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Antimicrobial and Antioxidant Studies of Methanol Extracts of Seeds of *Physalis angulata* l. Solanaceae

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ABSTRACT

Physalis angulata L. (Solanaceae) is a medicinal plant widely used in traditional medicine for its diverse therapeutic properties. This study evaluated the phytochemical composition, antimicrobial activity, and antioxidant potential of the methanol seed extract of *P. angulata*. Seeds were extracted by cold maceration using 70% methanol. Qualitative phytochemical screening was conducted to identify bioactive constituents. Antioxidant activity was assessed using 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay, ferric reducing antioxidant power (FRAP), total phenolic content (TPC), and total flavonoid content (TFC). Antimicrobial activity was determined by measuring zones of inhibition and minimum inhibitory concentrations (MICs) against selected bacterial and fungal isolates. Phytochemical analysis revealed the presence of alkaloids, saponins, reducing sugars, cardiac glycosides, and terpenoids. The extract exhibited concentration-dependent antimicrobial activity against the tested microorganisms. MIC values were 12.5 mg/mL for *Escherichia coli, Bacillus subtilis*, and *Pseudomonas aeruginosa;* 6.25 mg/mL for *Staphylococcus aureus*; and 25 mg/mL for *Candida albicans.* No inhibitory activity was observed against *Aspergillus* spp. The extract also demonstrated notable antioxidant activity, with total flavonoid and phenolic contents of 94.90 ± 0.05 mg QE/g and 94.80 ± 0.02 mg GAE/g, respectively. DPPH radical scavenging activity ranged from 60.90 ± 1.59% to 86.60 ± 0.23%, while FRAP values ranged from 87.70 ± 0.05% to 92.60 ± 0.05%. These findings indicate that *P. angulata* seed extract possesses significant antimicrobial and antioxidant properties, which may be attributed to its rich phytochemical constituents. The results support the potential use of the plant as a natural source of bioactive compounds for pharmaceutical and therapeutic applications.

Keywords: *Physalis angulata*, Seed Extract, Antioxidants, Antimicrobial, Bioactive Compounds.

Introduction

Medicinal plants have remained an indispensable component of healthcare systems worldwide and continue to contribute significantly to disease prevention and treatment (Sofowora *et al* 2023). The growing interest in natural products is driven by their therapeutic efficacy, accessibility, and relatively low incidence of adverse effects. According to the World Health Organization (WHO, 2023), traditional medicine remains an essential healthcare resource for billions of people globally, particularly in developing countries, where medicinal plants constitute a major component of primary healthcare (WHO, 2023).

Numerous plants, including neem (*Azadirachta indica*), ginger (*Zingiber officinale*), garlic (*Allium sativum*), and aloe vera (Aloe barbadensis), have been extensively investigated and reported to possess diverse pharmacological properties (Atanasov *et al.,* 2021).

Microorganisms play crucial roles in maintaining ecological balance and supporting human health. However, pathogenic microorganisms are responsible for a wide range of infectious diseases that contribute substantially to global morbidity and mortality. The emergence and rapid spread of antimicrobial resistance (AMR) have become one of the greatest threats to Global health, resulting in increased healthcare costs.

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Recent estimates indicate that antimicrobial resistance was associated with approximately 4.95 million deaths globally in 2019, highlighting the urgent need for alternative therapeutic options (Murray *et al.,* 2022). Although antimicrobial agents such as β-lactams, aminoglycosides, tetracyclines, polyenes, and azoles have revolutionized the treatment of infectious diseases, the rapid emergence of antimicrobial resistance (AMR) resulting from the continuous evolution of resistant microbial strains has reduced their effectiveness (Laxminarayan *et al.*, 2013; Puri *et al* 2025). Furthermore, the development of new synthetic antibiotics has slowed considerably over the past few decades, creating a pressing need for the discovery of novel antimicrobial compounds from natural sources (Butler *et al.*, 2017; Lewis, 2020).

Medicinal plants are promising reservoirs of bioactive compounds with antimicrobial potential. Phytochemicals such as alkaloids, flavonoids, tannins, terpenoids, and phenolic compounds have demonstrated broad-spectrum activity against pathogenic microorganisms through diverse mechanisms of action. These compounds are often associated with fewer adverse effects and a lower tendency to induce resistance compared with conventional antimicrobial drugs (Salehi *et al*., 2021; Ruddaraju *et al*., 2020). Several medicinal plants, including *Zingiber officinale, Curcuma longa, Andrographis paniculata,* and *Psidium guajava,* have been reported to exhibit significant antibacterial and antifungal activities, emphasizing the importance of exploring additional plant species as potential sources of antimicrobial agents (Álvarez-Martínez *et al*., 2021).

