungal activity [31]. *Beltrania querna* isolated from Amazonian medicinal plants contains active antiviral compounds [32]. Beltrania species showed their importance for the production of antitumor agents. Two new sesquiterpenes were isolated from the culture broth of Beltrania species [33], and sesquiterpenes are well known to have a potential application as an anticancer agent [34].

The results of the literature study [12,35] produced a report that the phenyl compounds from *S. aqueum* and other *Syzygium* spp. (Fig. 8) were not the same as compound 1. This indicates that compound 1 is typically produced by the endophytic fungus *Beltrania rhombica* of *S. aqueum*. There is no genetic evolution between fungal and host genes in producing compound 1.

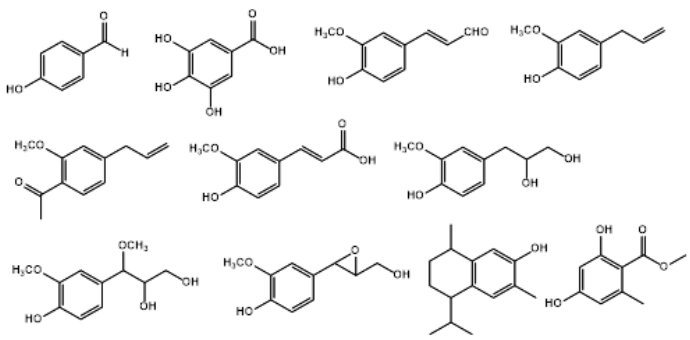

Figure 8. Phenyls of *S. aqueum* and other *Syzygium spp.*

Some endophytic fungi produce certain phytochemical compounds that are also produced by their host plants. This is thought to be the result of genetic transfer from the host plant to endophytic fungi. Studies have shown that about 18% of plant-derived metabolites can also be derived from related fungi. That is the case with anticancer compounds, such as taxol and podophyllotoxin. Taxol is produced from the medicinal plant *Taxus* spp. and the endophytic fungus *Taxomyces andreanae*. Podophyllotoxin compounds are produced from the *Sinopodophyllum hexadrum* plant and its endophytic fungus *Fusarium solani* [36-38]. In recent years, endophytic fungi have become a source of secondary metabolite production. A total of 449 new secondary metabolites were produced from different tissues and plants with different chemical structures and biological activities. Among these new compounds, terpenoids constituted the largest proportion (26%), followed by ketones (22%), lactones (7%), anthraquinones (5%), steroids, penylpropanoids, alkaloids each 3% and other compounds (31%) [39].

4. Conclusions

Endophytic fungi B52 were isolated from *Syzygium aqueum* leaves stalk identified as *Beltrania rhombica* produced compound 1 as 3-(hydroxy(4-hydroxyphenyl)methyl)-3,4-dihydro-2H-pyran-4,5,6-triol, which is a phenolic compound that has antioxidant activity that can be developed as a source of new antioxidants. The compound produced by *Beltrania rhombica* is a promising potential source as a drug raw material in the future through several stages of simple semisynthetic reactions.

Funding

The research was funded by Daftar Isian Pelaksanaan Anggaran (DIPA) Universitas Sriwijaya,Indonesia, through Unggulan Profesi grants 2020, number 0009/UN9/SK.LP2M.PT/2020, September 28, 2020.

Acknowledgments

The authors wish to respect the facilities' support of the Organic Chemistry and Microbiology Laboratory, Faculty of Mathematics and Natural Sciences, University of Sriwijaya.

Conflicts of Interest

The authors declare no conflict of interest.

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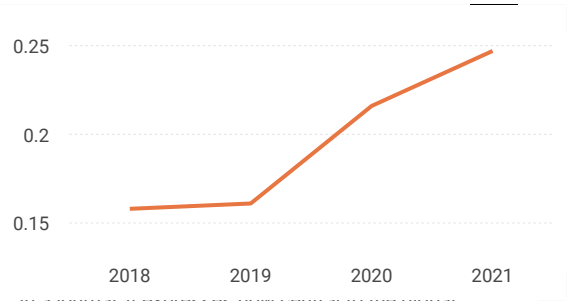

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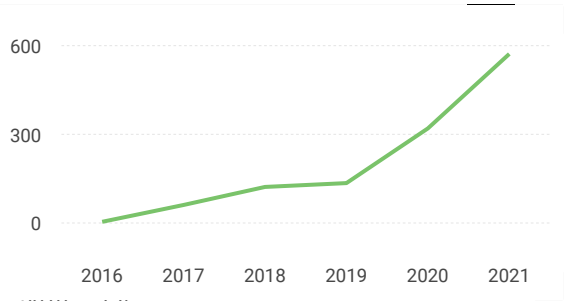

