Hue University Journal of Science: Natural Science
Vol. 134, No. 1S-3, 83–91, 2025 (Special Issue: CBA 2025)

pISSN 1859-1388
eISSN 2615-9678

Evaluation of antibacterial, antioxidant, and anticancer activities of *Alocasia odora* (Roxb.) K. Koch extract

Thao Hien Thi Van[1], Dan Quang Tran[1], Tho Thi Bui*

Department of Biotechnology, Faculty of Biology, Agriculture, Environmental Science, The University of Danang - University of Science and Education, Da Nang City 550000, Vietnam

* Correspondence to Tho Thi Bui <bttho@ued.udn.vn>

(*Received: 08 July 2025; Revised: 02 September 2025; Accepted: 16 September 2025*)

Abstract. *Alocasia odora* (Roxb.) K. Koch is a traditional medicinal plant widely used in Vietnam to treat diseases related to anti-inflammatory, antibacterial, antioxidant, and anticancer properties; however, its biological activities have not been comprehensively investigated. This study evaluates the antibacterial, antioxidant, and anticancer activities of the *Alocasia odora* (Roxb.) K. Koch extract (AOE). AOE exhibited antibacterial activity against *S. aureus* and *P. aeruginosa*. Their inhibition zone diameters ranged from 4.06 ± 0.11 mm to 26.55 ± 0.25 mm, and from 9.21 ± 0.25 mm to 13.23 ± 0.24 mm, respectively, at concentrations between 100 and 800 μg/μL. The MIC and MBC values were 25 μg/μL and 50 μg/μL with *S. aureus* and 50 μg/μL and 100 μg/μL with *P. aeruginosa*. The antioxidant capacity with IC_{50} values of 566.16 μg/mL and 1487.07 μg/mL, determined with DPPH and ABTS methods, respectively, and a low Fe-reducing ability with an IC_{50} of 2100 μg/mL. Anticancer activity of AOE was tested at concentrations from 0.8 to 100 μg/mL on four common human cancer cell lines: MKN-7 (gastric cancer), HepG2 (liver cancer), A549 (lung cancer), and HT-29 (colon cancer). At a 100 μg/mL concentration, the inhibition rate ranged from 23.93% (A549) to 35.51% (HepG2). These preliminary results showed the potential biological activities of *Alocasia odora* (Roxb.) K. Koch and provided a basis for future studies on its medically valuable compounds.

Keywords: *Alocasia odora* (Roxb.) K. Koch, biological activities, antibacterial, antioxidant, anticancer

1 Introduction

Plants have long been known as a precious medicinal storehouse with antifibrotic, antifungal, anti-inflammatory, antimalarial, antibacterial, antimutagenic, antioxidant, anticoagulant, antitumor, antiviral, cytotoxic, hypoglycemic, and leukopenic properties [1]. These properties result from the presence of several compounds, such as vitamins, terpenoids, and polyphenols, including flavonoids [2]. In addition, bioactive components from plants are easily extracted with environmentally friendly solvents, allowing for their use as food and medicine when synthetic drugs cause numerous burdens and harmful effects on the body's excretory organs. The increase in serious illnesses, drug resistance, and counterfeit drugs has made plants more sought-after medicinal materials than ever.

Alocasia odora (Roxb.) K. Koch is a soft perennial plant that thrives in humid environments and is widely distributed in tropical and subtropical regions of Asia, such as Vietnam, China, Japan, Taiwan, and other Southeast Asian countries. The underground stem is a cylindrical or nearly spherical rhizome, creeping, and can be up to 4–5 m long. From the rhizome, long, clearly segmented tubers develop, and each segment is covered by brown scales. This is the part commonly used in traditional medicine. The plant has an upright upper stem, 0.3 to 1.4 meters high.

The leaves are large, with heart-shaped or arrow-shaped blades, entire edges, and prominent pinnate veins. The petioles are thick, hollow, and often grow vertically, with a swollen base like a sheath embracing the rhizome [3]. Numerous reports have identified that plants of this genus are used in traditional medicine. As the juice from *Alocasia macrorrhizos* aids in treating digestion, laxative, diuretic, astringent, and rheumatic diseases, the plant is recommended for various purposes, such as detoxification, liver protection, skin disinfections, and malaria treatment [4].

