

Antioxidant Activity and Phytochemical Screening of Some *Sansevieria* Plants

T. M. Sarjani, A. L. Mawardi*, E. S. Pandia, A. R. S. Siregar
Biology Education Department, Faculty of Teacher Training and Education
Samudra University
Nanggroe Aceh Darussalam, Indonesia
*mawardibio@unsam.ac.id

Abstract—*Sansevieria* plants are known as ornamental plants that are able to ward off free radicals in nature, this plant allegedly potential as antioxidant. This study aimed to determine the antioxidant activity of three ethanol plant extracts from *Sansevieria* genus, *Sansevieria trifasciata*, *Sansevieria green tiger* and *Sansevieria zeylanica*, were tested by using the 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical-scavenging assay. This method measuring the IC₅₀ of the extracts. The plant extracts that point the highest antioxidant activity were *Sansevieria trifasciata*, the most potential as an alternative to antioxidant substitutes for vitamin C with an IC₅₀ value of 9.44 ppm. This result would be promising sources for developing anticancer agents. Flavonoids are the principle elements for toxicity activity and are promising compounds for use as antioxidant agents.

Keywords—antioxidant activity, DPPH, *Sansevieria*

I. INTRODUCTION

Over their life span, the organism is exposed to the effects of free radicals, the generation of oxidizing agents caused by environmental pollutants, lifestyle, pesticides and cigarette smoke [1,2].

Two of the numerous chemical entities such as ROS (Reactive Oxygen Species) and RNS (Reactive Nitrogen Species) agents that act as oxidizing agents have shown causing cross-linking and protein modification, lipid peroxidation, polypeptide backbone, cross-linking in DNA causing intrastrand and interstrand DNA [3,4]. All these processes over time will cause serious effects, such as arteriosclerosis, ageing, blind spot, long-term inflammation; as well as cancers, diabetes mellitus, liver and neurodegenerative disease, and cardiovascular disorder [5,6].

Humans have their own endogenous defense system to ward off free radical compounds formed by various enzymes, such as catalase (CAT), glutathione peroxidase (GPX), and superoxide dismutase (SOD) which form antioxidant compounds, however, their effectiveness is still lacking due to the disproportionate number of free radical attacks from the environment that enter the body, therefore exogenous antioxidant compounds are needed [7,8].

Antioxidants from outside the body (exogenous) can be obtained naturally from nature, such as plants that function as antioxidants and antioxidants synthetically. The use of synthetic antioxidants is carcinogenic and in a certain period can cause poisoning to the body [9,10]. The use of natural antioxidants from certain plants has been developed. Plants with phenolic content such as flavonoids, alkaloids, saponins, tannins, steroids / triterpenoids can inhibit exposure to free radicals [11,12].

Based on the metabolite compounds contained in plants from the genus *Sansevieria*, it is thought to have antioxidant activity. *Sansevieria roxburghiana* Schult is stated to have active antioxidant compounds in the form of alkaloid compounds, saponins, flavonoids, phenols, and steroids by phytochemical tests with IC₅₀ 1.45 µg/mL [13,4]. Followed by *Sansevieria Masoniana Chahin* the extract contains flavonoid and saponin compounds with IC₅₀ 97,902 µg/mL [15], and by *Sansevieria Cylindrica* shows the phytochemical content of alkaloids, triterpenoids, flavonoids and steroids with IC₅₀ 99,66 µg/mL which have the ability as antioxidants [16,17].

However, information about the antioxidant activity of several other *Sansevieria* species and also the comparison of their effectiveness, namely *Sansevieria trifasciata*, *Sansevieria green tiger*, and *Sansevieria zeylanica* is not yet known, even though the knowledge of these plants is important to know so that it can make the plant genus *Sansevieria* a plant source of antioxidants. The use of *Sansevieria* plants in research is also based because these plants are easy to find in tropical regions such as Indonesia, so they are efficient to be used as research samples.

The high yield of antioxidants produced by the *Sansevieria* plant so that it can protect body cells from exposure to UV rays, free radical compounds, and with the aim of reducing the use of synthetic antioxidants prompted us to examine 3 ethanol extracts from 3 species of *Sansevieria* to see their antioxidant activity and make comparisons. The antioxidant assays selected for this study is 1,1-diphenyl-2-picrylhydrazyl (DPPH), These assay are primarily based totally on electron transfer (ET) response principle, where the colour change will act as an

indicator to the potential of antioxidant in reducing the radicals [18].

II. METHODS

A. Plant Material

Samples of fresh tongue-in-law leaves were collected from Meurandeh Village, Langsa city of Aceh Province Indonesia between June and July 2020. Samples were cleaned and then dried without direct sun exposure for 2 days. After drying, let it air the leaves are crushed and stored inside a closed container. The purpose of drying is to prevent enzymatic reactions (microbial activity) and prevent the growth of fungi so that they can be stored longer and are less easily damaged and their chemical composition does not change.