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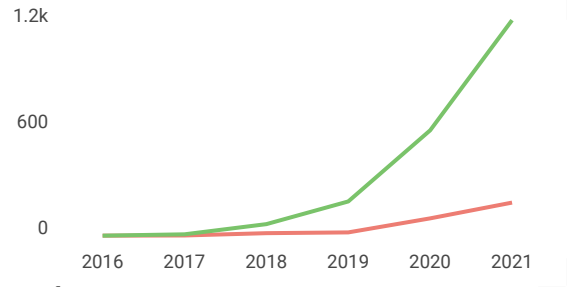

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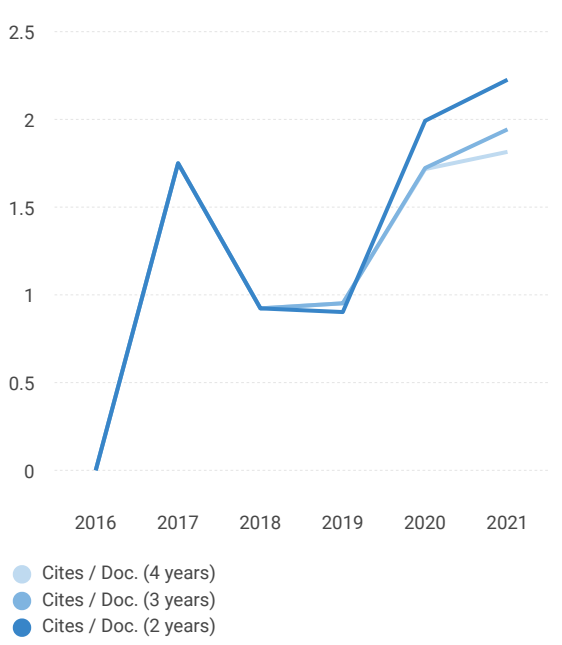

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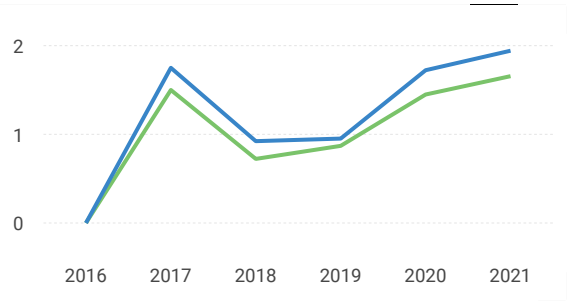

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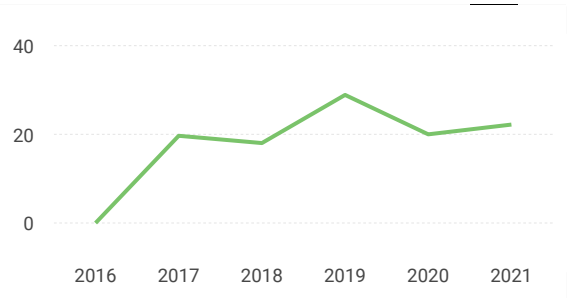

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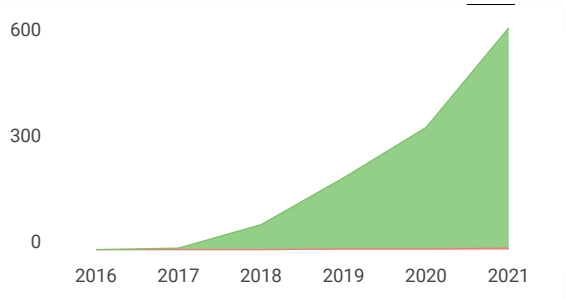

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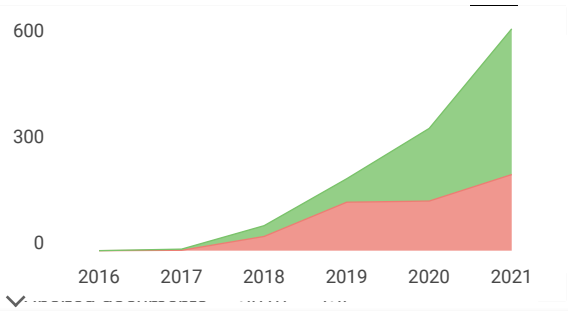

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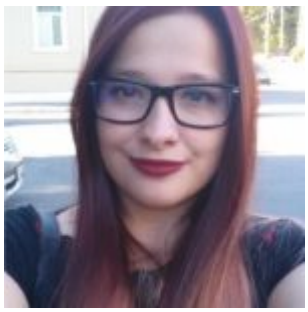

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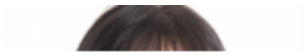

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(https://www.scopus.com/authid/detail.uri?authorId=13105221300)

Research interests: Analytical Chemistry, Materials Chemistry and Environmental Science

Rabah Khenata, (https://scholar.google.com/citations?user=4FYHetYAAAAJ&hl=en)

Faculty of Sciences & Technology, Mascara University, Algeria

(https://www.scopus.com/authid/detail.uri?authorId=6508291264)

Research interests: structural, mechanical, magnetic and optoelectronic properties of crystalline materials using Density functional theory (DFT) as implemented in some computer packages.