Despite its versatile medical potentials, no specific studies have evaluated the antibacterial, antioxidant, and anticancer activities of *Alocasia odora* (Roxb.) K. Koch. This study is of both scientific and practical significance, not only contributing to clarifying the potential biological effects of this plant but also opening up prospects for developing valuable medicinal products for the treatment and care of community health.

2 Material and methods

Plant and bacterial samples

Specimens of *Alocasia odora* (Roxb.) K. Koch, including corm samples, were collected from natural populations in Da Nang, Vietnam. Geographical coordinates were recorded by means of GPS; a representative site was located at WGS 84: 16.1102°N, 108.2794°E.

The bacterial strains used to evaluate the antibacterial activity of the extract are *Staphylococcus aureus* (ATCC) and *Pseudomonas aeruginosa* (ATCC).

Extract preparation

After harvesting, *Alocasia odora* (Roxb.) K. Koch samples were treated with 0.1–0.2% $Ca(OH)_2$ and high temperature to remove calcium oxalate, then washed with sterile distilled water. The sample was dried in an oven at 95 °C for 10 minutes and then at 60 °C until a constant weight. The sample powder was extracted with 70% ethanol under reflux for 4 hours at 70–75 °C. The powder-to-solvent ratio was 1:8; then, the extract was cooled and filtered to remove residue. The filtrate was concentrated with a rotary evaporator (StuartRE 400, USA) under a reduced pressure of 90 mbar at 55 °C for 1 hour and 50 minutes. The concentrated extract was dried at 50 °C for 72 h and stored in a refrigerator at –4 °C [5].

Antibacterial activity

Bacteria were activated in Mueller-Hinton broth (MH) and incubated at 37 °C for 24 hours. The antimicrobial activity of AOE against *S. aureus* and *P. aeruginosa* was evaluated with the agar disk diffusion method. Bacterial suspensions were adjusted to 10^6 CFU/mL onto Mueller-Hinton agar plates with concentrations ranging from 100 to 800 μg/μL and placed on the agar surface. DMSO (0.5%) served as a negative control, while netilmicin (for *P. aeruginosa*) and sulfamethoxazole/trimethoprim (for *S. aureus*) served as positive controls. The plates were incubated at 37 °C for 24 hours, and inhibition zones were measured after 24 hours [6]. Antibacterial activity was determined by means of the inhibition zone diameter (mm), calculated as $(D - d)$, where D is the total diameter including the disk, and d is the diameter of the paper disk.

Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC)

50 μL of bacteria at a concentration of 10^6 CFU/mL was added to the MH liquid medium, followed by 50 μL of AOE at various diluted concentrations ranging from 50 to 800 μg/μL. The samples were transferred to a 96-well plate. The positive control consists of bacteria and MH, while the negative control contains of PRE and MH. The samples were incubated overnight at 37 °C. After 24 hours,

pISSN 1859-1388
eISSN 2615-9678

30 μL of 0.015% diluted resazurin (SBC Scientific, Vietnam) was added to each well, and the colour change in each well was observed. MIC is the concentration of AOE at which no resazurin colour change occurs. MBC was determined with the disk diffusion method. 100 μL of the samples from wells with no resazurin colour change was placed onto agar plates and incubated at 37 °C for 24 hours; then, the colony formation was observed. MBC is the lowest AOE concentration where no colonies appear [7].

