DPPH scavenging property of bioactives from soft corals origin palu bay, Central Sulawesi, Indonesia

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Abstract. Antioxidants is a substance widely explored and sought after, due to the increase of free radicals in the human body, is very closely linked to the human degenerative disease. Soft corals are also reported to produce compounds that show antioxidant activity. This research aimed to examine the antioxidant and profile bioactive of six soft corals species from three genera Sinularia, Sarcophyton and Nephthea origin Palu Bay, Central Sulawesi. The antioxidant activity was measured by the DPPH radical scavenging method. Profile bioactive were identified using GC-MS spectra analysis. The results of IC₅₀ analysis showed the crudes of soft corals belonging to the very strong antioxidant activity. Sinularia sp. (SCA) has the highest (IC₅₀ = 10.708 ± 0.374 μg/mL). The GC-MS analysis showed 2-Dodecen-1-yl (-) succinic anhydrid; Hexadecanoic acid, methyl ester; Bacchotricuneatin c; L-(+)-Ascorbic acid 2,6-dihexadecanoate; 14 (β)-Pregnane; Octacosane; Heptacosane; and Tetrapentacontane, 1,54-dibromo common compounds that have the potential as antioxidants. This study provides on the potential soft corals origin Palu Bay, Central Sulawesi as a source of antioxidant. This study also shows the compounds in soft coral according to GC-MS. This is a new report of antioxidant substances from Nephthea sp. origin of Indonesian oceans.

1. Introduction
The oceans are a source of natural products and new active components with a variety of biological activity, which may be useful as a raw material drug with efficacy and function in the treatment of human disease. There are many benefits from various marine organisms for medicinal sources, such as algae [1] and marine bacteria[2]. Soft coral, although it has benefit for ecological function, also has important medicinal sources. Soft corals are invertebrate organisms inhabitants of the coral reef ecosystem, which utilizes chemical compounds or substances in life[3]. Soft corals are known rich sources of natural products that have unique and diverse structures and unusual biological activity[4]. Soft corals are included in cnidarians phylum, class of Anthozoa, Octocorallia subclass is a soft-bodied animal and live with environmental stresses, such as competition of space, light, and other sources that cause soft corals produce a variety of chemical compounds as a defense [5]. The Octocorallia subclass contained 3200 soft coral species (Alcyonacea) and found 94% of new compounds from the cnidarian phylum[6].

The literature study shows a biological potential of bioactive compounds soft coral genus Sinularia, Sarcophyton, and Nephthea, among other anti-cancer [7], cytotoxic [8], antimitic [9], anti-inflammatory [10], antibacterial [11] and antioxidants [12]. Bioactive antioxidants are substances that
can reduce oxidative stress and are closely related to human degenerative diseases such as cancer, coronary heart disease, and aging[13].

Oxidative stress caused by free radicals such as hydroxyl, superoxide and peroxyl radicals that are formed in human cells by endogenous and exogenous factors[14]. Free radicals such as reactive oxygen species (ROS) are chemically reactive molecules in the cell and linked to various biological processes[15]. Mechanism of action of bioactive antioxidants to provide electron, thus becoming unstable free radical molecules. The scavenging of ROS molecules can prevent oxidative stress by bioactive antioxidants[16].

Although many studies have reported bioactive compounds isolated from soft corals and have diverse biological functions, there are still few studies on antioxidant activity. In addition, there are more than 210 publications of research results that reveal bioactive compounds from soft corals of the genus Sinularia [17]. However, the authors only found 10 publications of research results between 2005 and 2016, which examined the potential for antioxidant activity from soft corals [4-6, 12, 17-22].

The ocean of Central Sulawesi has much biodiversity of marine organisms but have not been extensively explored for their bioactive potential. Palu Bay belongs to Wallace's grouping transition zone, which has been known to have high biodiversity [18]. Palu Bay is semi-enclosed water, located on the western island of Sulawesi and connect directly to the Makassar Strait. Therefore, this study aims to examine the antioxidant potential and profile bioactive of six soft corals species from three genera Sinularia, Sarcophyton and Nephthea origin Palu Bay, Central Sulawesi. Antioxidant potential was evaluated through DPPH, and IC\textsubscript{50} was measured as the concentration of extract needed to reduce DPPH free radicals by 50%. Also in this study, profile bioactive were identified using GC-MS spectra analysis.