Zivile Luksiene, (https://scholar.google.lt/citations?user=Hu2bcNQAAAAJ&hl=en)

Vilnius University, Inst. Applied Research, Sauletekio10, 10223, Vilnius, Lithuania

(https://www.scopus.com/authid/detail.uri?authorId=55909649500)

Research interests: Application of light in life sciences; Biomedical optics: fundamental, applications, clinical investigation; Food safety and quality: development of novel non-thermal antimicrobial technologies; Biophotonic technologies for organic agriculture and food safety and quality: inactivation of pathogenic and harmful microorganisms

He Yong (http://orcid.org/0000-0001-6752-1757),

College of Biosystems Engineering & Food Science, Zhejiang University, China

(https://www.scopus.com/authid/detail.uri?authorId=36079131500)

Research interests:

Alina Maria Holban, (https://scholar.google.com/citations?user=1Px1JYAAAAAJ&hl=en)

Faculty of Biology, University of Bucharest, Romania

(https://www.scopus.com/authid/detail.uri?authorId=55630243600)

Research interests: antimicrobial therapy; nanostructured drugs; biofilms; host-pathogen interactions;

Florin Iordache, (https://scholar.google.com/citations?user=VH9RPdIAAAAJ&hl=en)

Institute of Cellular Biology and Pathology "Nicolae Simionescu" (ICBP), Bucharest, Romania

(https://www.scopus.com/authid/detail.uri?authorId=56442793100)

Research interests: Molecular biology, cell culture, cell biology.

Valentina Grumezescu,

Lasers Department, National Institute for Lasers, Plasma and Radiation Physics, Romania

(https://www.scopus.com/authid/detail.uri?authorId=55209888700)

Research interests: thin coatings; modulation of microbial biofilm; drug targeting; hard tissue engineering;

Eliana M. Barbosa Souto (http://orcid.org/0000-0002-9737-6017),

Faculdade de Farmácia da Universidade de Coimbra, Portugal

(https://www.scopus.com/authid/detail.uri?authorId=8839435500)

Research interests: design, development, and characterization of new drug delivery systems. Other research interests include the controlled delivery of drugs across biological barriers, e.g. skin, gastrointestinal tract and blood-brain-barrier.

A.A. Pantazaki,

Dept. of Chemistry, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece

(https://www.scopus.com/authid/detail.uri?authorId=6601911470)

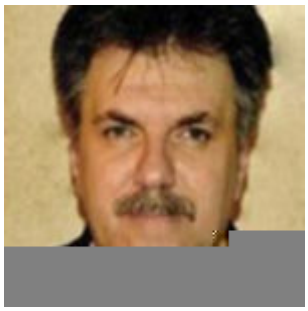
Research interests:

Tin Wui Wong (http://orcid.org/0000-0002-9131-6937), (https://scholar.google.com/citations?user=a5XrVwwAAAAJ&hl=en)

Non-Destructive Biomedical and Pharmaceutical Research Centre, iPROMISE, Universiti Teknologi, MARA, Malaysia

(https://www.scopus.com/authid/detail.uri?authorId=7403531742)

Research interests: Oral/transdermal drug delivery; Particle design; Polymeric drug delivery system; Wound dressing; Pharmaceutical analysis; Pharmaceutical processor design.



Paul Balaure, (https://scholar.google.com/citations?user=5_ds1rcAAAAJ&hl=en)

Faculty of Applied Chemistry and Materials Science, University Politehnica of Bucharest, Romania

(https://www.scopus.com/authid/detail.uri?authorId=6507593592)

Research interests: antimicrobials, nanomaterials, organic synthesis, drug targeting and delivery.

Marcello Iriti (https://orcid.org/0000-0002-5063-1236),

Department of Agricultural and Environmental Sciences, Faculty of Agricultural and Food Sciences, Milan State University, Italy

(http://www.scopus.com/inward/authorDetails.url?authorID=6506548774&partnerID=MN8TOARS)

Research interests: Bioactive phytochemicals, foods and medicinal plants.

Nima Rezaei (http://orcid.org/0000-0002-3836-1827), (https://scholar.google.com/citations?user=aqiMhRgAAAAJ&hl=en)

Children's Medical Center Hospital, Dr. Qarib St, Keshavarz Blvd, Iran

(https://www.scopus.com/authid/detail.uri?authorId=57204849465)

Research interests: Paediatric Immunology and Infectious Diseases; genetics & heredity; immunology; primary immunodeficiency disorders; Cancer Immunology;

Hazizan bin Md Akil, (https://scholar.google.co.uk/citations?user=jCZhon8AAAAJ&hl=en)

School of Materials and Mineral Resources Engineering, Engineering Campus, Universiti Sains Malaysia, Malaysia

(https://www.scopus.com/authid/detail.uri?authorId=7102836574)

Research Interests: Polymer Composites, 3D printing of polymers and Hydrogels

Elias C. Aifantis,

Aristotle University of Thessaloniki, Greece / Mechanics and Optics University ITMO, Saint Petersburg, Russian Federation

(https://www.scopus.com/authid/detail.uri?authorId=34871245600)

Research interests: dislocation patterning and material instabilities, gradient elasticity and plasticity, chemomechanics and nanomechanics.