DPPH radical scavenging

DPPH (1,1-diphenyl-2-picrylhydrazyl) is a stable free radical, purple in colour, and has a maximum absorption at 517 nm. In the presence of antioxidants, it is reduced to 2,2-diphenyl-1-picrylhydrazine (DPPH-H), which is yellow. The DPPH radical scavenging ability of the antioxidant was determined by means of the decrease in absorbance at 517 nm [8]. To measure the absorbance, we prepared a 0.3 mM DPPH solution and extracts at different concentrations. The mixture consists of 100 μL of extract (water as a blank) and 100 μL of the DPPH solution. The suspension was incubated at 37 °C for 30 minutes, and the absorbance was measured at 517 nm. The DPPH free radical scavenging ability (I) was calculated as follows:

$$I = [(A_{Control} - A_{Sample})/A_{Control}] \times 100\% \quad (1)$$

where $A_{Control}$ is the maximum absorbance of the blank sample without extract, and A_{Sample} is the maximum absorbance of the sample to be measured.

ABTS free sadical scavenging activity assay

$ABTS^+$ [2,2'-azinobis (3-ethylbenzothiazoline-6-sulfonate)] is a stable free radical. It is a blue fluorescent substance, characterised with an absorbance at 734 nm. When antioxidants are added to a solution containing $ABTS^+$, they reduce $ABTS^+$ to ABTS. The decrease in absorbance of the solution at 734 nm indicated the antioxidant activity in comparison with a standard. In the potassium persulfate medium, the $ABTS^+$ radical can be stable for two days at ambient temperature in the dark [8]. The procedure is as follows: the $ABTS^+$ radical was formed by reacting 7 mM ABTS and 2.45 mM potassium persulfate ($K_2S_2O_8$) at the 3:1 ratio, incubated in the dark at ambient temperature for 12–16 hours before use. The $ABTS^+$ solution was diluted with water to obtain an absorbance of 1.00 ± 0.02 at 734 nm. 750 μL of the $ABTS^+$ solution was added to 150 μL of the samples with different concentrations. The absorbance at 734 nm was measured after 5 min. The ABTS free radical scavenging capacity (H) was calculated as follows:

$$H = [(A_{Control} - A_{Sample})/A_{Control}] \times 100\% \quad (2)$$

where $A_{Control}$ is the maximum absorbance of the blank sample without extract, and A_{Sample} is the maximum absorbance of the sample to be measured.

Fe3+ reduction

The extract reduces the Fe^{3+} ion in the potassium ferricyanide molecule ($K_3[Fe(CN)_6]$) to the Fe^{2+} ion in the potassium ferrocyanide molecule ($K_4[Fe(CN)_6]$). When $FeCl_3$ is added, Fe^{3+} reacts with the ferrocyanide ion to form a blue ferric ferrocyanide complex ($K_4[Fe(CN)_6]_3$). The procedure for testing the reducing ability is as follows: 1 mL of the sample at the tested concentrations was added to 2.5 mL of a 0.2 M phosphate buffer solution (pH = 6.6), and the mixture was incubated at 50 °C for 20 minutes. Then, each test tube was filled with 2.5 mL of a 10% trichloroacetic acid solution. The working mixture consisted of 2.5 mL of the above solution, 2.5 mL of double-distilled water, and 0.5 mL of a 0.1% $FeCl_3$ solution. The absorbance was measured at 700 nm, and the optical density, OD, reflects the reducing ability of the sample. The

higher the optical density value is, the higher the reducing ability of the sample becomes [9].

Cytotoxic activity

The cell lines used in the study are MKN-7 (gastric cancer), HepG2 (liver cancer), A549 (lung cancer), and HT-29 (colon cancer). The method recognised by the National Cancer Institute (NCI) is a standard cytotoxicity test to screen and detect substances that can inhibit the growth or kill cancer cells *in-vitro* [10]. The test determines the total cell protein content by means of the optical density (OD) measured when the cell protein component is stained with sulforhodamine B (SRB). The measured OD value is proportional to the amount of SRB attached to the protein molecule, so the more cells (the more protein) are, the larger the OD value is. The test was performed under the following specific conditions:

The sample was dissolved in 100% DMSO to obtain an initial 20 mM or 20 mg/mL solution (stock). The solution was diluted on the 96-well plate with the cell culture medium (without FBS) into four concentration ranges from high to low.

