International Journal of Public Health Science (IJPHS)
Vol.4, No.1, March 2015, pp. 58~62
ISSN: 2252-8806

Antioxidant Activity of Some Selected East Borneo Plants

Islamudin Ahmad[1], Riski Sulistiarini[2], Laode Rijai[1]
[1]Department of Natural Product Pharmacy, Pharmacy Faculty of Mulawarman University, Indonesia
[2]Department of Pharmacology, Pharmacy Faculty of Mulawarman University, Indonesia

Article Info

Article history:

Received Jan 02, 2015
Revised Feb 02, 2015
Accepted Feb 22, 2015

Keyword:

Antioxidant activity
DPPH
East Borneo
Extract
LC_{50}

ABSTRACT

The native plants of East Borneo the *Costus specious* (Koening) J.E. Smith stem, *Lagerstroemaspesiosa* Pers leaf, *Cerberamangans* L leaf, *Vitistrifolia* L fruit., *Scurrulaatropurpurea* (Blume) Danser root, *Bruceajavanica* (L.) Merr. leaf, *Lygodiummicrophyllum, Bidens Chinensis* Willd., *Sonneratiacaseolaris* L. peel, *Sonneratiacaseolaris* L. stem is almost under-explored for their potensial benefits. They were extracted by the solvents of increasing polarity (n-hexane, ethyl acetate, and n-butanol) were tested for their free radical activity against DPPH (2.2-diphenyl-1-picrylhydrazyl). The ethyl acetate extract of *Costusspesiosus* (Koening) J. E. Smith antioxidant were screnned concentration of 68 ppm, similarly athyl acetate extract of *Vitistrivolia* L., showed antioxidant activity at 64.30 ppm. As the ethyl acetate extract of *Scurrullaatropurpurea* (Blume), *Bruceajavanica* (L.) Merr, *Lygodiummicrophyllum* and *Sonneratiacaseolaris* L. stem, showed antioxidant activity at 273.52 ppm, 91.12 ppm, 17.39 ppm and 7.03 ppm. N-butanol extract of *Lagerstroemaspesiosa* Pers, *Cerberamangans* L, *Bidenschinensis*Willd, and *Sonneratiacaseolaris* L. peel showed 8.37 ppm, 128.59 ppm, 18.17 ppm and 54.29 ppm antioxidant activity using DPPH model systems. Owing to the property, the studies can be further extended to exploit them for their possible application for preservation of food products as well as their use as health supplements.

Corresponding Author:

Laode Rijai,
Department of Natural Product Pharmacy,
Pharmacy Faculty of Mulawarman University,
Campus of Pharmacy Faculty of Mulawarman University, Samarinda, East Kaltim, Indonesia, 75119.
Email: laode@farmasi.unmul.ac.id ; islamudinahmad@farmasi.unmul.ac.id

1. INTRODUCTION

Indonesia is a country that has the greatest biodiversity in the world with more than thirty thousand species of plants efficacious as a medicine. Only about 180 species have been used in traditional medicine by the traditional medicine industry in Indonesia.

This is due to the utilization of Indonesian medicinal plants for treating a disease typically only based on empirical experience passed on from generation to generation without any supporting data that meets the requirements. To be accepted in modern medicine, some of the requirements that must be met mainly its active subtances, so in addition to efficacy, safety rate can be predicted easily [1].

According to philosophies theory, potential of biological resources for human life depends on the amount and type of chemical compounds. Biological resources used as pharmaceuticals, agro-chemicals, and materials science generally contain alkaloids, these Terpenoids, flavanoid compounds, phenols, and others. Variations and composition of these compounds make the biological resources of economic valuable, but the economic value that also trigger the damage because it is exploited or utilized in excess.

Potential of natural compounds in East Borneo tropical forest region untapped to good use.utilization in a traditional manner for using traditional medicine has been done, meanwhile, wild plants

who grow up in East Borneo region that is one sources of antioxidant compounds that has not been a lot of disclosed [1].

A free radical can be defined any molecular species capable of independent existence that contains an unpaired electron in an atomic orbital. The presence of an unpaired electron results in certain common properties that are shared by most radicals. Many radicals are unstable and highly reactive [2]. These free radicals have very short half-life, high reactivity, and damaging activity towards macromolecules like proteins DNA and lipids. Oxidative stress is among the major causative factor in the induction of many chronic and degenerative diseases including atherosclerosis, ischemic heart disease, ageing, diabetes mellitus, imunosupressant, cancer and others. [3]

The purpose this research is conduct screening antioxidant activity in selected East Borneo wild plants with DPPH (2.2-diphenyl-1-picrylhidrazyl) method.

2. RESEARCH METHOD

2.1. Collecting Sample

Sample was collected and chosen based on folklore or traditional treatment from the society around east Kalimantan. It was determined in dendrology laboratorium of forestry faculty mulawarmanuniversity. It was determined to ensure plant species.It was sorted to dry out and to be extracted.