Kailas L. Wasewar, (https://scholar.google.com/citations?user=GCbHFnEAAAAJ&hl=en)

Department of Chemical Engineering, Visvesvaraya National Institute of Technology (VNIT), India

(https://www.scopus.com/authid/detail.uri?authorId=6506156879)

Research interests: Biotechnology, Reaction Engineering, Process Intensification, Separation Technology, Environmental Engineering, Ionic Liquids, Nanotechnology, CFD, Modeling & Simulation, and Reliability Engineering;

Javed Ali (http://orcid.org/0000-0001-5308-0655), (https://scholar.google.co.in/citations?user=ivR2PTUAAAAJ&hl=en&authuser=1)

Department of Pharmaceutics, Faculty of Pharmacy, Jamia Hamdard, Hamdard Nagar, India

(https://www.scopus.com/authid/detail.uri?authorId=25641028400)

Research interests: Improving oral bioavailability of BCS class II and Class IV drugs using polymeric conjugates and lipid based systems like microemulsions, nanoemulsions, solid lipid nanoparticles and nanostructured lipid carriers

Iola Melissa Fernandes Duarte (http://orcid.org/0000-0003-4289-9256) (https://scholar.google.com/citations?user=Q4kjkRcAAAAJ&hl=en)

CICECO – Aveiro Institute of Materials, Department of Chemistry, University of Aveiro, Portugal

(https://www.scopus.com/authid/detail.uri?authorId=7007025414)

Research interests: immune metabolic deregulations in chronic inflammatory diseases; tumour metabolism, anticancer drugs and nanomedicines, biological responses to nanomaterials.

Mustafa Turkyilmazoglu (https://orcid.org/0000-0003-0412-4580), (https://scholar.google.com.tr/citations?user=F_6HfxsAAAAJ&hl=tr)

Department of Mathematics, University of Hacettepe, Turkey

(https://www.scopus.com/authid/detail.uri?authorId=6603562364)

Research interests: Fluid mechanics, Hydrodynamic stability theory, Rotating-disk flow, High-Reynolds number flows, Triple-deck asymptotic theory of compressible viscous flows, Numerical simulation.

Sibel A. Ozkan (http://orcid.org/0000-0002-9547-7375), (https://scholar.google.com/citations?user=Ti6eQcUAAAAJ&hl=en)

Ankara University, Faculty of Pharmacy, Department of Analytical Chemistry, Tandogan, Turkey

(https://www.scopus.com/authid/detail.uri?authorId=7102661492)

Research interest: analysis of pharmaceuticals with using separation techniques especially on liquid chromatography, method development and their validation, electroanalytical techniques, novel electrode materials, nano-structured materials, surface–modified electrodes, fabrication of biosensors and nano-sensors, analysis of pharmaceuticals from their dosage forms and biological samples.

Cristobal Noe Aguilar Gonzalez (http://orcid.org/0000-0001-5867-8672), (https://scholar.google.com/citations?user=YiRXQjIAAAAJ&hl=en)

Department of Food Research (DIA-UAdeC), School of Chemistry, University Autonomous of Coahuila, Mexico

(https://www.scopus.com/authid/detail.uri?authorId=7102461199)

Research interest: Tannase; Bioactive Extraction; Active Peptides; Active Oligosaccharides; Candelilla Wax; Tannins-Gallic acid-Ellagic acid; Solid-State Fermentation; Edible Films and Coatings; Bioactives and Bioactivities; Biocontrol

Rajeshwar Sinha, (https://scholar.google.com/citations?user=3xcuJzAAAAAJ&hl=en)

Laboratory of Photobiology and Molecular Microbiology, Centre of Advanced Study in Botany, Banaras Hindu University, India

(https://www.scopus.com/authid/detail.uri?authorId=35485458700)

Research interest: UV radiation effects on aquatic ecosystems (DNA damage and repair, phycobiliproteins, mycosporine-like amino acids and scytonemin)

Hassan Vatandoost, (https://scholar.google.com/citations?hl=en&user=krRd7M8AAAAJ&view_op=list_works&sortby=pubdate)

Department of Environmental Chemical Pollutants and Pesticides, National Institute for Environmental Research, School of Public Health , Tehran University of Medical Sciences, Iran

(https://www.scopus.com/authid/detail.uri?authorId=9743822200)

Research interest: Study on the identification of mosquitoes using molecular genetics; Investigation on the mechanisms involved in insecticide resistance in arthropods; Study on the functional basis of insecticide resistance on malaria vectors; Using of biological contort agents including Lagenidium giganteum, Bacillus thuringiensis for malaria vectors.