The experimental cells were trypsinised to loosen the cells and counted in the counting chamber to adjust the density to suit the experiment. 190 μL of the cell suspension (cultured in a medium containing 5% FBS) was added to each well of the 96-well plate, then incubated in a CO_2 incubator for 18–20 hours to allow stable cell growth.

After this stable growth period, the cells were incubated with the test sample, as follows: 10 μL of a diluted sample at the concentrations indicated above was transferred to the wells of the 96-well plate, where the cells had been prepared. The well without reagent but with cancer cells (190 μL) + 10% DMSO (10 μL) was used as the control for day zero. After one hour, the control well with cells on day zero was fixed with trichloracetic acid (TCA) 20%.

The cells were incubated in the incubator for 48 hours and then fixed with cold TCA 20% (v/v) for one hour. Then, TCA was removed, and the cells were gently washed with dH_2O, dried at ambient temperature, and stained with SRB 0.4% (w/v in 1% acetic acid) for 30 minutes at 37 °C. They were washed three times again with 1% acetic acid and dried at ambient temperature.

200 μL of 10 mM unbuffered Tris base was added to dissolve the SRB, and the mixture was shaken gently for 10 minutes. The OD was read at the 540 nm wavelength on the ELISA Plate Reader (BioTek).

– The percentage of cell growth inhibition in the presence of the test substance was calculated according to the following formula:

$$\% \text{ inhibition} = 100 - (OD_{sample} - OD_{day0})/ -[(OD_{DMSO} - OD_{day0}) \times 100 \quad (3)$$

– The tests were repeated three times to ensure accuracy. Ellipticine at concentrations of 10, 2, 0.4, and 0.08 g/mL was used as a control.

– A 10% DMSO solution was used as a negative control (final concentration in the test well is 0.5%). The IC_{50} value (concentration that inhibits 50% of growth) was determined by means of computer software TableCurve 2Dv4.

– According to the NCI standards, the extract is considered to have good activity with an IC_{50} of 20 μg/mL, while the pure substance is considered to have good activity with an IC_{50} of 5 μM [11].

Data processing

Data were processed on Excel, presented as mean ± standard deviation (SD). Statistical algorithms, t-test, F-test, and one-way ANOVA were used to test for statistically significant differences between

pISSN 1859-1388
eISSN 2615-9678

the samples and the negative control. The difference was considered statistically significant when $p < 0.05$.

3 Results and discussion

3.1 Antibacterial zone diameter

AOE with different concentrations (100–800 μg/μL) was used to test the inhibition of bacterial growth. For both bacterial strains, the antibacterial zone diameter increases with higher extract concentrations (Table 1). The results in Fig. 1 and Table 1 show that the maximum antibacterial zone diameter of *S. aureus* and *P. aeruginosa* was 26.55 ± 0.25 mm (Fig. 1A) and 13.23 ± 0.24 mm (Fig. 1B), respectively, at a AOE concentration of 800 μg/μL ($p < 0.05$). In addition, Haque et al. [12] studied *Alocasia fornicata*, another species of the same genus, and reported antibacterial effect against the *S. aureus* strain. The ethanol extract from roots and the chloroform extract from stolon showed significant activity with inhibition zones of 10–14 mm. This shows that AOE has very strong antibacterial activity against *S. aureus*. The diameter of the antibacterial zone produced by AOE against *P. aeruginosa* was equivalent to that produced by the *Phaeanthus vietnamensis* Ban extract (13.25 mm), a plant species with a strong antibacterial activity against *P. aeruginosa* [5], indicating that AOE has good resistance to *P. aeruginosa.*

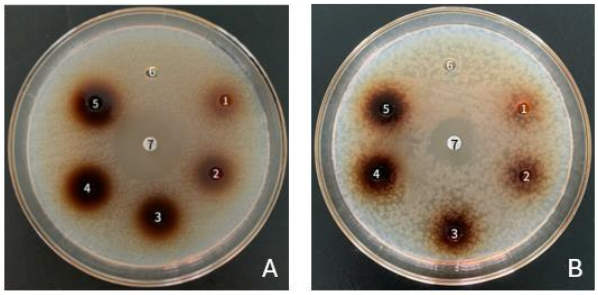

Fig. 1. Antibacterial activity of AOE at tested concentrations: S. Aureus (A) and P. Aeruginosa (B). (1) 100 μg/μL; (2) 200 μg/μL; (3) 400 μg/μL; (4) 600 μg/μL; (5) 800 μg/μL; (6) DMSO 0,5%; (7A) Sulfamethoxazole/Trimethoprim (Bt); (7B) Netilmicin (NI)