2. Materials and methods

2.1 Chemical and reagents
Dichloromethane (Merck), methanol (Merck), and 1,1-Diphenyl-2-picrylhydrazyl, free radical (DPPH, Merck).

2.2 Animal materials
All Soft coral were collected from the coastal of Palu Bay, Central Sulawesi, Indonesia at coordinates 43.31 LS and 119.46 BT in December 2016. Soft corals samples were identified as Sinularia sp. (SCA), Nephthea sp. (SCB), Sarcophyton sp. (SCC), Sarcophyton sp. (SCD), Sinularia sp. (SCE) and Sinularia sp. (SCF), based on the shape of the monomorphic colony and interior sclerite (Figure 1). Soft coral genus identification to follow instructions Fabricus&Alderslade [19]. Sampling was done with SCUBA at a depth of 3-5 m. Each soft coral was rinsed with seawater and immediately stored in ice. After arriving at the laboratory, samples of soft corals is cut into smaller sizes, put into containers and stored in a freezer immediately, to reduce the possibility of degradation. A voucher sample was deposited at Laboratory of Fisheries Product Technology, Palu Fisheries and Marine Institute.

2.3 Extraction
A total of 100 g (wet weight) sample was macerated with methanol: dichloromethane (1: 1) for 48 hours (1:2 w/v) [17]. After it, filter evaporated (Rotary Vacuum Evaporator EYELA N-1100) and dried.

2.4 Antioxidant assay
The soft coral’s crude extract determined antioxidant activity using spectrophotometric by the DPPH radical scavenging method [20]. All fractions from the crude extract of soft corals prepared in different concentrations, ranging from 10 to 90 µg/mL, for each sample and analyzed in triplicate. The extract was taken as much as 2 ml and added with 2 ml of DPPH 50µM. The mixture was homogenized and left for 30 minutes in the dark. Then measured at 517 nm wavelength (spectrophotometer UV-VIS T90+ PG Instruments Ltd). The IC\textsubscript{50} value of the extract (the amount of extract solution required to
reduce DPPH free radical by 50%) obtained by linear regression analysis between the percentage of inhibition and concentration. The percentage of DPPH scavenging effect calculated using the following equation (1). All data performed in three replicates and expressed as Mean ± SD (n = 3). The Microsoft Excel 2013 data processing program used to analyze.

\[
\text{DPPH Scavenging Effect (\%) } = \frac{\text{Blank Absorbance} - \text{Sample absorbance}}{\text{Blank Absorbance}} \times 100\%
\]  

(1)

2.5 GC-MS analysis
Identification and analysis of chemical compounds in crude was carried out by GC-MS. The extracted residue was diluted with methanol, filtered through 10µL sterile syringe filters, and 1µL of crude solution was injected into a gas chromatograph. The chromatographic analysis was done on Hewlett-Pakard(HP) 6890 gas chromatograph equipped with a mass spectrometer with electron ionization as mass identification source. Dimethylpolysiloxane with 5% diphenyl (Elite 5MS) column

**Figure 1. Soft Corals From Palu Bay, Central Sulawesi**
was used for the separation (30 m length, 250 µm internal diameter). High-purity helium was used as the carrier gas. Pneumatic injection was used to introduce the sample at a split ratio of 50:1. The oven temperature was initially kept at 150°C, then increased up to 240°C at a rate of 10°C/min, and kept 22 min on this maximum level. Inlet and source temperature of the mass spectrometer was kept at 300°C. The scan range was 50 – 550 amu. Structural assignments were based on analysis of fragmentation pattern of mass spectra and direct comparison of mass spectra with profiles in the National Institute of Standards and Technology (NIST) and Wiley library.

3. Results and discussion

3.1 Results

DPPH was a stable free radical and can accept electrons or hydrogen radicals to form a stable diamagnetic molecule. In this research, we assayed the reactivity of six different soft coral crude extracts with stable free radicals. The results of the free radical potential of all crude extracts assayed by the DPPH method were presented in Figure 2. This research provides information on the reactivity of the soft coral crude extracts different from stable free radicals.

Figure 2 showed that the crude of six soft corals indicates antioxidant activity because it was able to donate hydrogen/electron atoms to react with DPPH radicals. Extract concentration increased, showing the percentage of DPPH radical scavenging also increased. According to the Blois category (1958), there were four categories of antioxidant activity, which was very strong (IC50 <50 μg/mL), strong (IC50 between 50-100 μg/mL), moderate (IC50 ranges from 100-150 μg/mL) and weak (IC50 ranges from 150-200 μg/mL) [24]. The IC50 analysis showed the six crude extracts of soft corals belonging to the very strong antioxidant activity (Table 1).

