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Potential Medicinal Plant Antioxidant Compounds Based on Local Ethnobotany of Dadap Ayam (*Erythrina variegata* L.) from East OKU District

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Abstract

Indonesia is one of the countries rich in natural resources, especially plant diversity. This plant diversity includes various plants that have the potential of being traditional medicine. Types of plants that can be used in traditional medicine are useful for curing various diseases in the community and can be used as raw materials for medicine. In Ogan Komering Ulu Timur (OKU Timur) district there are 20 sub-districts but only 2 sub-districts are used as plant exploration areas that are used as observation objects, namely Bunga Mayang and Martapura. The plant surveyed is the dadap ayam plant (*Erythrina variegata* L.), used in traditional medicine by the Javanese people in Buay Madang Timur, OKU Timur. To determine the chemical content and antioxidant activity of the dadap ayam plant leaves. The dadap ayam plant is used in traditional medicine by the Javanese people in Buay Madang Timur, OKU Timur and is known as a herbal plant based on previous research journals. The study of the antioxidant activity of dadap ayam leaves was conducted from October to March 2025. Sampling was conducted in Bunga Mayang District, Peracak Village and Martapura District, East Ogan Komering Ulu Regency, South Sumatra. Dadap ayam leaf samples were identified at the Botany Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, University of Lampung (UNILA). Sample processing such as extraction, fractionation and compound purification were performed at the Genetics and Biotechnology Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, Sriwijaya University (Indralaya). Metabolite profile analysis of dadap ayam leaf extract using GC-MS was conducted at the Integrated Research and Testing Laboratory, Universitas Gadjah Mada Yogyakarta. The results of this study obtained strong antioxidant activity in the thick extract of dadap ayam leaves (*Erythrina variegata* L.) obtained in the N-Hexane fraction, which was 5.4306 ppm and the ethyl acetate fraction, which was 17.819 ppm. The methanol-water fraction was not active in antioxidant activity. The groups of pure compounds that have antioxidant activity obtained in dadap ayam leaf samples are the terpenoid group (N1), phenol group (N2 and E1), steroid group (N3) and flavonoid group (N4, and E4). Pure compounds obtained from dadap ayam leaf samples have very strong, strong and moderate antioxidant activity. Pure compounds with the terpenoid group (N1) obtained an IC_{50} value of 58.49 ppm. The phenol compound group (N2 and E1) obtained an IC_{50} value of (17.12 ppm and 100.15 ppm). Meanwhile, the steroid compound group (N3) obtained an IC_{50} value of (65.59 ppm) and the flavonoid compound group (N4 and E4) obtained an IC_{50} value of (10.29 ppm and 25.09 ppm).

Keywords: Antioxidants; Dadap Ayam (*Erythrina variegata* L.); Medicinal Plants; Metabolite Profile; Ogan Komering Ulu Timur (OKU Timur).

INTRODUCTION

Indonesia is one of the countries rich in natural resources, especially plant diversity. This plant diversity includes various plants that have the potential of being traditional medicine. Types of plants that can be used in traditional medicine are useful for curing various diseases in the community and can be used as raw materials for traditional medicine. Traditional medicine is medicine made simply or traditionally by parents in ancient times that is still used by the community today. Not many people are interested in using traditional medicine because many people in this era do not know the content of each plant in their yard/around their place of residence that can be used as traditional medicine. According to Oktaviani et al., (2020), medicinal plants can be found in various habitats such as forests, agricultural land and planted in home yards. Yard land is one of the lands that has the potential to be used to plant various plant species such as ornamental plants, fruits, vegetables, spices, and other food crops.