Physalis angulata L. (Solanaceae), commonly known as cutleaf ground cherry, is an annual herb widely distributed in tropical and subtropical regions of Africa, Asia, Australia, and the Americas. The plant grows naturally in open fields, roadsides, gardens, and other non-waterlogged environments. Traditionally, *P. angulata* has been used as a tonic, diuretic, laxative, antipyretic, and anti-inflammatory agent. Various parts of the plant, including the roots, leaves, stems, fruits, and seeds, have been employed in ethnomedicine for the treatment of malaria, asthma, hepatitis, dermatitis, urinary disorders, earache, gout, colic, burns, ulcers, and skin infections (Sasikala and Meena, 2016; Singh *et al*., 2020 (Silva *et al*., 2022; Kurniawan *et al*., 2024). Crushed leaves are commonly applied to snake bites and wounds, while fruit paste and ashes of aerial parts are used to treat burns and other dermatological conditions (Thakur and Sidhu, 2017; Godara et al., 2019; (Ganesan and Xu, 2017; Gupta and Malhotra, 2020). *Physalis angulata* is a rich source of diverse bioactive secondary metabolites, including physalins, withaferin A, physaminilides, and other steroidal lactones.

These phytochemicals have been reported to contribute significantly to the plant's broad spectrum of pharmacological activities, such as antimicrobial, antioxidant, anti-inflammatory, immunomodulatory, and anticancer effects. The presence of these compounds underscores the therapeutic potential of P. angulata and supports its extensive use in traditional medicine (Daud *et al.*, 2016; Zhang *et al*., 2020; Rohilla *et al*., 2022).

The diverse medicinal applications of *P. angulata* are attributed to its rich phytochemical composition. The plant contains numerous biologically active compounds, including physalins, withanolides, flavonoids, alkaloids, terpenoids, and phenolic compounds, which are responsible for its wide range of pharmacological activities (Rengifo-Salgado and Vargas-Arana 2013; Rengifo-Salgado and Vargas-Arana 2023) Several studies have reported antimicrobial, antiviral, anti-inflammatory, antihyperglycemic, immunomodulatory, hepatoprotective, antioxidant, and anticancer properties of *P. angulata* extracts and isolated compounds (Novitasari *et al*., 2024).

In addition to antimicrobial activity, antioxidants derived from medicinal plants have gained considerable attention because of their ability to protect biological systems against oxidative stress. Oxidative stress results from an imbalance between the production of reactive oxygen species (ROS) and the body's antioxidant defense mechanisms. Excessive ROS generation can damage cellular lipids, proteins, and nucleic acids, contributing to the development of chronic diseases such as diabetes mellitus, cardiovascular disorders, neurodegenerative diseases, and cancer (Sies *et al.*, 2022). Antioxidants neutralize free radicals by donating electrons or hydrogen atoms, thereby preventing oxidative damage and maintaining cellular integrity.

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Despite the extensive traditional use and documented pharmacological properties of *P. angulata*, studies focusing specifically on the antimicrobial and antioxidant activities of its seeds remain relatively limited. Therefore, the present study was undertaken to evaluate the phytochemical constituents, antimicrobial activity, and antioxidant potential of methanolic seed extracts of *Physalis angulata.* The findings of this study may provide scientific evidence supporting the traditional use of the plant and contribute to the development of novel plant-based therapeutic agents for combating microbial infections and oxidative stress-related diseases.

Materials and Methods

Collection and Preparation of Plant Material

Healthy and complete plants of *Physalis angulata* was collected in February, 2021 at Abraka, Delta State. The identity of the plant was authenticated by Dr. Ikpefan Oise Emmanuel, a lecturer in the Department of Pharmacognosy. After proper collection, the seeds were carefully separated from the other parts of the plant. The fresh seeds were properly washed with distilled water and the air dried for two weeks in the laboratory.

The dried seeds were then chopped into smaller bits and then ground to coarse particles using an electric milling machine. The coarse particles were kept in an airtight container. About 140g of the plant materials (seeds) was extracted by cold maceration with absolute Methanol and distilled water (70% : 30%) at room temperature for 72 hours.