Table 1. Antibacterial zone diameter and MIC/MBC of AOE against *S. Aureus* and *P. Aeruginosa*

Antibacterial substance	Diameter of antibacterial ring (mm)	
	S. aureus	*P. aeruginosa*
Bt	39.27 ± 0.18[a]	–
NI	–	24.78 ± 0.1[a]
DMSO 0,5%	–	–
100 μg/μL	4.06 ± 0.11[d]	–
200 μg/μL	13.01 ± 0.36[c]	–
400 μg/μL	20.51 ± 0.26[b]	9.21 ± 0.25[b]
600 μg/μL	24.66 ± 0.29[b]	11.42 ± 0.37[b]
800 μg/μL	26.55 ± 0.25[b]	13.23 ± 0.24[b]

3.2 Minimum inhibitory concentration and minimum bactericidal concentration

The tested AOE concentrations were 100, 200, 400, 600, and 800 μg/μL, and the control did not contain the extract. The lowest extract concentration at which no colour change in the resazurin reagent occurred was recorded. The MIC value is defined as half the extract concentration of the well with the lowest concentration that does not change colour. MBC is the lowest extract concentration that can kill all bacteria, i.e., no colonies appear on the agar surface after inoculation. Fig. 2 and Table 2 show

that MIC and MBC values were 25 µg/µL and 50 µg/µL with *S. aureus*. The MIC and MBC values were 50 µg/µL and 100 µg/µL with *P. aeruginosa.* The ethanol extract of *Alocasia odora* (Roxb.) K. Koch has antibacterial activity because it contains components such as terpenoids disrupting cell membranes, quinones binding to outer membrane surface components, flavonoids affecting the activity of enzymes that form peptidoglycan, and alkaloids intertwining with the nucleic acid structure, killing bacteria [13].

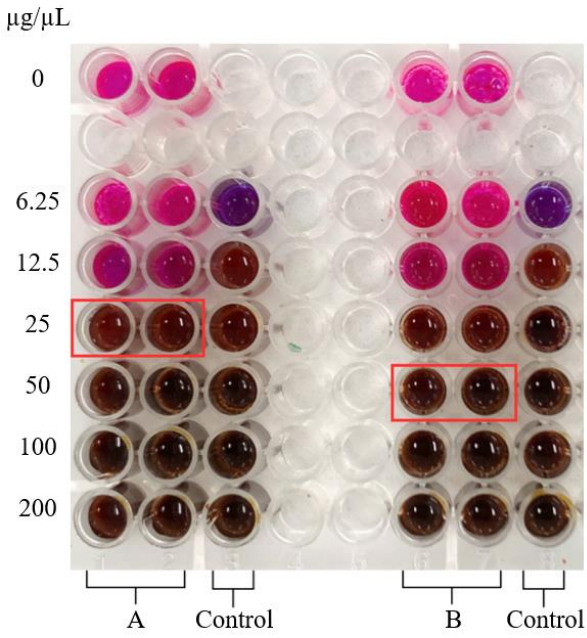

Fig. 2. MIC values of AOE for *S. aureus* (A) and *P. aeruginosa* (B)

Table 2. MIC and MBC values of AOE for bacterial strains

Bacterial strains	MIC (µg/µL)	MBC (µg/µL)
S. aureus	25	50
P. aeruginosa	50	100

3.3 DPPH free radical scavenging ability

Table 3 shows the DPPH free radical inhibition efficiency of the extracts at different concentrations, indicating that the antioxidant activity is dose-dependent. The higher the concentration of AOE is, the higher the free radical inhibition efficiency becomes. AOE has an IC_{50} of 566.16 µg/mL, while the IC_{50} of vitamin C is 41.07 µg/mL. The antioxidant activity of AOE was comparable with that of the leaves of *Boerhavia diffusa* L., the most active part of this species [9]. In addition, studying the *Alocasia indica* extract, Mulla et al. [14] found that its antioxidant efficiency reached approximately 83.48% at a concentration of 1000 µg/mL, similar to that of this study, further confirming the average antioxidant properties of *Alocasia odora* (Roxb.) K. Koch.