Table 1. IC50 Values from Antioxidant Assay using DPPH radicals of Soft Corals Crude

| Soft Corals         | IC50 (µg/mL) |
|---------------------|--------------|
| Sinularia sp. (SCA) | 10.708 ± 0.374 |
| Nepthea sp. (SCB)   | 13.654 ± 0.902 |
| Sarcophyton sp. (SCC)| 13.395 ± 0.530 |
| Sarcophyton sp. (SCD)| 15.276 ± 0.446 |
| Sinularia sp. (SCE) | 11.904 ± 0.881 |
| Sinularia sp. (SCF) | 16.499 ± 0.802 |

The current study extended to determine the GC-MS spectra of the six crude extracts. GC-MS analysis results showed Sinularia sp. (SCA) sixty-eight peaks, fifty-two peaks with qualities above 85%, and identified in twenty-five compounds. Nepthea sp. (SCB) detected sixty-four peaks, thirty-five peaks with qualities above 85%, and identified in thirty-four compounds. Sarcophyton sp. (SCC) detected thirty-one peaks, twenty-three peaks with qualities above 85%, and identified in eighteen compounds. Sarcophyton sp. (SCD) detected thirty-three peaks, twenty-six peaks with qualities above 85%, and identified in fifteen compounds. Sinularia sp. (SCE) detected fifty-six peaks, forty-four peaks with qualities above 85%, and identified in thirty-five compounds. Sinularia sp. (SCF) detected twenty-nine peaks, twenty-five peaks with qualities above 85%, and identified in twenty-two compounds. Each peak indicates the presence of a compound. Of each detected peak, there was a peak with quality below 85%. It can be estimated that there was a possibility of new compounds.

Based on literature, the extract of Sinularia sp. (SCA) indicated nine compounds that have the potential as a bioactive antioxidants; Nepthea sp. (SCB) indicated seven compounds; Sarcophyton sp. (SCC) indicated four compounds; Sarcophyton sp. (SCD) indicated seven compounds; Sinularia sp. (SCE) indicated seven compounds; and Sinularia sp. (SCF) indicated six compounds. These compounds can be seen in Table 2.
Figure 2. Radical Scavenging Potential of Soft Coral Crude Extracts by DPPH method at different concentrations

Table 2. The compounds probabilities in the six crude extracts Indicated with Potential Antioxidants.