Jia-Qian Jiang (http://orcid.org/0000-0003-3607-8910), (https://scholar.google.com/citations?user=Zyed_sQAAAAJ&hl=en)

School of Engineering and Built Environment, Glasgow Caledonian University, Glasgow G4 0BA, Scotland, United Kingdom

(https://www.scopus.com/authid/detail.uri?authorId=22979801300)

Research interest: advanced water and wastewater treatment technologies and processes; pollution remediation;

Sanjay K. Jain,

Pharmaceutics Research Projects Laboratory, Department of Pharmaceutical Sciences, Dr. H. S. Gour Central University, India

(https://www.scopus.com/authid/detail.uri?authorId=57207930125)

Research interest: Controlled Release, Nanoparticles, Formulations, Controlled Drug Delivery, Nanotechnology in Drug Delivery, Pharmaceutics and Pharmaceutical Technology, Biomaterials, Liposomes, Nano Drug Delivery

Gaurav Sharma **(http://orcid.org/0000-0002-5010-1710)**,

School of Chemistry, Shoolini University, India

(https://www.scopus.com/authid/detail.uri?authorId=57200185826)

Research interest: Nanocomposites, Bimetallic & trimetallics nanoparticles,Green Chemistry, Photocatalysis, Ion exchanger and Environmental remediation

Wei (Willy) Chu **(http://orcid.org/0000-0002-7166-5443)**,

School of Chemical Engineering, Sichuan University, China

(https://www.scopus.com/authid/detail.uri?authorId=55760847300)

Research interest: Energy Catalysis and Chemical Engineering, Nano Functional Materials, Petrochemicals, Carbon management (CCUS) , Environmental Engineering, Polymer & Chemical Sciences; Fischer Tropsch Synthesis, Clean Energy (Hydrogen, etc), Li Battary, Supecapacitor, CNT, GN, Plasma

Luis R. Pizzio, **(https://scholar.google.es/citations?user=JRVe4hkAAAAJ&hl=en)**

Centro de Investigación y Desarrollo en Ciencias Aplicadas Dr. Jorge J. Ronco (CINDECA), Departamento de Química, Facultad de Ciencias Exactas, Argentina

(https://www.scopus.com/authid/detail.uri?authorId=6701327888)

Research interest: thin films and nanotechnology, mesoporous materials, catalyst design.

Lala Behari Sukla **(http://orcid.org/0000-0001-5684-3021)**, **(https://scholar.google.com/citations?user=SaflpMUAAAAJ&hl=en)**

Biofuels and Bioprocessing Research Center, Siksha 'O' Anusandhan University, Khandagiri Square, Near PNB, India

(https://www.scopus.com/authid/detail.uri?authorId=6603724593)

Research interest: Biodiesel from Microalgae, Biomineral processing for extraction of metal values from ores, concentrates and wastes. Bioleaching, Biobenefication, Bioadsorption, Bioprecipitation, Bioremediation, Microbial strain improvement.

Hermann Ehrlich, (https://scholar.google.de/citations?user=aDJja38AAAAJ&hl=en)

Institute of Electronics and Sensor Materials, TU Bergakademie Freiberg, Germany.

(https://www.scopus.com/authid/detail.uri?authorId=55722706100)

Research interest: marine biomaterials, biominerals, biocomposites and biomimetics.

Li Zhou (http://orcid.org/0000-0003-0650-5256),

Key Laboratory of New Processing Technology for Nonferrous Metal & Materials (Ministry of Education), and College of Materials Science and Engineering, Guilin University of Technology, Guilin 541004, P. R. China

(https://www.scopus.com/authid/detail.uri?authorId=57164679600)

Research interest: Surface modification of functional inorganic nanomaterials for various applications; natural polysaccharide for bio-applications; magnetic and fluorescent nanomaterials; hyperbranched polymers.

Khan Moonis (https://orcid.org/0000-0002-0548-8581), (https://scholar.google.co.in/citations?user=SwW_98MAAAAJ&hl=en)

Department of Chemistry, College of Science, King Saud University, Saudi Arabia

(https://www.scopus.com/authid/detail.uri?authorId=51261077500)

Research interest: analytical chemist; interfacial chemistry.

Miao Ming,

State Key Laboratory of Food Science and Technology, Jiangnan University, China

(https://www.scopus.com/authid/detail.uri?authorId=36840373200)

Research interest: Food Chemistry, Food Processing and Engineering, Food and Nutrition, Food Safety, Food Technology, Enzymes.