The methanol and extract was concentrated to dryness under vacuum at 35^{O}C using a rotary evaporator. The concentrated extracts were then weighed and kept in a glass container and kept in a cool and dry place before analysis.

Qualitative Phytochemical Screening of Extracts

The methanol extract in paste-like form was subjected to different kinds of chemical tests to investigate the presence of secondary metabolites using the method of Ngbede *et al* (2008).

Evaluation of the Antimicrobial Activity of Methanolic seed Extract of *Physalis Angulata*

Nutrient broth of *Escherichia coli, Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosa, Candida albicans* and *Aspergillus* spp were prepared using standard procedures. The microorganisms were obtained from Pharmaceutical Microbiology Department, Faculty of Pharmacy, Delta State University, Abraka.

Preparation and standardization of microbial culture

Microbial cultures such as *Staphylococcus aureus, Pseudomonas aeruginosa, Bacillus subtilis, Escherichia coli, Aspergillusspp* and *Candida albicans* were sub-cultured to obtain pure isolates by streaking on freshly prepared Nutrient agar (NA) and Sabouraud dextrose agar (SDA) media and incubated at 37ºC for 24 hours (bacterial cultures) and at 28ºC for 48 hours (fungal cultures) respectively (Collins and Lyne. 1979).

Bacterial cultures were standardized to the turbidity of 0.5 Marfarland nephelometer standard corresponding to cells of approximate density (1x108 cfu/mL); while the fungal cultures were standardized using a haemocytometer to clear turbidity (Ekong *et al*., 2004).

Preparation of fresh Culture

Bacteria

The tested bacterial isolates namely; *Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa* and *Escherichia.coli* were sub-cultured to obtain pure isolates by streaking on the freshly prepared NA medium from the original stock culture. The cultures were allowed to incubate at 37ºC for 24 hours.

Fungi

The fungal species used in this study was sub-cultured to obtain pure isolated of *Aspergillus spp* and *Candida albicans* by streaking on the freshly prepared SDA medium from the original stock culture. The cultures were allowed to incubate at room temperature (28ºC) for 48-72 hours (2-3 days).

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Sensitivity test of seed extract of *Physialis angulata*

The "Agar well diffusion" method as described by Mela *et al*., (2020) was used with little modification. A 20mL quantity of the sterilized nutrient agar was poured into each petri-dish and allowed to set. Then using the swab sticks provided, the standard cell (bacteria) cultures were used to swab the surface of the nutrient agar. holes were drilled with a cork borer measuring 6 millimeters in diameter, and drops of the different concentration of the extract were added using a pasture pipette. Drops of ciprofloxacin (Bacteria), ketoconazole (positive control for Fungal spp) and 70% methanol (negative control) were also added to their respective bored holes. The plates were allowed to stand for 30 minutes, and incubated at 37°C for 24 hours and examined for zones of inhibition.

Minimum inhibitory concentration

The method of Jayachithra *et al.*, (2022) was used with little modification. The minimum inhibitory concentration (MIC), the least concentration of the fraction that inhibits the growth of a microorganism was determined using different concentration of the crude plant extract (200mg/ml, 100mg/ml, 50mg/ml, 25mg/ml, 12.5mg/ml and 6.25mg/ml) through two-fold serial dilution. About 0.1ml of each concentrates was dispensed into a sterile Petri dish, and 20mL of the sterilized nutrient agar was added, carefully shaken and allowed to set. This was repeated for the other concentrations and allowed to solidify. Using a sterile wire loop, three (3) parallel streaks of the test cultures (bacteria and fungi) were made on the solidified nutrient agar and crude plant extract. Each microorganism was labeled accordingly Underneath the plates and were allowed to Stand for some time at room temperature before incubation at 37^{o}C for 24 to 48h

Antioxidant Assay

Evaluation of antioxidant activity of the crude extracts of *Physalis angulata* seeds

About 1g of the crude extract was weighed and dissolved in 10mL of 70% methanol.