Table 3. DPPH antioxidant efficiency of AOE

AOE (µg/mL)	Antioxidant efficiency of AOE (%)	Vitamin C (µg/mL)	Antioxidant efficiency of vitamin C (%)
50	9.35 ± 0.86^{g}	10	11.21 ± 0.59^{e}
100	15.51 ± 0.72^{f}	20	19.98 ± 1.3^{d}
200	22.84 ± 3.32^{e}	40	50.05 ± 0.77^{c}
400	39.39 ± 2.45^{d}	60	75.82 ± 0.45^{b}
600	54.35 ± 1.24^{c}	80	92.26 ± 0.36^{a}
800	66.53 ± 4.09^{b}	–	–
1000	81.69 ± 5.16^{a}	–	–
IC_{50}	566.16	**IC_{50}**	41.07

3.4 ABTS free radical scavenging ability

Table 4 shows the ATBS free radical inhibition efficiency of the extracts at different concentrations, indicating that the antioxidant activity is dose-dependent. The higher the concentration of AOE is, the higher the free radical inhibition efficiency becomes. AOE has an IC_{50} of 1,487.07 µg/mL, while the IC_{50} of vitamin C is 67.78 µg/mL. According to these results, AOE has better antioxidant activity in terms of free radical scavenging capacity than other plant extracts, such as the papaya seed extract [15]. Previous studies have shown that plant ethanol

pISSN 1859-1388
eISSN 2615-9678

extracts contain phenolic compounds, flavonoids, ascorbic acid, vitamin E, and vitamin C. These compounds have been shown to exhibit moderate antioxidant properties [16]. This may explain why the ethanol extract of *Alocasia odora* (Roxb.) K. Koch exhibits vigorous antioxidant activity in the study.

Table 4. ABTS antioxidant efficiency of AOE

AOE (μg/mL)	Antioxidant efficiency	Vitamin C (μg/mL)	AOE (μg/mL)
600	22.16 ± 1.76^{g}	10	12.15 ± 0.63^{f}
800	29.60 ± 3.27^{f}	20	18.97 ± 1.48^{e}
1000	34.21 ± 0.63^{e}	40	32.48 ± 0.54^{d}
1200	42.09 ± 3.78^{d}	60	45.57 ± 3.23^{c}
1400	48.58 ± 2.24^{c}	80	58.76 ± 1.09^{b}
1600	54.46 ± 4.48^{b}	100	73,89 ± 4.12^{a}
2000	64.34 ± 3.89^{a}	–	–
IC_{50}	1487.07	IC_{50}	67.78

3.5 Fe^{3+} reduction capacity

Table 5 shows that AOE has the ability to reduce iron (antioxidant capacity through the reduction mechanism), and this effect increases gradually with concentration. Specifically, the OD value of the extract at 700 nm increased from 0.0634 (100 μg/mL) to 0.8829 (2000 μg/mL). The correlation between extract concentration and OD has a correlation coefficient of 0.9909, showing a linear relationship. From the regression equation, it can be seen that the equivalent IC_{50} value regarding the reducing ability of AOE is about 2,100 μg/mL, while that of Vitamin C is only around 75 μg/mL. This means that the reduction potency of Vitamin C is about 28 times as strong as that of *Alocasia odora* (Roxb.) K. Koch extract. Studies show that the increase in the number of free radicals in cells is the cause of atherosclerosis, a weakened immune system, reduced intelligence, diabetes, and cancer [17]. Therefore, the research and discovery of natural compounds with antioxidant and therapeutic properties are of practical significance, and *Alocasia odora* (Roxb.) K. Koch is one of the new plant species that possesses that potential.