Cacciotti Ilaria (http://orcid.org/0000-0002-3478-6510), (https://scholar.google.com/citations?user=6fRqQuAAAAAJ&hl=en)

Niccolò Cusano University, Rome, Italy

(https://www.scopus.com/authid/detail.uri?authorId=16201946300)

Research interest: Synthesis and characterization of biomaterials; Bone tissue engineering; Biomaterials for tissue engineering;

Ivo Grabchev (http://orcid.org/0000-0001-7204-8183), (https://scholar.google.com/citations?user=MUNSn7kAAAAJ&hl=en)

Department "Chemistry and Biochemistry, Physiology and Pathophysiology", Faculty of Medicine, University of Sofia "St. Kliment Ohridski", Sofia, Bulgaria

(https://www.scopus.com/authid/detail.uri?authorId=7004847951)

Research interest: Dye chemistry, dendrimers, fluorescent polymers, fluorescence, PET sensors, artificial antenna systems, biological systems

Tadeusz Hryniewicz (http://orcid.org/0000-0002-6425-7273),

Department of Engineering and Informatics Systems, Koszalin University of Technology, Poland

(https://www.scopus.com/authid/detail.uri?authorId=6604026438)

Research interests: Machine technology, Surface technology, Surface electrochemistry studies, Hydrogen embrittlement cases, Electrochemical corrosion studies, Plasma Electrolytic Oxidation.

Kostoglou Margaritis, (https://scholar.google.gr/citations?user=11LN7KEAAAAJ&hl=en)

Department of Chemistry, Aristotle University of Thessaloniki, Greece

(https://www.scopus.com/authid/detail.uri?authorId=55163355200)

Research interests: Transport phenomena, Unit processes, Physicochemical Engineering, Mathematical modeling, Interfaces Science, Controlled Release modeling.

Ling Wen Ding (https://orcid.org/0000-0003-0022-1551), (http://scholar.google.com.sg/citations?user=ZY7-kcoAAAAJ&hl=en)

Cancer Science Institute of Singapore, NUS, Singapore

(https://www.scopus.com/authid/detail.uri?authorId=57202281673)

Research interests: Immunotherapy and targeted therapy of cancer, cancer vaccine, cancer genome and cfDNA based cancer screening.

Minhaz Uddin Ahmed (https://orcid.org/0000-0002-8267-8506),

University Brunei Darussalam, Bandar Seri Begawan, Brunei Darussalam

(https://www.scopus.com/authid/detail.uri?authorId=7402830936)

Research interests: analytical and bioanalytical chemistry, chemistry of nanomaterials, biosensors, next generation nucleic acids and protein biosensors, novel chemical biology and biomaterials approaches,
point-of-care micro devices, agro/food based applied biotechnology

Martin Koller (https://orcid.org/0000-0002-9251-1822),

Institute of Chemistry, University of Graz, Austria

(https://www.scopus.com/authid/detail.uri?authorId=8275612000)

Research interests: Conversion of surplus materials of (agro)industrial origin towards value-added bio-products (polyhydroxyalkanoates); Optimization of biopolyesters production regarding economics, productivity and product quality (material performance) (polyhydroxyalkanoates); Downstream processing for efficient and sustainable recovery of intracellular bio-products (polyhydroxyalkanoates)

George Aggelis (https://orcid.org/0000-0002-1200-5592),

Unit of Microbiology, Division of Genetics, Cell and Developmental Biology, Department of Biology, University of Patras, Greece

(https://www.scopus.com/authid/detail.uri?authorId=7003394202)

Research interests: Microbial Biotechnology; single cell oil; microbial (yeast, fungal, algal) lipid biosynthesis and biotechnology; polyunsaturated fatty acids; organic acids; degradation of phenolics; Microbial metabolism of glycerol, methanol, fatty acids; modelling.

Heinz Hendrik,

Department of Chemical and Biological Engineering, University of Colorado-Boulder, United States

(https://www.scopus.com/authid/detail.uri?authorId=7006495491)

Research interests: Computer simulation of inorganic-(bio)organic interfaces and biomineralization; Design of catalysts and functional materials; Development of force fields for the prediction of multiphase material properties; Hierarchical simulation of building materials and multiscale mechanics; Structure-property relationships in polymer nanocomposites.

Guardia Pablo (https://orcid.org/0000-0001-9076-4642),

Catalonia Institute for Energy Research – IREC, Spain

(https://www.scopus.com/authid/detail.uri?authorId=16506603700)

Research interests: Biosensors; Nanoparticles; Chemical phisycs of materials; Autoassembly;
Nanostructures; Optic materials; Semiconductors; Nanomaterials; Magnetics; Nanobiotechnology; Mini and micro robots

Baoyang Lu (https://orcid.org/0000-0003-4663-4706),

School of Pharmacy, Jiangxi Science & Technology Normal University, China | Massachusetts Institute of Techonology, Cambridge, USA

(https://www.scopus.com/authid/detail.uri?authorId=24822324300)

Research interests: Design and synthesis of novel conjugated polymer-based molecular systems, and fabrication of organic optoelectronic devices; Conducting polymer hydrogels and their applications.

Morata Antonio (https://orcid.org/0000-0003-1275-6721),

Universidad Politécnica de Madrid, Madrid, Spain

(https://www.scopus.com/authid/detail.uri?authorId=8353219900)

Research interests: wine technology and microbiology, anthocyanins and stable pyranoanthocyanins, emerging technologies of food processing and preservation.