In East Ogan Komering Ulu Regency (East OKU) there are 20 sub-districts but only 2 sub-districts are used as exploration areas for plants that are used as objects of observation, namely Mayang and Martapura Flowers. The benefits of the leaves of the dadap ayam plant in

East Ogan Komering Ulu are believed to reduce internal heat, treat gout, smooth menstrual blood, postpartum and oxidative stress. How to use it is to mix the leaves with oil added with hot water then drink it and the leaves can also be crushed so that the water comes out and applied to the forehead with a fever. Another way is to crush the leaves until they are crushed, then add a little water, compress them on the head, stomach and chest (Yudianto et al. 2021). Antioxidants activate the development of oxidation reactions by binding free radicals and highly reactive molecules so that cell damage can be inhibited. Antioxidants can work by overcoming damage to human skin caused by the effects of free radicals which are the main factors in the aging process and skin tissue damage (Utami, 2021). Information regarding the efficacy of the dadap ayam plant as an antioxidant is traditionally still very limited and has not been widely studied in Indonesia. Based on research conducted by previous researchers, the researchers aimed to determine the antioxidant activity content of the leaves of the dadap ayam (*Erythrina variegata* L.) plant.

MATERIALS AND METHODS

Study area

Study areaThe study of antioxidant activity of leaves of dadap ayam (*Erythrina variegata* L.) was conducted from October to March 2025. Sampling was conducted in Bunga Mayang District, Peracak Village and Martapura District, East Ogan Komering Ulu Regency, South Sumatra (Figure 1). Identification of dadap ayam leaf samples was conducted at the Botany Laboratory, Biology Department, Faculty of Mathematics and Natural Sciences, University of Lampung (UNILA). Sample processing such as extraction, fractionation and compound purification were conducted at the Genetics and Biotechnology Laboratory, Biology Department, Faculty of Mathematics and Natural Sciences, University of Sriwijaya (Indralaya). Metabolite profile analysis of dadap ayam leaf extract using GC-MS was conducted at the Integrated Research and Testing Laboratory, Gadjah Mada University, Yogyakarta.

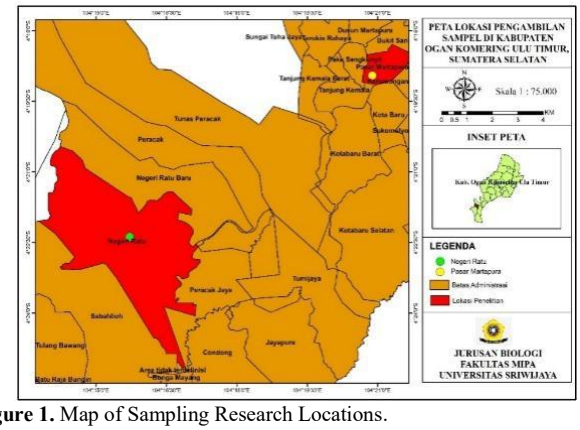

Figure 1. Map of Sampling Research Locations.

The tools used in this study were stationery, camera, stirring rod, blender, glass bottle, vial bottle (3mL and 10mL), funnel, separating funnel, 2000mL Erlenmeyer flask, glass, beaker, measuring cup, scissors, hot plate, hair dryer, column, cuvette, evaporator flask, fume hood, capillary pipette, dropper pipette, rotary evaporator (IKA RV 10), tweezers, petri dish, small tube, UV-Visible spectrophotometer, stand, analytical/analog scale and GC-MS Trace TM 1310 ISQ. The materials used in this study were samples of leaves of the dadap ayam plant (*Erythrina variegata* L.) weighing 500g. The chemicals used were methanol, ethyl acetate, n-hexane, KLT plate, *aluminum foil*, silica GF254 KLT plate, 1,1-*diphenyl-2picrylhydrazyl* (DPPH) powder, distilled water, *aluminum chloride*, $A1C1_3$ p.a, E Merck, *hydrochloric acid*, HCl, 37%, *ascorbic acid*, *boric acid*, HBO_3, E Merck, *sulfuric acid*, cotton, label paper, filter paper, sodium acetate, NaOAc, E Merck, *sodium hydroxide*, and NaOH p.a, 99%.

RESULTS AND DISCUSSION

Extraction of Dadap Ayam (*Erythrina variegata* L.) Leaves

Based on the results of the study of the extraction of dadap ayam by maceration with methanol solvent, the weight of the thick extract and the percentage of yield of dadap ayam leaf extract was obtained. The following is the data on the weight of the thick extract and the percentage of yield of methanol extract of dadap ayam leaves.