2.2. Extraction

Each sample was extracted using maceration method with different polarity solvent (n-hexane, ethyl acetate and n-butanol). Sample was macerated using n-hexane for 24 hours approximately. Extraction was continued with ethyl acetate and n-butanolin order respectively. Maceration with each solvent was repeated three times.

2.3. Antioxidant activity Determination

As much as 1.0 mL DPPH 0.4 mM put to Volumetrik flask, added a certain number of test material is then added up volume of 5.0 mL ethanol, mixed for 1 minute, until mixture is homogenous and silenced for 30 minutes. This solution is then measured its absorbance at a wavelength of 517 nm maximum wavelength which is in preliminary trials. Do negative control absorbance readings anyway i.e. without addition of solution.

The scavenging ability of the plant extract was determined by the following equation : [4]

$$(\%) = \frac{(Abs.Control - Abs.sample)}{Abs.Control} X100\%$$

The DPPH radical absorbs at 517 nm and in a second substrate-free system, antioxidant activity can be determined by monitoring the decrease in this absorbance. Results were reported as the EC50, that is, the amount of antioxidant necessary to decrease by 50% the initial DPPH concentration [5].

3. RESULTS AND ANALYSIS

Dried sample from some different plants such as: *Costus specious* (Koening) J.E. Smith stem, *Lagerstroemaspesiosa* Pers leaf, *Cerberamangans* L leaf, *Vitistrifolia* L fruit., *Scurrulaatropurpurea* (Blume) Danser root, *Bruceajavanica* (L.) Merr.leaf, *Lygodiummicrophyllum*, *Bidens Chinensis* Willd., *Sonneratiacaseolaris* L. peel, *Sonneratiacaseolaris*L.*steem.* Each sample was extracted using maceration method with different polarity solvent (n-hexane, ethyl acetate and n-butanol). Sample was macerated using n-hexane for 24 hours approximately. Extraction was continued with ethyl acetate and n-butanol in order respectively. Maceration with each solvent was repeated three times.

Antioxidant activity was defined as ability of each extract to inactivating DPPH radical. Parameter for antioxidant activity is called IC_{50}. Sample was mixed with DPPH solution. Absorbance of dpph and sample mixture measured using UV-Vis spectrofotometre at 510-520 nm wavelength. Measurement result showed that maximum wavelength is at 517 nm.

DPPH free radical used in antioxidant activity measurement generally. Purple colour of DPPH solution was resulted from nitrogen's free electron. DPPH radical's free electron reacted with electron from antioxidant compound in sample. Reaction resulted 2.2-diphenyl-1-picrylhydrazyn which changed solution's colour from purple to pale yellow (Figure 1) [6].