Table 5. Fe3+ reduction efficiency of AOE

AOE (μg/mL)	OD (700 nm)	Vitamin C (μg/mL)
100	0.0634	4.57
200	0.1166	8.87
400	0.2229	17.44
600	0.3220	25.43
800	0.3511	27.77
1000	0.5110	40.67
2000	0.8829	70.66
IC50	2100	75

3.6 Anticell proliferation activity

Table 6 shows that AOE at a concentration range of 0.8–100 μg/mL can inhibit the growth of the following human cancer cell lines: MKN-7 (gastric cancer), HepG2 (liver cancer), A549 (lung cancer), and HT-29 (colon cancer), but the effectiveness is relatively limited. At the highest tested concentration (100 μg/mL), the inhibition effect ranged from 23.93% (A549) to 35.51% (HepG2). Meanwhile, at lower concentrations, such as 20 μg/mL or 4 μg/mL, the inhibition ability decreased significantly, mostly below 20%.

Previous studies have shown that the *Nepenthes mirabilis* extract has potent anticancer activity on HT-29 with an IC_{50} of 141.25 μg/mL [18]. Although this study has not yet found the IC_{50} of AOE affecting cancer cell lines, the 100 μg/mL concentration has shown a strong anticancer potential of the *Alocasia odora* (Roxb.) K. Koch extract. This result not only supplements the scientific literature on plant species in Vietnam but also opens up new opportunities in developing more effective cancer treatments from herbs.

Table 6. Anticancer cell potential of AOE

AOE (μg/mL)	inhibition of AOE on cancer cells, %			
	MKN-7	**HepG2**	**A549**	**HT-29**
100	25.69 ± 2.49	35.51 ± 2.06	23.93 ± 2.67	26.62 ± 1.83
20	15.63 ± 1.08	20.02 ± 1.37	13.22 ± 1.18	16.31 ± 1.11
4	9.07 ± 0.71	11.62 ± 0.91	6.95 ± 0.49	7.54 ± 0.77
0,8	3.82 ± 0.40	7.95 ± 0.72	3.98 ± 0.37	4.01 ± 0.28
IC50	>100	>100	>100	>100
Ellipticine (μg/mL)	**% inhibition of ellipticine on cancer cells**			
	MKN-7	**HepG2**	**A549**	**HT-29**
10	90.03 ± 2.19	92.50 ± 2.15	89.50 ± 1.97	89.92 ± 1.92
2	80.17 ± 1.68	82.61 ± 1.04	78.75 ± 1.88	79.19 ± 1.62
0.4	51.15 ± 1.22	52.02 ± 1.41	49.12 ± 1.36	50.51 ± 1.24
0.08	22.29 ± 1.13	23.92 ± 0.97	21.79 ± 0.92	22.45 ± 1.09
IC_{50}	0.35 ± 0.03	0.32 ± 0.02	0.38 ± 0.03	0.36 ± 0.03

4 Conclusions

This study is an essential first step in exploring the pharmacological potential of *Alocasia odora* (Roxb.) K. Koch – a traditional medicinal plant widely used in Vietnam, but more research is necessary. AOE exhibits significant antibacterial activity, especially against *Staphylococcus aureus* and *Pseudomonas aeruginosa*, suggesting its potential use in controlling pathogenic bacteria. In addition, AOE possesses moderate antioxidant activity. At high concentrations, it inhibits the growth of human cancer cell lines, namely HepG2, HT-29, MKN-7, and A549, indicating its initial anticancer potential.

The results reveal that *Alocasia odora* contains biologically active compounds with potential therapeutic applications. Further phytochemical and mechanistic studies are needed to isolate active components and understand their modes of action. This would support the development of new plant-based therapeutic agents.