Eirini Marouli,

William Harvey Research Institute, Barts and The London School of Medicine and Dentistry, Queen Mary University of London, United Kingdom

(https://www.scopus.com/authid/detail.uri?authorId=57204885457)

Research interests: Computational Biology, Genetics, disease prediction.

Harinder Singh Oberoi (http://orcid.org/0000-0001-8851-103X),

Division of Post Harvest Technology and Agricultural Engineering, ICAR – Indian Institute of Horticultural Research, Bengaluru, India

(https://www.scopus.com/authid/detail.uri?authorId=6603479987)

Research interests: Fermentation, Food processing and safety, Bioprocessing and Biovalorization

Mohammad A. Al-Ghouti, (https://scholar.google.com/citations?user=TH7TGJ4AAAAJ)

Department of Biological and Environmental Sciences, College of Arts and Sciences, Qatar University, Qatar

(https://www.scopus.com/authid/detail.uri?authorId=23048725500)

Research interests: prepare and modify surface of adsorbents, polymers, and membranes, study the adsorption mechanisms and the influence on the chemical and physical characteristics on the remediation behavior on various environmental compartments, including areas of: environmental chemistry, membrane coating and technology, polymer and membrane modification.

Ilias Giannenas,

Faculty of Veterinary Medicine, Aristotle University of Thessaloniki, University Campus, 54124, Thessaloniki, Greece

(https://www.scopus.com/authid/detail.uri?origin=resultslist&authorId=6603458827)

Research interests: Aromatic plants in feeding of poultry as alternative growth promoters, alternative coccidiostats and antioxidants; Natural substances such as probiotics, prebiotics, organic acids, enzymes and trace
elements in poultry nutrition; Aromatic plants in feeding of ruminants as alternative growth promoters and antioxidants.

Mohamed Bououdina, (https://scholar.google.com/citations?user=nVGQSU8AAAAJ&hl=en)

University of Bahrain, Sakhir, Bahrain

(https://www.scopus.com/authid/detail.uri?authorId=7004156513)

Research interest: biosynthesis & nanotoxicology.

Hani Nasser Abdelhamid (http://orcid.org/0000-0002-3106-8302), (https://scholar.google.com/citations?user=y_Fr2cYAAAAJ&hl=en)

Department of Chemistry, Assiut University, Egypt

(http://www.scopus.com/authid/detail.url?authorId=55370888300)

Research interest: Nanotechnology: synthesis, characterization, and applications; Material Chemistry, synthesis, characterization, and applications; Metal-Organic Frameworks (MOFs), synthesis, characterization, and applications; Inorganic and structural chemistry.

Esra Capanoglu Guven (https://orcid.org/0000-0003-0335-9433),

Food Engineering Department, Faculty of Chemical & Metallurgical Engineering, Istanbul Technical University (ITU), Turkey

(https://www.scopus.com/authid/detail.uri?authorId=23666338900)

Research interest: Food Chemistry, Fruit and Vegetable Processing, Plant Biochemistry, Antioxidants, Phenolics, In vitro Bioaccessibility, Functional Foods, Sensory Analysis Food/Plant Analyses: LC-MS, HPLC, in vitro bioaccessibility methods, Rancimat, enzyme studies, chemical and sensory analyses.

Rodica Olar,

Department of Inorganic Chemistry, Faculty of Chemistry, University of Bucharest, Romania

(https://www.scopus.com/authid/detail.uri?authorId=6603223507)

Research interest: complex combinations – synthesis, psycho-chemical characterization, structure determination, biological use

Biointerface Research in Applied Chemistry
Open-Access Journal (ISSN: 2069-5837)
Issue 6
Biointerface Res. Appl. Chem., Volume 12, Issue 6, 2022 – 15th December

(4) Modern Perspectives of Curcumin and its Derivatives as Promising Bioactive and Pharmaceutical Agents

https://doi.org/10.33263/BRIAC126.71777204 (https://doi.org/10.33263/BRIAC126.71777204)

Mohd Yusuf, Sadiya, Bilal Ahmed, Mohd Gulfishan

Download

(5) Surface Functionalized Halloysite with N-[3-(Trimethoxysilyl)Propyl] Ethylenediamine for Chromium and Nickel Adsorption from Aqueous Solution

https://doi.org/10.33263/BRIAC126.72057213 (https://doi.org/10.33263/BRIAC126.72057213)

Sulyani Fitri, Amri Yahya, Sheikh Ahmad Izaddin Sheikh Mohd Ghazali, Is Fatimah

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(6) HDR Degree Bassed Indices and Mhr-Polynomial for the Treatment of COVID-19

https://doi.org/10.33263/BRIAC126.72147225 (https://doi.org/10.33263/BRIAC126.72147225)

Ammar Alsinai, Hanan Ahmed, Anwar Alwardi, Soner Nandappa D.