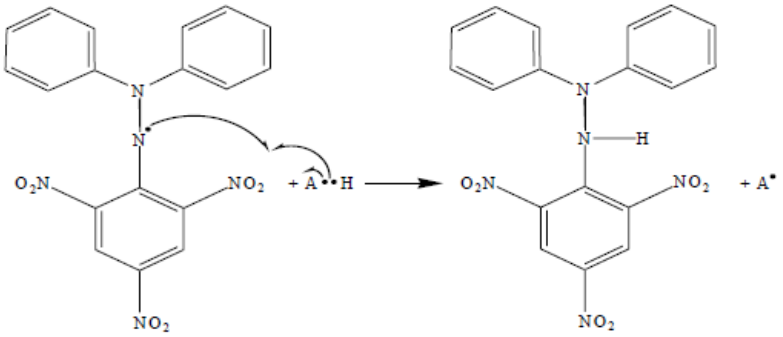

Figure 1. Reaction of Free Radical and DPPH

Table 1. Antioxidant activity of plant extracts

No.	Plants	Ekstract	Equation	r	IC50 (ppm)
1	*Costus specious* (Koening) J.E. Smith stem	N-heksane	y = 0.2569x + 13.028	0.960	143
		Ethyl Asetate	y = 0.3483x + 26.073	0.951	68
		n-Butanol	y = 0.0679x+ 12.358	0.972	547
2	*Lagerstroemaspesiosa*Pers leaf	n-heksane	y = 1.173x + 28.055	0.983	18.7
		Ethyl Asetate	y = 1.763x + 11.505	0.994	21.8
		n-Butanol	y = 2.761x + 26.877	0.981	8.37
3	*Cerberamangans*L leaf	n-heksane	y = 0.0724x + 14.078	0.996	496.16
		Ethyl Asetate	y = 0.1661x + 28.068	0.950	132.04
		n-Butanol	y = 0.2545x + 17.274	0.998	128.59
4	*Vitistrifolia*L fruit	n-heksane	y = 0.201x + 14.590	0.996	176.17
		Ethyl Asetate	y = 0.400x + 24.286	0.987	64.28
		n-Butanol	y = 0.116x + 21.970	0.987	241.64
5	*Scurrulaatropurpurea*(Blume) Danser root	n-heksane	y = 0.138x + 7.173	0.951	310.34
		Ethyl Asetate	y = 0.149x + 9.246	0.897	273.53
		n-Butanol	y = 0.109x + 1.689	0.995	443.22
6	*Bruceajavanica*(L.) Merr. leaf	n-heksane	y = 0.1264x + 21.297	0.972	227
		Ethyl Asetate	y = 0.257x + 26.585	0.937	91.12
		n-Butanol	y = 0.1495x + 26.896	0.960	154.54
7	*Lygodiummicrophyllum*	n-heksane	y = 0.2305x + 4.987	0.992	195.28
		Ethyl Asetate	y = 2.9982x – 2.137	0.996	17.39
		n-Butanol	y = 1.8474x + 4.36	0.974	24.70
8	*BidensChinensis*Willd	n-heksane	y = 0.194x + 2.740	0.997	243.61
		Ethyl Asetate	y = 0.648x + 14.434	0.998	54.89
		n-Butanol	y = 2.596x + 2.826	0.999	18.17
9	*Sonneratiacaseolaris*L. peel	n-heksane	y = 0.2737x + 31.3	0.989	67.48
		Ethyl Asetate	y = 0.470x + 1.346	0.992	109.24
		n-Butanol	y = 0.790x + 7.104	0.980	54.29
10	*Sonneratiacaseolaris*L.steem	n-heksane	y = 1.601x + 1.370	0.973	30.37
		Ethyl Asetate	y = 5.995x + 7.882	0.991	7.03
		n-Butanol	y = 4.373x + 7.604	0.998	9.69

Concentration of sample that could scavenge 50 % free radical (IC50) was used to determine antioxidant capacity of sample compared to standard. Sample that had IC50 < 50 ppm, it was very strong antioxidant, 50-100 ppm strong antioxidant, 101-150 ppm medium antioxidant, while weak antioxidant with IC50 > 150 ppm[7].

Research resultsin Table 1 indicate that the extract has a very strong antioxidant activity among others *Lagerstroemaspesiosa* Pressleaves with IC_{50} values of each extractn-butanol 8.37ppm, 18.7ppmn-hexane andethylacetateextract of21.8ppm. *Lygodiummicrophyllum*at 17.39ppm ethyl acetate extract and 24.70ppm of n-butanol in IC_{50}. *Bidens Chinensis Willd* n-butanol extract with IC_{50} value of 18.17ppm. And *Sonneratiacaseolaris* L. steem with IC_{50} values in 7.03ppm the ethyl acetate and 9.69ppm n-butanol, and n-hexane of 30.37ppm extract.

The extract of ethyl acetate *Costusspecious (Koening) JE Smithstem and Vitistrifolia Lfruit, Bidens Chinensis Willd* with respective IC_{50} of 68ppm, 64.28ppm and 54.89ppm has powerful antioxidant. While extracts which have atioksidan activity being that n-hexane extract of *Costusspecious(Koening) JE Smith*stem with IC_{50} of 143ppm, *Cerberamangans L* leaves with IC_{50} values in theethyl acetate extract of 132.04ppm

and 128.59ppm n-butanol and ethylacetate extracts *Sonneratiacaseolaris* L.peel with IC_{50} of 109.24ppm. And extracts which have a weak antioxidant activity of n-hexane extracts *Vitistrifolia* Lfruit and *Lygodiummicrophyllum* with IC_{50} values of each 176.17ppm and 195.28ppm, and n-butanol extract *Bruceajavanica* (L.) Merr. Leaves with IC_{50} of 154.54ppm. While the extract with IC_{50} values above 200ppm excluding categories that have antioxidant activity.

The antioxidant activity exhibited by plant extracts obtained from the activity is suspected of secondary metabolites present in the plant above [8].

Secondary metabolites are produced or synthesized compounds on cells and certain taxonomic groups in the rate of growth or a particular stress. Secondary metabolites are used as modern medicine among other alkaloids from plants *Rouwolvia serpentine*, atropine from *Hyoscymus niger* plant , Caffeine from *Coffea Arabica* plant, Cocaine from *Erythorxyln coca* plant , and Vinblastine from *Catharanthus roseus* [9].

Some secondary metobolit such as phenolic and flavonoid group has recorded a reduction of free radicals activity [9],[10].

In general it can be seen that the best antioxidant activity of each plant in Table 2.