| No. | Compound | Molecular Formula | RT (min) | Area (%) | Quality (min 85) | Library |
|-----|----------|-------------------|----------|----------|------------------|---------|
| 1.  | 2-Dodecen-1-yl(-)succinic anhydrid | C_{16}H_{26}O_{3} | 8.871 | 0.17 | 86 | NIST |
|     |                      |                   | 11.866  | 1.40   | 93               | NIST    |
|     |                      |                   | 14.101  | 1.39   | 86               | NIST    |
| 2.  | Hexadecanoic, methyl ester | C_{17}H_{34}O_{2} | 9.054 | 0.94 | 96 | NIST |
|     |                      |                   | 9.129  | 0.16   | 86               | NIST    |
| 3.  | Bacchotricuneatin c | C_{20}H_{22}O_{5} | 10.489  | 1.09 | 95 | NIST |
|     |                      |                   | 12.592  | 1.52 | 90 | NIST |
|     |                      |                   | 12.941  | 1.81 | 91 | NIST |
| 4.  | L-(+) - Ascorbic acid 2,6-dihexadecanoate | C_{38}H_{68}O_{8} | 9.409  | 1.95  | 91 | NIST |
|     |                      |                   | 9.614  | 0.46 | 91 | Wiley |
|     |                      |                   | 9.826  | 0.63 | 90 | Wiley |
|     |                      |                   | 10.363 | 0.63 | 97 | Wiley |
| 5.  | 14(β)-Pregnane | C_{21}H_{36} | 11.146  | 3.79  | 92 | Wiley |
|     |                      |                   | 11.718  | 1.55 | 98 | Wiley |
|     |                      |                   | 12.786  | 2.73 | 96 | Wiley |
|     |                      |                   | 14.267  | 0.36 | 99 | Wiley |
| 6.  | Terpinolene | C_{10}H_{16} | 10.089  | 1.08  | 86 | Wiley |
| 7.  | Thunbergol | C_{20}H_{34}O | 10.832  | 1.02  | 90 | NIST |
| 8.  | Octacosane | C_{28}H_{58} | 11.466  | 3.25  | 91 | NIST |
| 9.  | Heptacosane | C_{27}H_{56} | 18.582  | 0.18  | 95 | NIST |
|     |                      |                   | 21.776  | 0.40 | 93 | NIST |
| **Nepthea sp. (SCB)** |  |  |  |  |
|---|---|---|---|---|
| 1. Cyclohexene, 3-methyl-6-(1-methylethlylidene)- | C\textsubscript{16}H\textsubscript{16} | 3.596 | 0.45 | 87 | NIST |
| 2. Neoisolongifolene, 8,9-dehydro-7- | C\textsubscript{15}H\textsubscript{22} | 4.711 | 0.22 | 90 | NIST |
| 3. Tetracyclo[6.2.1.0\(3.8\)0\(3.9\)]undecan-1,5-diene, 4,4,11,11-tetramethyl- | C\textsubscript{15}H\textsubscript{26}O | 7.225 | 0.56 | 91 | NIST |
| 4. Isolongifolene, 9,10-dehydro- | C\textsubscript{15}H\textsubscript{22} | 7.340 | 0.66 | 90 | NIST |
| 5. Isopreneol | C\textsubscript{15}H\textsubscript{26}O | 7.437 | 0.42 | 90 | Wiley |
| 6. Hexadecanoic acid, methyl ester | C\textsubscript{17}H\textsubscript{33}O\textsubscript{2} | 9.060 | 1.22 | 97 | NIST |
| 7. Tetrapentacontane, 1,54-dibromo- | C\textsubscript{54}H\textsubscript{108}Br\textsubscript{2} | 14.170 | 0.41 | 91 | NIST |

| **Sarcophyton sp. (SCC)** |  |  |  |  |
|---|---|---|---|---|
| 1. 1-Hexadecanethiol | C\textsubscript{16}H\textsubscript{33}S | 8.620 | 0.36 | 93 | NIST |
| 2. 2,6,10,14,18,22-Tetracosahexaene, 2,6,10,14,18,22-hexamethyl- (all-E) | C\textsubscript{30}H\textsubscript{60} | 12.963 | 0.45 | 90 | NIST |
| 3. 2-Dodecen-1-yl(-)succinic anhydrid | C\textsubscript{16}H\textsubscript{26}O\textsubscript{3} | 15.369 | 4.95 | 91 | NIST |
| 4. Octacosane | C\textsubscript{28}H\textsubscript{58} | 17.450 | 6.39 | 99 | NIST |

| **Sarcophyton sp. (SCD)** |  |  |  |  |
|---|---|---|---|---|
| 1. 14B-Pregnane | C\textsubscript{21}H\textsubscript{36} | 6.997 | 0.11 | 99 | Wiley |
| 2. 1-Nonadecene | C\textsubscript{19}H\textsubscript{38} | 7.368 | 0.05 | 91 | NIST |
| 3. Hexadecanoic acid, methyl ester | C\textsubscript{17}H\textsubscript{33}O\textsubscript{2} | 9.054 | 1.06 | 95 | NIST |
| 4. Octadecane | C\textsubscript{18}H\textsubscript{38} | 10.798 | 13.06 | 95 | NIST |
| 5. 2-Dodecen-1-yl(-)succinic anhydrid | C\textsubscript{16}H\textsubscript{26}O\textsubscript{3} | 13.689 | 1.30 | 92 | NIST |
| 6. alpha.- Tocopherol (Vitamin E) | C\textsubscript{29}H\textsubscript{50}O\textsubscript{2} | 15.221 | 5.65 | 91 | Wiley |
| 7. Tetratetracontane, 1,54-dibromo- | C\textsubscript{54}H\textsubscript{108}Br\textsubscript{2} | 16.547 | 1.84 | 86 | NIST |