B. Extraction

The extraction method used is a maceration method with using 96% ethanol solvent. Each leaf powder of each species *Sansevieria* as much as 500 gr macerated with 2 L of 96% ethanol in the container closed for 2 x 24 hours with stirring occasionally. Then the macerate is filtered and pressed evaporation using a rotary evaporator at a temperature of 100° C to separate extract with solvent. Next evaporated with a water bath until formed a viscous extract.

C. Phytochemical Analysis

Flavonoids, saponins, terpenoids, steroids, alkaloids, and tannins were tested on the extract of the leaves. The flavonoid test was carried out with H₂SO₄, the saponin test was carried out with distilled water, alcohol, and HCL, the terpenoid test used the Liebermann-Burchard reagent, the steroid test was carried out with the Liebermann-Burchard reagent, the alkaloid test was carried out with HCL, Bouchardart reagent and Meyer reagent, the tannin test was carried out with FeCl₃ [19].

D. Antioxidant Activity Assay for DPPH Free Radical Scavenging Activity

Antioxidant activity was tested using the DPPH method which made into a control solution in the form of OH ethanol, vitamin C solution (positive control) was made into concentrations of 2, 4, 6, 8, 10 ppm, and the third series solution of the in-law's tongue leaf extract, each series solution was made into concentrations of 2, 4, 6, 8, 10 ppm; then, each solution is left for 30 minutes in a dark room; Then, measure the absorbance at a wavelength of 517 nm with a UV-VIS spectrophotometer. As blank was used a solution prepared mixing 1 mL DPPH solution with ethanol p.a and reading at the same wavelength.

E. Data Analysis

The percent inhibition was calculated from the following equation :

$$\% \text{ Inhibition} = \frac{[\text{Absorbance of control} - \text{Absorbance of test sample}]}{\text{Absorbance of control}} \times 100$$

Then, the data were analyzed by using the Linear Regression with Microsoft Excel test.

III. RESULTS AND DISCUSSION

This study used three species of *Sansevieria* plants consisting of *Sansevieria trifasciata*, *Sansevieria green tiger* and *Sansevieria Zeylanica*. First, leave *Sansevieria* dry and air dry for two days as much as 500 grams of *Simplicia*. After maceration and evaporation of each extract of the leaves of the tongue-in-law as much as 200 ml was used for the antioxidant test. Before doing the antioxidant test, first, the secondary metabolites were determined by using phytochemical tests on leaf extracts. The results of the phytochemical test can be seen in table 1.

TABLE I. RESULT FROM PHYTOCHEMICAL SCREENING

Phytocompounds	<i>S. trifasciata</i>	<i>S. green tiger</i>	<i>S. zeylanica</i>
Flavonoid	(+)	(+)	(+)
Saponin	(+)	(+)	(+)
Terpenoid	(-)	(-)	(-)
Steroid	(+)	(+)	(+)
Alkaloid	(-)	(-)	(-)
Tanin	(-)	(-)	(-)

Based on the results of phytochemical tests, the three *Sansevieria* species were positive for the same secondary metabolites in the form of flavonoids, steroids, and saponins.

The determination of the value of antioxidant activity in the extract of the *Sansevieria* plant uses the DPPH (1,1-diphenyl-2-picrihidrazil) free radicals absorption method. The reason for using this method is due to its simple, fast, and proven accuracy. The reduction of free radicals by these antioxidant compounds will form DPPH radicals to become stable and experience a reduction in color intensity, thus indicating an increase in the antioxidant activity from the extract [20,21].

Based on tables 2, 3, and 4 it can be seen that the greater the concentration of the extract of the tongue-in-law leaves that is tested for its antioxidant activity, the smaller the absorbance value and the greater the% inhibition value. At a concentration of 10 ppm, the% inhibition was found to be the greatest and at a concentration of 2 ppm had the smallest% inhibition. Likewise, with vitamin C solution which at a concentration of 10 ppm found the highest% inhibition, namely 62.08%, and at a concentration of 2 ppm had the smallest% inhibition, namely 47.99%. Thus it shows that the higher the leaf extract concentration or the concentration of vitamin C given, the higher the number of antioxidants contained in the leaf extract and vitamin C concentrations so that it has the better ability to reduce free radicals. The relationship between the IC₅₀ value and the% of attenuation is that if the IC₅₀ value is smaller, the% of attenuation is greater, which means that the extract contains a lot of potential antioxidant compounds and the antioxidant activity of an extract against free radical reduction is getting better because it can reduce more free radicals.

The flavonoids contained in the *Sansevieria* extract have the ability as antioxidants because there are hydroxyl groups can give one of its hydrogen atoms to a free radical compound so that phenolic compound

radicals can reduce free radicals. On the other hand, if the IC₅₀ value is large, the% attenuation is small, which means that the antioxidant compounds are in small amounts and have less good antioxidant activity [10,22].