References

1. Rayne S, Mazza G. Biological activities of extracts from sumac (*Rhus spp.*): A Review. Nature precedings. 2007.
2. Suhaj M. Spice antioxidants isolation and their antiradical activity: A Review. Journal of food composition and analysis. 2006;19(6-7):531-37.
3. Moon JM, Lee BK, Chun BJ. Toxicities of raw *Alocasia odora*. Human & experimental toxicology. 2011;30(10):1720-23.
4. Mulla WA, Chopade AR, Bhise SB, Burade KB, Khanwelkar CC. Evaluation of antidiarrheal and *in vitro* antiprotozoal activities of extracts of leaves of *Alocasia indica*. Pharmaceutical biology. 2011; 49(4):354-61.
5. Tho BT, Dan TQ, Tuan VC. Study on antibacterial activity of Thuoc Thuong leaf extracts (*Phaeanthus vietnamensis* Ban). Journal of Science and Technology-The University of Da Nang. 2022;20(7):99-103.
6. Tu XF, Hu F, Thakur K, Li XL, Zhang YS, Wei ZJ. Comparison of antibacterial effects and fumigant toxicity of essential oils extracted from different plants. Industrial Crops and Products. 2018;124: 192-200.
7. Elshikh M, Ahmed S, Funston S, Dunlop P, McGaw M, Marchant R, et al. Resazurin-based 96-well plate

pISSN 1859-1388
eISSN 2615-9678

microdilution method for the determination of minimum inhibitory concentration of biosurfactants. Biotechnology Letters. 2016;38:1015-19.

8. Alam MN, Bristi NJ, Rafiquzzaman M. Review on *in vivo* and *in vitro* methods evaluation of antioxidant activity. Saudi Pharmaceutical Journal. 2013;21(2):143-52.
9. Hang NT, Tam NTT, Phuong MH. DPPH free radical scavenging and reducing power properties of B*oerhavia diffusa* in Can Gio, Ho Chi Minh City. Journal of Science-Ho Chi Minh city University of Education. 2019;12(90):112.
10. Monks A, Scudiero D, Skehan P, Shoemaker R, Paull K, Vistica D, et al. Feasibility of a high-flux anticancer drug screen using a diverse panel of cultured human tumor cell lines. JNCI: Journal of the National Cancer Institute. 1991;83(11):757-66.
11. Hughes JP, Rees S, Kalindjian SB, Philpott KL. Principles of early drug discovery. British Journal of Pharmacology. 2011;162(6):1239-49.
12. Haque M, Jahan T, Rashid MA. Antibacterial and cytotoxic activities of *Alocasia fornicata* (Roxb.). International Journal of Nutrition, Pharmacology, Neurological Diseases. 2014;4(Suppl 1):S29-S33.
13. Tiwari U. Cummins E. Fruit and vegetables. Handbook of plant food phytochemicals. Wiley-Blackwell, Chichester, United Kingdom; 2013. p. 107-137.
14. Mulla WA, Kuchekar SB, Thorat VS, Chopade AR, Kuchekar BS. Antioxidant, antinociceptive anti-inflammatory activities of ethanolic extract of leaves of *Alocasia indica (Schott.).* Journal of Young Pharmacists. 2010;2(2):137-43.
15. Nhu NTH, Hung NĐ, Hoai PN, Sang VT. Investigation of chemical compositions and antioxidant activity of Papaya seed extract. Thu Dau Mot University Journal of Science. 2020;2(45):101-7.
16. Olaleye MT, Akinmoladun AC, Ogunboye AA, Akindahunsi AA. Antioxidant activity and hepatoprotective property of leaf extracts of *Boerhaavia diffusa* Linn against acetaminophen-induced liver damage in rats. Food and Chemical Toxicology. 2010;48(8-9):2200-5.
17. Fernández-Mejía C. Vitamins with antioxidant actions. Oxidative stress and chronic degenerative diseases: *A role for antioxidants.* InTech; 2013. p. 209.
18. Thanh NQC, Tue TG, Huynh TTD, Thanh VN, Khiem NH, Khang VT, et al. Study on anticancer potential of *Nepenthes mirabilis* extract. CTU Journal of Science-CTUJoS. 2025;61(3):99-107.