| **Sinularia sp. (SCE)** |  |  |  |  |
|---|---|---|---|---|
| 1. 1,13-Tetradecadiene | C\textsubscript{14}H\textsubscript{26} | 7.800 | 0.70 | 87 | NIST |
| 2. Hexadecanoic acid, methyl ester | C\textsubscript{17}H\textsubscript{33}O\textsubscript{2} | 9.054 | 1.36 | 95 | NIST |
| 3. 14B-Pregnane | C\textsubscript{21}H\textsubscript{36} | 10.752 | 0.36 | 97 | Wiley |
| 4. Pyridine-3-carboxamide, oxime, N-(2-trifluoromethylphenyl)- | C\textsubscript{13}H\textsubscript{14}F\textsubscript{3}N\textsubscript{2}O | 11.798 | 15.80 | 93 | NIST |
| 5. Bacchotricuneatin c | C\textsubscript{20}H\textsubscript{26}O\textsubscript{5} | 12.466 | 1.39 | 86 | NIST |
| 6. Heptacosane | C\textsubscript{27}H\textsubscript{56} | 15.581 | 0.54 | 94 | NIST |
| 7. Octacosane | C\textsubscript{28}H\textsubscript{58} | 18.256 | 7.75 | 91 | NIST |
**Sinularia sp. (SCF)**

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 1. | Cyclohexanol, 5-methyl-2-(1-methylethenyl)- | C10H18O | 10.906 | 0.61 | 86 | NIST |
| 2. | Nonadecane | C19H40 | 12.169 | 0.92 | 91 | NIST |
| 3. | Bacchotricuneatin c | C20H22O5 | 12.255 | 0.28 | 90 | NIST |
| 4. | Tetrapentacontane, 1,54-dibromo- | C36H108Br2 | 12.781 | 0.12 | 87 | NIST |
| 5. | Hexatriacontane | C36H74 | 18.679 | 0.36 | 94 | NIST |
| 6. | Longifolenaldehyde | C15H24O | 20.908 | 17.52 | 96 | NIST |

### 3.2 Discussion

The DPPH radical scavenging method is the most common and widely used method for screening the free radical ability of a substance. This assay method is sensitive, easy to do and provides a quick way to filter the activity of radicalization that indicates the presence of an antioxidant substance. The DPPH is a stable radical, with maximum strong absorbance at 517 nm (purple color) in the UV spectrum [21].

The previous research has shown that soft coral extracts also show potential as antioxidants. *Cladiella* sp. was collected from Sanyabay of Hainan Island of China, reported to have isolated Cladiellin A and two dehydrated products. These three compounds show antioxidant activity evaluated by the ORAC (Oxygen Radical Absorbance Capacity) method [22]. Two sesquiterpene compounds isolated from *Sinularia* sp. were collected from Sanya bay Hainan Island of China [12]. The crude of *Dendronephthya* sp. collected from Payar Island, Langkawi, which was evaluated by the DPPH and FTC methods (Ferric Thiocyanate) [17]. Lobocompactols A and B isolated from Vietnamese soft coral *Lobophytum compactum* showed moderate peroxy radical scavenging activity [23]. *Sinularia* sp. and *Lobophytum* sp. collected from Pongok Island, Bangka Belitung, Indonesia detected flavonoid derivative components that can act as antioxidants [24].

Soft corals that have not been identified are collected from the Wakatobi Islands Marine National Park, Indonesia inhibits 91.7% DPPH radicals [5]. Ethanolic extract of Red Sea soft coral *Heteroxenia fuscescens* showed mild antioxidant activity [25]. Twenty-four diterpenoid derivatives collected from *Sinularia maxima* and *Lobophytum crissum* showed Peroxy radical capacity-scavenging capacity from moderate to strong [26]. Ethanol extract from *Sarcophyton flexuosum* Tixier-Durivault was collected from Kavarathi Island, Lakshadweep Islands showed increased free radical scavenging when the extract concentration increased gradually [4]. n-butanol fraction *Lobophytum* sp. collected from Selayar Island, South Sulawesi Indonesia, showing DPPH radical scavenging activity (IC50 = 150 μg/mL) [6].