2,2 - Diphenyl -1- Picryl Hydrazyl (DPPH)

The method of Kheiria *et al*., (2021) was used with little modification. The DPPH solution was prepared in methanol and 0.5mL of the DPPH was subsequently added to 2mL of the plant extract at various concentrations (1000mg/mL, 500mg/mL, 250mg/mL, 125mg/mL, and 62.5mg/mL) and the contents were vortexed for 10 seconds and allowed to stand for 20 minutes at room temperature. Their absorbance were recorded at 517nm using UV Spectrophotometer. The result of their absorbance was compared with 70% methanol (control solution) and ascorbic acid (standard solution). These measurements were performed in triplicate and the mean percentage inhibition as well as the standard error of mean (SEM) were calculated using the following equation:-

$$\text{Percentage inhibition (\%)} = \frac{\text{Abs of control - Abs of individual test sample}}{\text{Abs of control}} \times 100$$

Where; Abs = Absorbance

Ferric Reducing Antioxidant Power (FRAP)

The method of Dong-Ping *et al*., (2017) was adopted with little modification. The method is based on the reduction of the Fe (III) - TPTZ complex to the ferrous form at low pH. The fresh working solution (FRAP reagent) was prepared by mixing 25mL of 0.3M acetate buffer, 2.5mL of TPTZ solution, and 2.5mL of FeCl3. 6H20 solution and then warmed (pre-heated) at 37°C before use. A properly diluted sample (0.1mL) was added to 4.0mL of FRAP reagent to form a mixture. The content was incubated in the dark for 10 minutes at 37°C and its absorbance was measured at 593nm against the blank that was prepared using distilled water. The results Obtained from triplicate analyses were Expressed as aqueous solution of ferrous Sulfate (FeSO4. 7H20) and derived from the Calibration curve of the standards (62.5 ~ 1000mg/mL). The mean percentage Inhibitions were obtained with the same Procedure.

Total Phenol Content

The amount of phenol in the methanolic extract of *Physialis angulata* seeds was determined by Folin - Ciocalteu reagent method with some modifications. About 1.5mL of 10% Folin - Ciocalteu reagent and 1mL of 2% solution of Na2CO3 were added to the 1mL of plant extract. The resulting mixture was incubated at room temperature for 15minutes, and the absorbance of the sample was measured at 765nm using a UV spectrophotometer. Garlic acid was used as a standard (1mg/mL) and the mean percentage inhibitions were obtained by the same procedure.

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Total Flavonoid Content

Aluminium Chloride colorimetric method was used with some modifications to determine the flavonoid content. About 1mL of the plant extract was mixed with 3mL of methanol, 0.2mL of 10% aluminium chloride, 0.2mL of 1M potassium acetate, and 5.6mL of distilled water were mixed together. The mixture was kept at room temperature for 30 minutes and the absorbance was measured using UV spectrophotometer at a wavelength of 420nm. Quercetin was used as the standard (1mg/mL) and the mean percentage inhibitions were obtained by the same procedure.

Results

Total phenol and Flavonoids contents of methanolic extract of *Physalis angulata* seeds

The total phenolic content (TPC) of the methanolic seed extract was determined to be 94.80 ± 0.02 mg gallic acid equivalent per gram (mg GAE/g), while the total flavonoid content (TFC) was 94.90 ± 0.08 mg quercetin equivalent per gram (mg QE/g), as presented in Table 1. These relatively high levels of phenolic and flavonoid compounds suggest that the extract possesses substantial antioxidant potential, as these phytochemicals are known to contribute significantly to free radical scavenging activity.

Table 1: Total phenol and flavonoid contents of methanolic extract of *Physalis angulata* seeds

Extract	Total phenol content (mg/GAE/g)	Total flavonoid content (mg/GAE/g)
	94.8 ± 0.02	94.90 ± 0.08

Preliminary Phytochemical Screening of the Methanol Extract of Seeds *Physalis angulata*

Phytochemical screening of the seed extract of *Physalis angulata* revealed the presence of several bioactive secondary metabolites, including saponins, tannins, alkaloids, terpenoids, and flavonoids. However, anthraquinones were not detected in the extract. The results of the phytochemical analysis are presented in Table 2.

Table 2: Results of phytochemical screening of seed extract of *Physalis angulata*

Phytochemical	Observations
Saponins	+
Tannin	+
Alkaloid	+
Anthraquinone	–
Terpenoids	+
Flavonoids	+

Key: + = Present - = absent

The methanolic seed extract of *Physalis angulata* exhibited antimicrobial activity against all tested bacterial and fungal isolates, although the degree of inhibition varied among microorganisms. The highest zones of inhibitions was 19.75± 0.43 at 25mg/ml for *Escherichia.coli*; 18± 0.32 at 100mg/ml for *Bacillus subtilis*,16.75± 0.76 at 100mg/ml for *Staphylococcus aureus*; 14± 0.20 at 100mg/ml for *Pseudomonas aeruginosa*; 11.5± 0.49 at 100mg/ml for *Candida albicans* and 11± 0.49 at 100mg/ml for *Aspergillus* spp. as presented in Table 3).