Table 2. The best activity of each plant

No	Plants	Ekstract	IC_{50} (ppm)
1	*Costus specious* (Koening) J.E. Smith stem	EtilAsetat	68
2	*Lagerstroemaspesiosa*Pers leaf	n-heksan	18.7
3	*Cerberamangans*L leaf	n-butanol	128.59
4	*Vitistrifolia*L fruit	EtilAsetat	64.28
5	*Scurrulaatropurpurea*(Blume) Danser root	EtilAsetat	273.53
6	*Bruceajavanica*(L.) Merr. leaf	EtilAsetat	91.12
7	*Lygodiummicrophyllum*	EtilAsetat	17.39
8	*BidensChinensis*Willd	n-butanol	18.17
9	*Sonneratiacaseolaris*L. peel	n-butanol	54.29
10	*Sonneratiacaseolaris*L.steem	EtilAsetat	7.03

Based on the results of the determination of antioxidant activity (IC50) of some herbsare extracted using solvents with different polarity level (n-hexane, ethylacetate, andn-butanol). Showed that the plants that grow naturally in East Kalimantan region has a very promising potential as a source of natural antioxidants that can be developed into a good health product in dosage form drugs and health sulplemen.

4. CONCLUSION

Based on the research that has been done, it can be concluded that results of screening antioxidant activity of various extracts from each plant is known that most of the material has potential as a natural antioxidant from the category of the most powerful to the weak category.

ACKNOWLEDGEMENTS

Our thanks to all lecturers and all researchers in Pharmacy Faculty of MulawarmanUniversity.

REFERENCES

[1] Rijai, L.,"Kajian Strategi Pemanfaatan Potensi Tumbuhan Obat Unggulan secara Berkelanjutan",*Desertasi*, Sekolah Pascasarjana Institit Pertanian Bogor, 2010.

[2] V. Lobo, A. Patil, A. Phatak, N. Chandra, "Free Radicals, Antioxidants And Functional Foods: Impact On Human Health",*Pharmacogn rev*.,vol/issue: 4(8), pp. 118–126, 2010. Doi: 10.4103/0973-7847.70902.

[3] Effat S., "Screening of Thirteen Medicinal Plant Extracts for Antioxidant Activity",*Iranian Journal of Pharmaceutical Research*,vol/issue: 7(2), pp. 149-154, 2008.

[4] Naima S., MR.Khan, Maria S., "Antioxidant Activity, Total Phenolic and Total Flavanoid Contents of whole Plant Extract Torilis leptophylla L.", *BMC Complementary and Alternative Medicine*,vol.12, pp.221, 2012. doi:10.1186/1472-6882-12-221 The electronic version of this article is the complete one and can be found online at: http://www.biomedcentral.com/1472-6882/12/221.

[5] Michael A., Paul DP., Emilios P., Suzanne M., Kevin R., "Methods for testing antioxidant activity", *Analyst*, vol. 127, pp. 183-198, 2001. DOI: 10.1039/B009171P.

[6] Molyneux P.,"The Use of the Stable Free Radical Diphenyl Picrylhidrazyl (DPPH) for Estimating Antioxidant Activity",*Sonklanakarin J.Sci. Technol*., pp. 211-219, 2004.

[7] Fidrianny, Irda, Ira R., Komar RW.,"Antioxidant Capacities From Various Leaves Extracts Of Four Varieties Mangoes Using Dpph, Abts Assays And Correlation With Total Phenolic, Flavonoid, Carotenoid",*International Journal of Pharmacy and Pharmaceutical Sciences*, vol/issue: 5(4), 2013. ISSN- 0975-1491.
[8] Mariska I.,"Metabolit Sekunder: Jalur Pembentukan dan Kegunaannya", Balai Besar Litbang Bioteknologi & Sumber Daya Genetika Pertanian, Bogor, 2013.
[9] Gahafar MS., et. al.,"Flavonoid, Hespiridine, Total Phenolic Contents And Antioxidant Activities From Citrus Species", *African Journals Online*,vol/issue: 9(3), 2010.
[10] Amarowicz R., et. al.,"Free Radical-Scavenging Capacity, Antioxidant Activity, And Phenolic Composition Of Green Lentil (*Lens cuculinaris*)",*Food chemistry*,vol/issue: 121(3), pp. 705 – 711,2010.

BIOGRAPHIES OF AUTHORS

Islamudin Ahmad, S.Si., M,Si., Apt
islamudinahmad@farmasi.unmul.ac.id
+6281342205060
Departement of Natural Product Pharmacy, Pharmacy Faculty of Mulawarman University

RiskiSulistiarini, S.Farm., M.Si
riski@farmasi.unmul.ac.id
+62 85247257700
Departement of Pharmacology, Pharmacy Faculty of Mulawarman University

DR. LaodeRijai, M.Si., Drs
loade@farmasi.unmul.ac.id
+62 85247263809
Departement of Natural Product Pharmacy, Pharmacy Faculty of Mulawarman University