Table 1. Weight of Thick Extract and Percentage of Methanol Extract Yield of Dadap Ayam Leaves.

No.	Simple Weight	Condensed Extract Weight	Extract Yield Weight
		(gram)	(%)
1	500	57,64	11,53

From the results of the study in (Table 1) it shows that from 500g of dadap leaf simplicia that has been macerated using 3L of methanol solvent with 3 times of remaceration process, a thick extract of 57.64g was obtained and the percentage value of the extract yield was 11.53%. For the percentage weight of the dadap chicken leaf extract yield, it is above 10% and this can be said that the results of the extraction process are quite good. According to Ramdhini (2023), the yield calculation is carried out to determine the ratio of the weight of the simplicia or extract produced to the weight of the raw material. The general requirement for raw material yield is >10% (more than 10%).

Fractionation of Chicken Dadap Leaf Extract (*Erythrina variegata* L.)

Based on the results of the study, it was shown that the fractionation of methanol extract of dadap ayam leaves using 3 solvents, namely: N-Hexane, ethyl acetate and water methanol obtained different weights of fractions and percentage yields of dadap ayam leaf extract fractions as shown in (Table 2). The following are the results of the weights of fractions and percentage yields of methanol extract fractions of dadap ayam leaves.

Table 2. Fraction Weights and Percentage Yields of Dadap Ayam Leaf Extract Fractions.

No.	Solvent Type	Fraction Weight	Fraction Yield (%)
1	N-Hexase	23,21	40,27
2	Ethyl acetate	24,99	43,36
3	Methanol water	9,44	16,37

The study's results in (Table 2) show that the weight of the N-Hexane fraction is 23.21g, the weight of the ethyl acetate fraction is 24.99g and the weight of the water methanol fraction is 9.44g. Meanwhile, the percentage of the N-Hexane fraction yield is 40.27%, the yield of the Ethyl acetate fraction is 43.36% and the yield of the water methanol fraction is 16.37%. From these results it can be seen that the ethyl solvent has a larger fraction weight than N-hexane because the N-hexane solvent tends to produce more pure compounds compared to the ethyl acetate solvent because it is different in polarity. The N-hexane solvent is a more effective solvent in dissolving and separating nonpolar compounds (nonpolar solvents). Meanwhile, the ethyl acetate solvent is a non-polar medium that can dissolve both polar and nonpolar compounds (semipolar solvents). According to Sutomo et al. (2021), fractionation with ethyl acetate is intended to obtain more polar compounds such as flavonoids, tannins, phenols, and glycosides.

Antioxidant Activity Test of Fractions with DPPH using UV-Vis Spectrophotometer

Based on the research results of the fractionation process using 3 types of solvents tested using a UV-Vis spectrophotometer which aims to determine the IC_{50} value of each fraction so that the fraction containing high antioxidant compounds can be identified. This process is useful in the next stage, namely for the column chromatography test. The test on the UV-Vis spectrophotometer was repeated three times and the average was found. The average test results can be seen in (Table 3). The results of the antioxidant activity test on the thick extract fraction of dadap leaves can be seen below.

Table 3. IC_{50} Value of Antioxidant Activity Test of Thick Extract Fraction of Dadap Leaves Using 3 Types of Solvents (N-Hexane, Ethyl Acetate and Methanol Water).

No	Fraction	Rf Value	Antioxidant Activity Fraction	Information
1	N-Hexane	0,7	++	Medium
		0,64	++	Medium
		0,5	+++	Strong
2	Ethyl acetate	0,3	++	Medium
3	Methanol water	0	-	None

Spraying DPPH solution on KLT aims to determine the activity of antioxidant compounds as indicated by the presence of colored spots that appear and the Rf value obtained. According to Ramadhan et al. (2020), qualitative tests using thin layer chromatography (KLT) were also carried out to confirm further the results obtained from the color test. According to Megawati et al., (2021), DPPH reagents that react with antioxidants will experience a color change from purple to yellow, the color intensity depends on the ability of the antioxidant. Pratiwi et al. (2021) state that the Rf value is specific to certain compounds in certain eluents. The Rf value can be used as evidence to identify compounds.