Download

(7) Synthesis and Evaluation of Anti-inflammatory Activity of some Thiazolo[4,5-b]pyridines

https://doi.org/10.33263/BRIAC126.72267238 (https://doi.org/10.33263/BRIAC126.72267238)

Taras Chaban, Vasyl Matiychuk, Zoriana Chulovska, Iryna Myrko, Iryna Drapak, Rostyslav Sogujko, Ihor Chaban, Volodymyr Ogurtsov, Ihor Nektegaev

Download

(8) Effects of the Temperature and the pH on the Main Protease of SARS-CoV-2: A Molecular Dynamics Simulation Study

https://doi.org/10.33263/BRIAC126.72397248 (https://doi.org/10.33263/BRIAC126.72397248)

Azadeh Kordzadeh, Ahmad Ramazani Saadatabadi

Download

(9) A Computational Approach on Acetaminophen Drug using Degree-Based Topological Indices and M-Polynomials

https://doi.org/10.33263/BRIAC126.72497266 (https://doi.org/10.33263/BRIAC126.72497266)

Srinivasan Melaiyur Sankarraman

Download

(10) Essential Oils in Treatment and Management of Dental Diseases

https://doi.org/10.33263/BRIAC126.72677286 (https://doi.org/10.33263/BRIAC126.72677286)

Inderbir Singh, Parneet Kaur, Udesh Kaushal, Vimanpreet Kaur, Navendu Shekhar

Download

(11) Exploring Cytotoxic Potential of Ciclopirox on Colorectal Cancer Cells by In-Silico Methodology

https://doi.org/10.33263/BRIAC126.72877310 (https://doi.org/10.33263/BRIAC126.72877310)

Savita Shrikant Deokar, Karimunnisa Sameer Shaikh

Download

(12) Neuroprotective Role of Curcumin Against Benzo[a]pyrene-Induced Neurodegeneration in Zebrafish

https://doi.org/10.33263/BRIAC126.73117320 (https://doi.org/10.33263/BRIAC126.73117320)

Laxminandan Satpathy, Siba Prasad Parida

Download

(13) In vitro & In vivo Phytochemical Evaluation of Bioactive Components Against Hyperglycemic-induced Oxidative Stress in Streptozocin Rat Model: A histopathological investigation

https://doi.org/10.33263/BRIAC126.73217341 (https://doi.org/10.33263/BRIAC126.73217341)

Arif Nazir, Rahat Mustafa, Munawar Iqbal

Download

(14) In vitro Studies on Calcium Oxalate Induced Apoptosis Attenuated by Didymocarpus pedicellata

https://doi.org/10.33263/BRIAC126.73427355 (https://doi.org/10.33263/BRIAC126.73427355)

Anubha Singh, Simran Tandon, Tanzeer Kaur, Chanderdeep Tandon

Download

(15) A Study of the Antibacterial Activities and the Mode of Action of L-Methionine and L-Cystine Based Surfactants and their Interaction with Bovine Serum Albumin Using Fluorescence Spectroscopy and in Silico Modelling

https://doi.org/10.33263/BRIAC126.73567375 (https://doi.org/10.33263/BRIAC126.73567375)

Sabina Jhaumeer Laulloo, Prakashanand Caumul, Nausheen Joondan, Shobha Jawaheer, Sundev Parboteeah, Sabrina Devi Dyall, Minu Gupta Bhowon

Download

(16) Potential of Transforming Sodalite from Synthesis Kaolin with a Mild Condition of the Hydrothermal Method

https://doi.org/10.33263/BRIAC126.73767393 (https://doi.org/10.33263/BRIAC126.73767393)

Norsuhailizah Sazali, Zawati Harun, Tijjani Abdullahi, Faiz Hafeez Azhar, Azlinnorazia Ahmad, Nurul Izwanie Rasli, Norazlianie Sazali

Download

(17) Sonochemical Synthesis of Laurate Sucrose Ester as Bio-Based Plasticizer and Bio-Additive for PVC

https://doi.org/10.33263/BRIAC126.73947403 (https://doi.org/10.33263/BRIAC126.73947403)

Dragomir Vassilev, Nadezhda Petkova, Milka Atanasova, Milena Koleva, Panteley Denev

Download

(18) Modeling the Liquid Phase Exfoliation of Graphene in Polar and Nonpolar Solvents

https://doi.org/10.33263/BRIAC126.74047415 (https://doi.org/10.33263/BRIAC126.74047415)

Rima Biswas

Download

(19) Synergistic Interaction Between Cationic Novel Gemini Surfactant and Non-ionic Conventional Surfactants in Aqueous Medium

https://doi.org/10.33263/BRIAC126.74167428 (https://doi.org/10.33263/BRIAC126.74167428)

Naved Azum, Malik Abdul Rub, Maha Moteb Alotaibi, Anish Khan, Abdullah M. Asiri

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