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# Exploring Antimicrobial and Antioxidant Potential of Ethnomedicinal *Iphigenia magnifica*

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**A B S T R A C T**

*Iphigenia magnifica* is a seasonal medicinal plant categorized as vulnerable and is known for colchicine alkaloids. Local healers widely use different plant parts for the treatment of rheumatism, microbial infections, and muscle-related disorders. With the increasing demand for plant-based medicine, the present investigation was designed to estimate antibacterial, antifungal, and antioxidant activities of different parts of *I. magnifica*. Plant extracts were obtained through Soxhlet extraction and a rotary evaporator. Fractionation was performed using various polarity solvents such as methanol, dichloromethane, ethyl acetate, n-hexane, and chloroform. The antibacterial and antifungal activities were tested using the disk diffusion method and the well diffusion method against two bacterial and three fungal strains. The DPPH free radical scavenging test was followed to measure antioxidant capability, with ascorbic acid serving as the standard. Among the different extracts, ethyl acetate showed strong antibacterial activity against *S. aureus* with 14.3 ± 1.20 mm zone of inhibition and *E. coli* with 12 ± 1.15 mm zone of inhibition. Methanolic seed extracts recorded the highest antifungal activity against *P. chrysogenum* with 51.0 ± 1.66 mm zone of inhibition, followed by *A. niger* and *F. verticillioides* with 42.0 ± 1.15 and 32.0 ± 1.15 mm zone of inhibition. Significant antioxidant potential was recorded in ethyl acetate extracts of seed, leaf, and corm, revealing $IC_{50}$ values of 54.5 ± 0.3, 58.3 ± 0.5, and 58.6 ± 0.2 µg/mL, respectively. The output of this ethnomedicinally important *I. magnifica* is one of the promising sources of novel bioactive compounds for further drug design.

## Introduction

Plants are a natural source of medicinal compounds and bioactive chemicals, and can synthesize many therapeutically important compounds. The isolation and characterization of these compounds from medicinal plants play an important role in the development of novel medications with high therapeutic value that may be used to treat a variety of disorders (Hassan and Ullah, 2019). Approximately 20% of known plants have been utilized in pharmaceutical studies, with a positive impact on healthcare systems to treat harmful diseases (Altemimi *et al.,* 2017). Herbal medicine has been known to humans since ancient times. Traditional medical practitioners have reported the therapeutic usefulness of numerous indigenous plants for the treatment of various ailments (Bhalodia and Shukla, 2011). Medicinal and aromatic plants have gained economic importance because they have long been used as therapeutic agents (Sharifi-Rad *et al.,* 2015). Nowadays, demand for herbal remedies and natural medicine has increased because of environmental pollutants and the harmful effects of synthetic pharmaceutical medicines (Balunas and Kinghorn, 2005).

As a result, various endemic and native medicinal plants have been used in herbal and traditional healthcare practices (More *et al.,* 2025). Therefore, this wealth of medicinal plants has gradually depleted in surrounding areas; there is an urgent need for conservation of valuable resources (Sangale *et al.,* 2025a).

Many naturally occurring secondary metabolites or bioactive chemicals reported in plant extracts have been shown to possess antifungal, antibacterial, antioxidant, anticancer, and anti-inflammatory capabilities relevant to human diseases (Patwardhan, 2005). The widespread occurrence of antibiotic-resistant bacteria, *Staphylococcus aureus* (MRSA), a methicillin-resistant, *Enterococci* (VRE), a vancomycin-resistant, and *Streptococci* (PCRS), a penicillin and cephalosporin-resistant have significantly increased the prevalence of infectious diseases in both hospital and community settings (Dewal *et al.,* 2012; Kengne *et al.,* 2021). The majority of conventional antibiotics currently on the market have significant drawbacks due to patient side effects and the development of multiple drug resistance by pathogenic bacteria (Nkomo *et al.,* 2011; Kengne *et al.,* 2021). Therefore, there is increasing interest in the identification and development of novel natural antimicrobial medicines to address resistant infections and avoid or minimize the adverse effects associated with the use of synthetic antibiotics (Rojas and Buitrago, 2015). Medicinal plants possess diverse therapeutic activities based on species-specific compounds such as alkaloids, phenolics, steroids, flavonoids, and tannins (El-Saadony *et al.,* 2025). They attracted substantial attention due to their ability to suppress growth and decrease the prevalence of virulent pathogens (Kang *et al.,* 2011). In the last two decades, several research highlighted plants as a valuable and promising source of bioactive compounds for the development of new pharmaceutical agents (Locher *et al.,* 1995; Rabe and Staden, 1997; Rates, 2001).