Purification and Isolation of N-Hexane Fraction Compounds of Condensed Extract of Dadap Ayam Leaves

Based on the results of purification and isolation of the N-hexane fraction compound of thick extract of dadap ayam leaves, 5 N-hexane subfractions were obtained which had colored spots on Rf values (Table 5) which were suspected of having antioxidant activity from a total of 12 N-hexane subfractions that had been spotted on the KLT plate.

Table 5. Rf Values of Subfractions in N-Hexane and Antioxidant Activity.

Fraction	Subfraction	Rf Value	Antioxidant Activity	Information
N-Hexane	N1	0,86	+++	Strong
	N2	0,8	++	Medium
	N3	0,4	++	Medium
	N4	0,4	+++	Strong
		0,2	+++	Strong

In (Table 5) above, the results of the Rf value of the N-hexane subfraction that has a colored spot after being spotted on the KLT plate. It is known that the N1 subfraction has an Rf value of 0.86 with a dark yellow/orange color on the KLT plate having antioxidant activity marked with a category (+++) which is strong. N2 has an Rf value of 0.8 with a yellow color at the bottom and a green spot at the top has antioxidant activity marked with a category (++) which is moderate. Meanwhile, N3 has an Rf value of 0.4 with yellow and green colors having antioxidant activity marked with (++) which is moderate. N4 (1) has an Rf value of 0.4 with a dark yellow and green color having antioxidant

activity marked with (+++) which is strong and N4 (2) has an Rf value of 0.2 with a dark yellow color having antioxidant activity marked with (+++) which is strong. According to Fajriani et al. (2022), factors that can influence the Rf value are the number of spots, temperature, and steam in the development vessel used.

Purification and Isolation of Ethyl Acetate Fraction Compounds of Condensed Extract of Dadap Ayam Leaves

Based on the results of purification and isolation of the compound fraction of Ethyl acetate thick extract of chicken daap leaves, 4 Ethyl acetate subfractions were obtained which had colored spots on Rf values (Table 6), which were suspected of having antioxidant activity from a total of 12 N-hexane subfractions that had been spotted on the KLT plate.

Table 6. Rf Values of Subfractions in Ethyl Acetate and Antioxidant Activity.

Fraction	Subfraction	Rf Value	Antioxidant Activity	Information
Ethyl acetate	E1	0,8	+++	Strong
	E3	0,5	+++	Strong
	E4	0,3	+++	Strong
	E5	0,2	++	Medium

In (Table 6) above, the results of the Rf value of the Ethyl acetate subfraction that has a colored spot after being spotted on the KLT plate can be seen in (Appendix 10). It is known that the E1 subfraction has an Rf value of 0.8 with a dark yellow/orange color on the KLT plate having antioxidant activity marked with a category (+++) which is strong. E3 has an Rf value of 0.5 with a yellow color at the bottom and a green spot appears at the top having antioxidant activity marked with a category (+++) which is strong. E4 has an Rf value of 0.3 with a yellow-orange color having antioxidant activity marked with (+++) which is strong and E5 has an Rf value of 0.2 with yellow and green colors having antioxidant activity marked with (++) which is moderate. Different Rf values can indicate the presence of antioxidant compounds with different characteristics, for example compounds with high Rf values approaching 1 have higher polarity and are more easily soluble in water. However, compounds with lower Rf values approaching 0 have more nonpolar properties and are more soluble in organic solvents. According to Forestryana & Arnida (2020), the Rf values obtained indicate differences in the properties of compounds and can be used to identify compounds. Compounds that have a higher Rf mean they have low polarity. This is because the stationary phase is polar. More polar compounds will be strongly retained in the stationary phase, resulting in low Rf values.

Determination of Pure Compound Groups of Chicken Dadap Leaves (*Erythrina variegata* L.)

Based on the results of the study conducted on the determination of pure compound groups of chicken dadap with the repetition method on thin layer chromatography (KLT) and then sprayed with 0.5% sulfuric acid (H_2SO_4). The compound groups obtained from this method of determining pure compound groups are in the N-hexane isolate obtained 1 terpenoid, 2 flavonoids and 1 phenol and in the ethyl acetate isolate obtained pure compound groups, namely 1 phenol and 1 flavonoid. Meanwhile, the Rf value of each isolate can be seen in (Table 7).