The minimum inhibitory result in Table 4, showed that *E. coli, B. subtilis* and *P. aeruginosa* recorded MIC at 12.5 mg/mL while *S. aureus* recorded MIC at 6.25 mg/ml however C. *albicans* was at 25mg/m while no activity was observed for *Aspergillus* spp.

Table 3: Zone of inhibition of the extract against the test organisms

Concentration (mg/ml)	Zones of inhibition (Mean ± SEM)					
	E. coli	***B. subtilis***	***S. aureus***	***P. aeruginosa***	***C. albicans***	***Aspergillus***
100	19± 0.32	18± 0.32	16.75± 0.76	14± 0.20	11.5± 0.49	11± 0.49
50	18± 0.28	16.5 ± 0.33	14.50± 0.32	13± 0.32	7± 0.57	12± 0.45
25	19.75± 0.43	15± 0.57	14.50± 0.67	12.5± 0.42	7.5± 0.57	13± 0.33
12.5	10.5± 0.32	15± 0.66	15± 0.57	12.5± 0.45	8± 0.66	12± 0.46
6.25	14± 0.66	15.5± 0.99	13.5± 0.81	12± 0.44	5± 0.42	11± 0.48

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Table 4: Minimum inhibitory concentration of the extract against the test organism

Concentration (mg/ml)	Minimum Inhibitory Concentration					
	E. coli	*B. subtilis*	*S. aureus*	*P. aeruginosa*	*C. albicans*	*Aspergillus* spp
100	-	-	-	-	-	+
50	-	-	-	-	-	+
25	-	-	-	-	-	+
12.5	-	-	-	-	+	+
6.25	+	+	-	+	+	+
3.125	+	+	+	+	+	+

Ferric Reducing Antioxidant Power (FRAP) Activity of Methanolic Seed Extract of *P.* angulata

The Ferric reducing antioxidant power (FRAP) assay result revealed the reducing power of *Physalis angulata* seed extract with a moderately high FRAP activity on decreasing concentration. The FRAP activity ranged from 87.70% ± 0.05 to 92.60% ± 0.05 in an increasing order (Table 5.) when compared to that of the standard (Ascorbic acid).

Table 5: Ferric reducing antioxidant power of the extract of *Physalis angulatas seeds*

Concentration (mg/mL)	Mean Absorbance	Mean % Inhibition ± SEM
1000	0.0479	87.70% ± 0.05
500	0.0367	91.40% ± 0.11
250	0.0248	92.10% ± 0.05
125	0.0237	92.60% ± 0.05
62.5	0.0217	89.6% ± 0.68

Note: Absorbance of the standard = 0.342.

DPPH Radical Scavenging Activity of the Extract of *Physalis angulata* seeds

Free radical scavenging activity of the seeds extract was examined with ascorbic acid as the standard. The result as presented in Table 6 showed a high scavenging activity of the pulp sample at 62.5mg/mL with a percentage inhibition of 86.60% ± 0.23 when compared to that of the standard (Ascorbic acid).

Table 6: DPPH scavenging activity of the extract of *Physalis angulata* seed

Concentration (mg/mL)	Mean Absorbance	Mean % Inhibition
1000	0.119	60.90 ± 1.59
500	0.056	80.06 ± 0.67
250	0.052	81.30 ± 0.35
125	0.041	85.20 ± 0.52
62.5	0.037	86.60 ± 0.23

Note: Absorbance of the standard = 0.279

Discussion

The Phytochemical screening of the seed extract of *Physalis angulata* revealed several bioactive secondary metabolites. These bioactive constituents are known to possess diverse pharmacological properties such as antimicrobial, antioxidant, anti-inflammatory, and anticancer activities. The occurrence of these phytochemicals in the seed extract of *Physialis angulata* may therefore account for the biological activities observed in the present study. Similar phytochemical profiles have been reported in recent investigations of P. *angulata*, where alkaloids, flavonoids, tannins, saponins, terpenoids, and phenolic compounds were identified as major contributors to its therapeutic potential (Siddiqui *et al*., 2022; Nwozo et *al*., 2021).The results of the phytochemical analysis are presented in Table 2. The methanolic seed extract of *Physalis angulata* exhibited antimicrobial activity against all tested bacterial and fungal isolates, although the degree of inhibition varied among microorganisms as shown in Table 3.