The traditional medicine has employed genus *Iphigenia* for its strong antifungal and antibacterial properties. Bioactive compounds, particularly phenethylisoquinoline alkaloids, flavonoids, phenolics, and steroids, are associated with this action (Chachad, 2024; Lekhak *et al.,* 2021).

A classic example is the corm and seeds of the *Iphigenia* genus, which mainly contain colchicine alkaloids and are used to treat tumors and breast cancer, especially in women (Wang *et al.,* 2017; Kumar *et al.,* 2017; Olofinsan *et al.,* 2023; Dhyani *et al.,* 2022; Falahianshafiei *et al.,* 2023). *Iphigenia magnifica* Ansari & Rolla Rao (Colchicaceae) is a seasonal herbaceous medicinal plant, especially the leaves, corms, capsules, and seeds, which are often used in folklore practices as a traditional medicine (Sangale *et al.,* 2025b).

It contains diverse secondary metabolites, including alkaloids, steroids, phenolics, tannins, flavonoids, fatty acids, and their derivatives (Bhogaonkar and Devarkar, 2011; Sharifi-Rad *et al.,* 2015).

*I. magnifica* plant used for the present investigation based on traditional and ethnobotanical uses, which suggest potential antibacterial, antifungal, and antioxidant properties. For the first time, the antimicrobial, antifungal, and antioxidant activities of *I. magnifica* have been evaluated against different solvent systems, including water, dichloromethane, n-hexane, methanol, ethyl acetate, and chloroform.

The different plant parts (leaves, corms, and seeds) are used against selected strains of bacteria, including *Staphylococcus aureus* and *Escherichia coli.* The fungal strains *Aspergillus niger, Penicillium chrysogeneum,* and *Fusarium verticilloides* have been used against different plant parts for testing antifungal capability.

## Materials and Methods

### Collection, identification, and authentication

Prior permission for plant collection was obtained from Maharashtra State Biodiversity Board, Nagpur, Maharashtra, India. (Ref. No: MSBB/Desk-5/Research/995/2024-25). Plant material was collected from the Deccan plateau regions of Maharashtra, Shirur, Pune (N $18^0$ 49″ 33.56″, E $74^0$ 22″ 47.41). The collected seeds were grown, and plantlets were established in the Botanical Garden of Prof. Ramkrishna More College, Akurdi, Pune, India. Plant authentication and identification were done at the Botanical Survey of India (BSI), Western Region, Pune. Voucher specimen was submitted to the herbarium section of the Botanical Survey of India (WR), Pune. (Ref. No: BSI/WRC/Tech./2021/RM/04).

### Chemicals

All chemicals, such as water, dichloromethane, n-hexane, ethyl acetate, methanol, chloroform, oxytetracycline (test control), nystatin (positive control), DMSO (negative control), and streptomycin (positive control), used for extraction and various microbial activities were procured from Sigma–Aldrich (USA) and Merck (India).

### Preparation of Extracts

All plant parts, including leaves, corms, and seeds, were collected from the botanical garden-grown plants. The collected plant material was oven dried at $60^0$ C for 48 hours after being cleaned three or four times in distilled water. A mortar and pestle or a motorised grinder were used to separately crush and prepare the dried plant parts as powders. Using a shaken water bath at 50 rpm for 24 hours at room temperature, 20 g of each plant part powder was extracted in 200 mL of 75 % methanol. The final extracts were filtered using Whatman No.1 filter paper, and the solvent was eliminated by concentrating the filtrate under a rotary evaporator (Laborota 4000, Heidolph, Germany) at $50^0$C for 30 minutes. The final obtained solid crystal or semi-solid extracts were stored at 4 $^0$C and used for further microbial analysis.