Table 7. Rf Values and Antioxidants from Subfractions of Chicken Dadap Leaves.

Isolate	Color	Rf Value	Compound Groups
N1	Purple	0,88	Terpenoids
N2	Yellow	0,8	Phenol
N3	Bluish Green	0,76	Steroids
N4	Yellow Orange	0,5	Flavonoids
E1	Yellow	0,86	Phenol
E4	Yellow Orange	0,5	Flavonoids

Based on the results in (Table 7) samples of dadap ayam leaves, the results of the study showed that there were 6 pure compounds consisting of the N-Hexane subfraction (N1, N2, N3 and N4) and the Ethyl acetate subfraction (E1 and E4). The terpenoid compound group was obtained from the N1 subfraction with eluent (9:1) producing a purple color in the H_2S0_4 spray results on the isolate. Terpenoids are a group of compounds found in the dadap ayam leaf subfraction which show various pharmacological activities, such as: anti-malarial, anti-bacterial, anti-viral, anti-inflammatory and anti-cancer activities. According to Yang et al., (2020), terpenoids have various biological activities such as anti-inflammatory, anti-bacterial, anti-viral, anti-malarial, anti-tumor, preventing and treating cardiovascular disease, lowering blood sugar, as an immunomodulator, antioxidant, and have neuroprotective effects. Most of the terpenoids that have active ions are isolated from medicinal plants.

Antioxidant Activity Test of Pure Isolates of Dadap Ayam Leaves (*Erythrina variegata* L.) Using UV-Vis Spectrophotometer

Based on the antioxidant activity test of pure chicken dadap isolates obtained from the DPPH method by measuring the IC_{50} value, the absorbance value was then measured using a UV-Vis spectrophotometer with a wavelength of 517nm, the average test results were obtained.

Table 8. Results of Antioxidant Activity Test of Pure Isolate Compounds of Dadap Ayam Leaves using the UV-Vis Spectrophotometer method.

Pure Isolate	Persamaan Regresi (Y=ax+b)	IC_{50} (ppm)	Antioxidant Activity
Ascorbic Acid	Y = 9,846 (4,28) + 35,682	4,28	Very Strong
N1	Y = 20,108 (4,0688) - 31,817	58,49	Strong
N2	Y = 13,441 (2,8404) + 11,824	17,12	Very Strong
N3	Y = 7,0749 (4,1367) + 20,733	62,59	Strong
N4	Y = 13,828 (2,3320) + 17,753	10,29	Very Strong
E1	Y = 24,049 (4,6067) - 60,787	100,15	Medium
E4	Y = 14,913 (3,2226) + 1,9401	25,09	Very Strong

In (Table 8) it can be seen that the IC_{50} value of ascorbic acid is higher than the value of the pure isolate of the dadap ayam leaf sample, which is 4.28ppm, meaning it is very strong. This is because ascorbic acid has high natural antioxidants which are used as a comparison for positive controls in pure compounds of dadap ayam leaf isolates in testing the activity of antioxidant compounds. According to Melinda et al. (2024), vitamin C or ascorbic acid is a water-soluble vitamin derived from hexose. Ascorbic acid contains a chromophore group, which is sensitive to light or forms of electromagnetic radiation. In addition, ascorbic acid functions as an antioxidant and protector against free radicals. Vitamin C is a vitamin in the antioxidant group that can ward off various extracellular free radicals. According to Maryanti (2022), vitamin C functions as an antioxidant because it effectively captures free radicals, especially ROS or reactive oxygen compounds. vitamin C works as an electron donor in biochemical reactions both intracellularly and extracellularly.