The compounds detected by GC-MS analysis, based on the literature show one hundred and forty-nine compounds (Min Quality 85%) that are potential for varied biological activities. The compounds detected by GC-MS analysis, there were forty compounds reported to indicate potential as antioxidants. 2-Dodecen-1-yl (-) succinonic anhydride (SCA, SCC, and SCD) reported showing antineoplastic agents, antioxidants and antimicrobial activity, detected from *Cynodon dactylon* ethanolic extract [27]. Hexadecanoic acid, methyl ester (SCA, SCB, SCD, and SCE) reported to be detected from the methanolic extract of *Halymenia dilatata* and showed antioxidant activity, nematicide, pesticide, antiandrogenic, flavor [28]. Bacchotricuneatin c (SCA, SCA, and SCA) reported from the chloroform extract of *Ziziphus mauritiana* L. which showed antioxidant, antitumor and antibacterial activity [29]. L- (+) -Ascorbic acid 2, 6-dihexadecanoate detected from *Padina gymnospora* ethyl acetate extract and potentially as an antioxidant [30]. 14 (β) -Pregnane(SCA, SCD, and SCE) reported to identified from *Rhododendron arboreum* ethyl acetate extract [31] and ethanolic extract of *Urgenia indica* [32], which showed potential as an antioxidant and for the prevention and treatment of diabetic retinopathy.
Terpinolene is a *Cupressus macrocarpa* essential oil extract and showed antioxidant activity [33]. Thunbergol was a diterpene alcohol compound detected in soft coral eggs *Lobophyllum compactum* and *Lobophyrum crissum* and reported to have potential as an antioxidant [34,35]. Octacosane(SCA, SCC, and SCE) reported being potent antioxidant and anti-inflammatory, isolated from the ethanolic aqueous extract of *Nymphaea alba*[36]. Heptacosane(SCA and SCE) reported as an antioxidant, which found in the methanol extract of *Halyenina dilatata* marine algae[28]. Tetrapentacontane, 1,54-dibromo- (SCB, SCD, and SCF) detected in the n-hexane extract of *Callistemon viminalis* leaves [37].

Cyclohexene, 3-methyl-6- (1-methylethylidene) - with another name isoterpinolene was a methane monoterpenoids compound, reported to have free radical scavenging activity [38]. Neoisolongifolene, 8,9-dehydro- detected from the *Nardosta chysjatamansi* hexane fraction[39]. 7-Tetracyclo [6.2.1.0 (3.8) 0 (3.9)] undecanol, 4,4,11,11-tetramethyl- reported from essential oil of *Toonasinensis*[40]. Isolongifolene, 9,10-dehydro- reported being detected in essential oil from *Elettariosis wandokthong* rhizome[41]. Isosphathulenol was previously detected in *Salvia syriaca* L.[42].

1-Hexadecanethiol detected in hexane fraction of *Paracoccus pantotrophus* FMR19[43]. 2,6,10,14,18,22-Tetracosahexaene, 2,6,10,15,19,23-hexamethyl-, (all-E) - with another name squalene, a compound of isoprenoids, detected in *Nepthea achabrolii*[44]. 1-Nonadecene reported in hexane, chloroform and methanol fractions of *Scirpus articulatus* seeds[45]. Octadecane reported being detected in *N. alba* L. leaves [36], 1,13-Tetradecadiene detected in the methanol extract of marine microalgae *Tetraselmis chui*[46]. Pyridine-3-carboxamide, oxime, N- (2-trifluoromethylphenyl) - detected in chloroform extract of *Glycyrhiz alegabra* root[47]. Cyclohexanol, 5-methyl-2- (1-methylthelylen) - with another name isopulegol, is an essential oil, and reportedly detected in *Corymbiace triodora* leaves extract[33]. Nonadecane detected in the hexane and chloroform fraction of *S. articulatus* seeds[45]. Hexatriacontane detected in n-hexane extract of *C. viminalis* leaves[37]. Longifolealdehyde is a terpenoid compound and reported in *Ardisia elliptica* methanol extract[48].

The existence of identified compounds in soft corals crude extracts, from the GC-MS analysis, could account for the observed antioxidant property. These compounds can work alone or interact with each other to provide antioxidant properties. Bioactive compounds from natural products work synergistically between compounds with one another [49]. Bioactive compounds can work through multi-target and multi-compound synergistic modes [50].

### 4. Conclusion
This study provides on the potential soft corals origin Palu Bay, Central Sulawesi as a source of antioxidant bioactive (Free Radical Scavenging) [50]. This study also shows the diversity of compounds in soft coral extracts according to GC-MS analysis. This study also gives new information about the potential soft corals of the genus *Nepthea* as an antioxidant. Further study to isolate, purify and identify compounds that have the potential as an antioxidant in soft corals need to do more.

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