### Source of Microorganisms

The bacterial strains, *Staphylococcus aureus,* a gram-positive (NCIM.5021), and *Escherichia coli, a* gram-negative (NCIM. 2065), were obtained from the Microbiological Laboratory of CSIR National Chemical Laboratory, Pune, Maharashtra, India and used as model organisms to evaluate the antibacterial properties of *I. magnifica*. The fungal strains, *Aspergillus niger* (NFCCI 5060), *Penicillium chrysogenum* (MTCC 5108), and *Fusarium verticilloides* (NFCCI 5145) were procured from the Microbiology Laboratory, Agharkar Research Institute, Pune, Maharashtra, India, and used for antifungal susceptibility testing based on their pharmacological and clinical relevance. On nutrient agar plates, bacterial cultures were inoculated for 48 hours at 37°C and maintained at -80°C. Fungal strains were cultured on Potato Dextrose Agar (PDA) and Sabouraud Dextrose Agar (SDA) media at 35°C and maintained at 4°C.

### Antibacterial activity using the agar well diffusion method

The antibacterial activity of the plant part extracts was evaluated using the agar well diffusion assay. Mueller-Hinton Agar (MHA) media was uniformly infected with a 100 µl bacterial suspension (~$10^6$ cfu/ml) and incubated for 24 hours at 37 $^0$C. A 6 mm wells were created using a sterile cork borer into the agar using a sterile cork borer. Subsequently, 50 µl of each crude extract (50 mg/ml) from different plant parts was dissolved in 100% DMSO (Hi Media, India), and final concentrations of approximately 50 mg/ml were separately added to the respective wells to assess antibacterial activity. 100 % DMSO served as the negative control, and 0.5 mg/ml streptomycin was used as the positive control. After allowing the extracts to diffuse into the agar for 30 minutes at 4 $^0$C, the plates were incubated at 37 $^0$C for 18 hours. The diameter of the zone of inhibition in millimeters was used to measure the antimicrobial activity.

### Antifungal activity through disc diffusion method

### Preparation of the inoculum

Fungal strains were cultured on PDA plates for 5 days at 27 °C to promote growth. The spore suspension was obtained from freshly grown pure cultures. The culture was vortexed to homogenize the suspension. The suspension was standardized by counting the number of spores using a hemocytometer to achieve a concentration of 1–5×10^4 spores/mL.

## Antifungal susceptibility testing

The plant extract working solutions were prepared using 50 mg/mL of 100% dimethyl sulfoxide (DMSO). PDA plates were prepared and allowed to solidify under sterile conditions. Using a sterilized glass spreader, the spore suspension was uniformly spread over the PDA plates' surfaces. Wells were created on agar plates using a sterile cork borer, and 50 µL of each crude extract was dispensed into designated wells. DMSO served as the negative control, and Nystatin- standard antifungal drugs used as the positive control. Finally, plates were incubated at 27 °C for 5 days. After incubation, the antifungal property was assessed by measuring the zone of inhibition diameter around the wells. The inhibition zone was measured in millimeters.

## Antioxidant potential determination using DPPH free radical scavenging assay

Antioxidant potential of plant extracts was calculated by using the qualitative 2- diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay, which provides stable free radicals. Crude extracts of the corms, leaves, and seeds were prepared in DMSO at various concentrations, viz. 20, 40, 60, 80, and 100 µg/mL. A blank was prepared without the addition of plant extract, while ascorbic acid was used as the standard antioxidant and served as the positive control. A freshly made 0.1 mM DPPH solution with methanol solvent was stored in the dark at 4 $^{0}$C before use. A mixture of plant extract of specified concentrations and DPPH solutions was shaken thoroughly and incubated at 37 °C for 15 minutes. A UV-Vis spectrophotometer was used to measure the absorbance at 517 nm, and the following formula was used to compute radical scavenging activity (RSA), which was expressed as the inhibition percentage of DPPH.