TABLE II. ABSORBANCE MEASUREMENT OF SANSEVERIA TRIFASCIATA LEAF EXTRACTS WITH COMPARATIVE VIT C

No.	Control (EtOH, Abs)	Concentration (ppm)	Absorbance		% Inhibisi	
			Vitamin C	Sansevieria T	Vitamin C	Sansevieria T
1	0,298	2	0,155	0,213	47,99	28,52
2		4	0,127	0,195	57,38	34,56
3		6	0,119	0,169	60,07	43,29
4		8	0,116	0,164	61,07	44,97
5		10	0,113	0,146	62,08	51,01

TABLE III. ABSORBANCE MEASUREMENT OF SANSEVERIA GREEN TIGER LEAF EXTRACTS WITH COMPARATIVE VIT C

No.	Control (EtOH, Abs)	Concentration (ppm)	Absorbance		% Inhibisi	
			Vitamin C	Sansevieria GT	Vitamin C	Sansevieria GT
1	0,298	2	0,155	0,241	47,99	19,13
2		4	0,127	0,241	57,38	19,13
3		6	0,119	0,23	60,07	22,82
4		8	0,116	0,222	61,07	25,50
5		10	0,113	0,21	62,08	29,53

TABLE IV. ABSORBANCE MEASUREMENT OF SANSEVERIA TRIFASCIATA LEAF EXTRACTS WITH COMPARATIVE VIT C

No.	Control (EtOH, Abs)	Concentration (ppm)	Absorbance		% Inhibisi	
			Vitamin C	Sansevieria Z	Vitamin C	Sansevieria Z
1	0,298	2	0,155	0,216	47,99	27,52
2		4	0,127	0,212	57,38	28,86
3		6	0,119	0,201	60,07	32,55
4		8	0,116	0,198	61,07	33,56
5		10	0,113	0,155	62,08	47,99

TABLE V. IC₅₀ VALUE OF LEAF EXTRACT OF SANSEVERIA TRIFASCIATA, SANSEVERIA GREEN TIGER AND SANSEVERIA ZEYLANICA AND VIT C

No	Sample	Straight-line equations	IC ₅₀ values
1.	Vitamin C	y = 1,594x + 48,154 R ² = 0,778	1,16
2.	Sansevieria trifasciata	y = 2,768x + 23,859 R ² = 0,968	9,44
3.	Sansevieria green tiger	y = 1,359x + 15,067 R ² = 0,938	25,70
4.	Sansevieria Zeylanica	y = 2,282x + 20,403 R ² = 0,782	12,97

An antioxidant is included in the very strong class if the IC value is much less than 50 ppm, a strong antioxidant if it's far 50-a hundred ppm, slight if it's far 101-250 ppm, is weak if it's far 251-500 ppm and does now no longer characteristic an antioxidant with a cost of extra than 500 ppm. From table 2, 3, and 4 it can be seen that at each concentration there is an increase in% inhibition, where at a concentration of 2 ppm the inhibition value of the three extracts is 28.52%, 19.13%, 27.52%, at a concentration of 4 ppm. with% inhibition of 34.56%, 19.13%, and 28.86%, the% inhibition continued to increase followed by an increase in extract concentration. The highest% inhibition was 51.01% with a concentration of 10

ppm in the *Sansevieria trifasciata* species. From the curve that continues to increase, the R₂ value of the three extracts is 0.9678, 0.9389, and 0.782, which are close to +1 (positive value). It shows that% free radical reduction has a correlation with the three extracts of the *Sansevieria* leaves. Where the higher the concentration tested, the higher the% of free radical reduction.

From table 2,3 and 4 it can also be seen that at each concentration of vitamin C there is an increase in% inhibition, where at a concentration of 2 ppm the inhibition value of vitamin C is 47.99%, at a concentration of 4 ppm the inhibition

of vitamin C is 57.38, continues to occur. an increase in% inhibition followed by an increase in the concentration of vitamin C given. The highest in percent inhibition was at a concentration of 10 ppm which was 62.08%. From the increasing curve, the R_2 value of the vitamin C solution is 0.778 which is close to +1 (positive value). This shows that the% free radical reduction has a correlation with the vitamin C solution. Where the higher the concentration tested, the higher the% free radical reduction.

The IC_{50} value can be determined using the Least square equation. Making graphs and looking for linear regression equations using the Microsoft Excel test. The following is a table of the results of calculating the IC_{50} value of the three extracts leaves and vitamin C.

From table 5, it can be seen that the results of the IC_{50} value of the three extracts of the tongue-in-law leaves are still lower than the IC_{50} value of vitamin C. This indicates that vitamin C as a positive comparison is still better than the three extracts of the *Sansevieria* leaves as an antioxidant at the same concentration. (2 ppm, 4 ppm, 6 ppm, 8 ppm, 10 ppm), but the *Sansevieria trifasciata* species has the most potential as a source of antioxidants with the smallest IC_{50} value of 9.44 which is included in the very strong antioxidant category.

IV. CONCLUSIONS

Based on the results of the research and the data obtained, it can be concluded that *Sansevieria trifasciata* leaf extract has very strong antioxidant activity and has the most potential as an alternative to antioxidant substitutes for vitamin C, with an IC_{50} value of 9.44 ppm. From this research, it can also be seen that flavonoids are the main factors for toxicity activity and are promising compounds to be used as antioxidant agents.

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