CONCLUSIONS

Based on the research that has been done, the following conclusions can be drawn: strong antioxidant activity in thick extract of dadap ayam leaves (*Erythrina variegata* L.) was obtained in the N-Hexane fraction, which was 5.4306ppm and the ethyl acetate fraction, which was 17.819ppm. Meanwhile, the methanol-water fraction was not active in antioxidant activity. The groups of pure compounds that have antioxidant activity obtained in dadap ayam leaf samples are the terpenoid group (N1), phenol group (N2 and E1), steroid group (N3) and flavonoid group (N4, and E4). Pure compounds obtained from dadap ayam leaf samples have very strong, strong and moderate antioxidant activity. Pure compounds with the terpenoid group (N1) obtained an IC_{50} value of 58.49ppm. The phenol compound group (N2 and E1) obtained an IC_{50} value of (17.12ppm and 100.15ppm). Meanwhile, the steroid compound group (N3) obtained an IC_{50} value of (65.59ppm) and the flavonoid compound group (N4 and E4) obtained an IC_{50} value of (10.29 ppm and 25.09 ppm).

Competing Interests: The authors declare that there are no competing interests.

REFERENCES

Anwar, K., Santoso, H. B., & Cahaya, N. (2013). Penghambatan Radang Infusa Daun dadap Ayam (*Erythrina variegata* L.) pada Mencit Jantan yang Diinduksi Karagenin. Prosiding Semirata (pp. 45-52). Lampung: Universitas Lampung.

Fajriani N, Kurniawan H and Ugraha F. 2022. Identify the Rhodamin B on lipsticks in the market Using Thin Layer Chromatography (KLT) Method (Identifikasi Pewarna Rhodamin B Pada Lipstik dengan Metode Kromatografi Lapis Tipis (KLT)). Journal Syifa Sciences and Clinical Research (JSSCR). Volume 4 Nomor 3, 2022

Falah F, Sayaktiningsih T, Noorcahyati (2013) Keanekaragaman Jenis dan Pemanfaatan Tumbuhan Berkhasiat Obat oleh Masyarakat Sekitar Hutan Lindung Gunung Beratus Kalimantan Timur. Jurnal Penelitian dan Konservasi Alam.10: 1-18.

Forestryana, D dan Arnida. (2020). Skrining Fitokimia dan Analisis Kromatografi Lapis TipisEkstrak Etanol Daun Jeruju (*Hydolea spinosa* L.). Jurnal Ilmiah FarmakoBahari, 11(2), 113-124.

Hasnaeni., Wisdawati dan Usman, S. (2019). The Effect of Extraction Method on Yield Value and Phenolic Content of Beta-Beta (*Lunasia amara* Blanco) Bark Extract). Galenika Journal of Pharmacy, 5(2), 175-18.

Helmina, Sylvia & Hidayah, Yulianti. 2021. Kajian Etnobotani Tumbuhan Obat Tradisional Oleh Masyarakat Kampung Padang Kecamatan Sukamara Kabupaten Sukamara. Jurnal Pendidikan Hayati. ISSN: 2443-3608Vol.7No. 1(2021) 20-28.

Ismail, A; Rahmawati & Sukmawati. 2024. Uji Aktivitas Antioksidan Fraksi Etil Asetat Kulit Batang Jamblang (*Syzygium Cumini* L.) Dengan Metode DPPH. Makassar Pharmaceutical Science Journal, 2024:1[4] (36), 337-346 ISSN: 2987-0887. Universitas Muslim Indonesia, Makassar, Sulawesi Selatan

Maryanti, Dwi. 2022. Pemanfaatan Buah Jambu Monyet Sebagai Obat Herbal Alternatif Untuk Menunjang Kesehatan Dalam Bentuk Kapsul Jambu Monyet (*Jamet*).

Megawasti; Sukmawati; Aminah.2021. Uji Aktivitas Antioksidan Fraksi Etil Asetat Daun Asam Jawa (*Tamarindus Indica* L) Dengan Metode DPPH (1,1 Diphenyl-2-Picrylhydrazil). Wal'afiat Hosp J. 2021;2(2):95–102.

Melinda, R; Daulay, A. S; Ridwanto & Nasution, M. A. 2024. Penetapan Kadar Vitamin C dan Aktivitas Antioksidan Hasil Perasan Buah Jambu Biji Kristal. *Indonesian Journal of*

Pharmaceutical Education (e-*Journal*) 2024; 4 (3): 438 – 449. ISSN: 2775- 3670 (*electronic*). Jurusan Farmasi, Fakultas MIPA, Universitas Muslim Nusantara Alwashliyah, Kota Medan, Indonesia.