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The observed antimicrobial effect may be attributed to the ability of phytochemicals to disrupt microbial cell membranes, inhibit essential enzymes, and interfere with nucleic acid synthesis. The extract produced inhibition zones ≥10 mm, indicating significant antimicrobial activity. Furthermore, the antimicrobial effect decreased with decreasing extract concentration, suggesting a dose-dependent response. Similar concentration-dependent antimicrobial activities have been reported for methanolic extracts of *P. angulata* leaves and fruits against *Escherichia coli, Staphylococcus aureus, Bacillus subtilis,* and *Pseudomonas aeruginosa* (Sunday and Adeyemi, 2023; Ikpefan *et al*., 2022)

The Minimum Inhibitory concentration (MIC) values obtained in this study further confirmed the antimicrobial potential of the extract. The lowest MIC was observed against *Staphylococcus aureus* (6.25 mg/mL), indicating greater susceptibility of this organism to the extract. In contrast, *Candida albicans* exhibited a higher MIC (25 mg/mL), while *Aspergillus* species showed resistance at all tested concentrations as shown in Table 4. The lower susceptibility of fungal organisms may be associated with the structural complexity of fungal cell walls and membranes, which limit the penetration of antimicrobial compounds. Similar observations have been documented in previous studies, where Gram-positive bacteria were generally more susceptible to plant extracts than fungi and Gram-negative bacteria due to differences in cell wall composition (Ahmed, 2016; Ahmed *et al.*, 2022).

The antioxidant evaluation demonstrated that the methanolic seed extract possesses appreciable free-radical scavenging and reducing capacities. The DPPH radical scavenging assay and Ferric Reducing Antioxidant Power (FRAP) assay both revealed significant antioxidant activity across the tested concentrations. The highest DPPH scavenging activity (86.60 ± 0.23%) was recorded at 62.5 mg/mL, while the highest FRAP value (92.60 ± 0.05%) was observed at 125 mg/mL. These findings suggest that the extract contains compounds capable of donating electrons or hydrogen atoms to neutralize reactive oxygen species.

The high flavonoid and phenolic contents observed in the extract further support its antioxidant potential. The highest flavonoid content (94.90 ± 0.05%) was recorded at 12.5 mg/mL, whereas the highest total phenolic content (94.80 ± 0.02%) was obtained at 31.25 mg/mL. Phenolic compounds and flavonoids are well-established natural antioxidants that protect biological systems against oxidative stress. Recent studies have similarly reported strong correlations between phenolic content and antioxidant activity in *P. angulata* extracts, emphasizing their role in scavenging free radicals and preventing oxidative damage associated with chronic diseases, including cancer, cardiovascular disorders, and neurodegenerative conditions (Rahman *et al.,* 2023; Kumar *et al.*, 2024).

Overall, the findings of this study are consistent with contemporary reports that identify *Physalis angulata* as a promising source of bioactive compounds with significant antimicrobial and antioxidant properties. The observed biological activities provide scientific support for the traditional medicinal use of the plant in the management of infectious and oxidative stress-related diseases.

Conclusion

The present study demonstrated that the methanolic seed extract of *Physalis angulata* contains important phytochemical constituents, including alkaloids, saponins, terpenoids, and reducing sugars, which may be responsible for its observed biological activities. The extract exhibited broad-spectrum antimicrobial activity against the tested bacterial and fungal organisms, with *Staphylococcus aureus* showing the greatest susceptibility. In addition, the extract demonstrated significant antioxidant activity as evidenced by DPPH radical scavenging and ferric reducing antioxidant assays, supported by its appreciable phenolic and flavonoid contents. These findings validate the ethnomedicinal use of *P. angulata* and highlight its potential as a source of novel antimicrobial and antioxidant agents. However, further studies are required to isolate and characterize the specific bioactive compounds responsible for these activities. Detailed investigations involving toxicity assessment, mechanism of action studies, pharmacokinetic evaluations, *in vivo* experiments, and clinical trials are necessary before the development of therapeutic products derived from *Physalis angulata* can be recommended.

Conflict of interest: The authors declare no conflict of interest.

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