Merdika. M; Febriyanti. R & Amananti. W. 2023. Penentuan IC_{50} Ekstrak Akar Bajakah Tampala (*Spatholobus littoralis* Hassk) Dan Kalalawit (*Uncaria gambir* Roxb) Dengan Metode DPPH. Determination of IC50 Root Extracts of Bajakah Tampala (Spatholobus littoralis Hassk) and Kalalawit (*Uncaria gambir* Roxb) Using DPPH Method. Jurnal Ilmiah Teknik Kimia, Vol. 7 No. 1 (Januari 2023. E-ISSN 2685– 323X

Nadila. (2021). Aktivitas Senyawa Antioksidan Daun Kirinyuh (*Eupatorium Inulifolium* Kunth.). Skripsi. Jurusan Biologi Fakultas Matematika Dan Ilmu Pengetahuan Alam Universitas Sriwijaya.

Oktaviani AD, Ulayyah NNP, Yuliani TS, Rahayu MS, Lubis I, Nurul F (2020) Pemanfaatan Lahan Pekarangan untuk Memenuhi Kebutuhan Keluarga di Desa Cintalaksana, Kecamatan Tegalwaru, Kabupaten Karawang. Jurnal Pusat Inovasi Masyarakat. 2: 535-539.

Pratiwi, D. N., Utami, N., & Pratimasari, D. 2021. Identifikasi Senyawa Flavonoid dalam Ekstrak, Fraksi Polar, Semi Polar serta NonPolar Bunga Pepaya Jantan (*Carica papaya* L.). Jurnal Farmasi, 2(1), 25-31. Precious LAA, Coren JPA, Celestine LA, Mary RMA, Janina CEC, Rheinmark LSS, Adelina PA, Citadel AP. 2012. *Topical administration of Averrhoa bilimbi Linn. Leaves crude e xtract prevents UVB-induced oxidative damage in albino mice*. The Steth,6:29-41.

Ramadhan. N; Rezky D. P & Susiani E.F. 2020. Penetapan Kandungan Total Fenolik-Flavonoid pada Fraksi Etil Asetat Kulit Batang Kasturi (*Mangifera casturi* Kosterman). Jurnal Farmasi Dan Ilmu Kefarmasian Indonesia Vol. 8 No. 1 April 2021. Program Studi S1 Farmasi, STIKES Borneo Lestari, Banjarbaru, Indonesia

Sutomo; Kiptiah, M; Nurmaidah & Arnida. 2021. Identifikasi Potensi Senyawa Antioksidan Dari Fraksi Etil Asetat Daun Mundar (*Garcinia Forbesii* King.) Asal Kalimantan Selatan. Prosiding Seminar Nasional Lingkungan Lahan Basah P-Issn 2623-1611. Volume 6 Nomor 3 April 2021 E-Issn 2623-1980.Program Studi Farmasi Fakultas Mipa Universitas Lambung Mangkurat

Umboro R.O; Bimmaharyanto D. E; & Yanti N. K. 2020. Uji Efektivitas Antioksidant (IC_{50}) Dan Toksisitas Akut (Ld50) Fraksi Etanol Daun Nangka (*Artocarpus Heterophyllus* Lam.). JUPE: Jurnal Pendidikan Mandala. http://ejournal.mandalanursa.org/index.php/JUPE /i ndex. Vol. 5. No. 6 Desember 2020.p-ISSN: 2548-5555 e-ISSN: 2656-6745

Utami, Yuri Pratiwi. 2021. Uji Aktivitas Antioksidan Ekstrak Etanol Akar Sambiloto (*Andrographis paniculata* (Burm.F.) Ness.) Dengan Metode DPPH. Journal Pharmacy Medical Vol.4 No.1,2021. Diakses pada 09 April 2025.

Yang, W., X. Chen, Y. Li, S. Guo, Z. Wang & X. Yu. 2020. Advances in Pharmacological Activities of Terpenoids. Natural Product Communications. 15(3): 1-13