*Inhibition percentage = [Abs 517 (control) - Abs517 (test compound)]/Abs517 (control) × 100.*

## Statistical analysis

The experiments were carried out in triplicate using a fully randomized design. The data were analyzed by analysis of variance (ANOVA) to find significant differences between the means. Duncan's multiple range test (DMRT) was used to compare the mean at 5 % significance level (Duncan, 1955). The means ± standard deviation (SD) is used to express variability data.

## Results and Discussion

Different plant parts of *I. magnifica* have been traditionally used to cure various diseases, including earache, muscular dystrophy, arthritis, snakebites, and migraine (Bhogaonkar and Devarkar, 2011). Local people have directly utilized its tubers for medicinal purposes. Despite its traditional knowledge, there is limited information available concerning its antibacterial, antifungal, and antioxidant activities. Similar investigation has been conducted for other monocotyledonous plants, including *Allium wallichii, Sansevieria roxburghiana,* and *Colchicum autumnale,* highlighting the need for similar investigations in *I. magnifica* (Philip *et al.,* 2011; Bhandari *et al.,* 2017; Falahianshafiei *et al.,* 2023).

## Antibacterial activity of *Iphigenia magnifica*

The plant parts (Leaves, Corms, and Seeds) of *I. magnifica* exhibited antibacterial activity against *S. aureus* and *E. coli.* Among the different solvents, ethyl acetate extract was more potent against both bacterial strains (Fig. 1, Table 1). The ethyl acetate extract of the corn produced the largest zones of inhibition, with 14.3±1.20 and 12±1.15 mm zones of inhibition, followed by 14±1.15 and 11.33±0.66 mm zones of inhibition in leaves and 10±1.15 and 8±1.15 mm zones of inhibition in seeds against 30 µL extracts of *S. aureus and E. coli,* respectively. Methanolic leaf extracts also exhibited notable antibacterial activity, with zone of inhibition of 12 ± 1.15 mm for *S. aureus* and 10 ± 1.15 mm for *E. coli*. Extracts prepared using n-hexane and dichloromethane presented a moderate inhibitory effect, whereas the aqueous and chloroform extracts presented weak activity, with an inhibition zone below 6 mm. The positive control, streptomycin, showed zone inhibition of 16.33 ± 0.88 mm against *S. aureus* and 14 ± 1.15 mm against *E. coli*, while the negative control (DSMO) exhibited negligible inhibition. Solvent-dependent antibacterial potential was observed in the corm and seed extracts. Leaf and corm extracts showed higher antibacterial potential than seed extracts. *S. aureus* was found to be more susceptible than *E. coli* in all treatments.

The antibacterial activity of *I. magnifica* confirms its ethnomedicinal use and potential as a source of natural antimicrobial agents. The higher activity of ethyl acetate extracts indicates that most of the antibacterial constituents are semi-polar in nature. Moderate activity of methanolic extracts also suggests the contribution of

polar phytochemicals. The weaker activity of aqueous and nonpolar extracts revealed that the lower concentration or reduced availability of active compounds in the extracts. The susceptibility of *S. aureus* than *E. coli* may be attributed to structural differences in the cell wall. A similar solvent-dependent antibacterial pattern has been reported in various plants, including *Butea monosperma*, *Carissa macrocarpa*, *Rosmarinus officinalis*, and *Gloriosa superba* (Khan *et al.,* 2008; Chaudhari and Patil, 2022; Ramasar *et al.,* 2022; Rathore *et al.,* 2022; Kiros *et al.,* 2023).

## Antifungal activity of *Iphigenia magnifica*

The antifungal activity of leaf, corm, and seed extracts prepared in various solvents was assessed using the agar well diffusion method with 10 µL extract against *A. niger, P. chrysogenum,* and *F. verticillioides.* The diameter of the inhibition zone in mm was recorded and compared with the standard (oxytetracycline and nystatin) and a negative control (DSMO). The antifungal potential of the seed extracts exhibited the highest antifungal activity, followed by leaf and corm extracts. The methanolic seed extract produced the strongest inhibition, 42 ±1.15 mm, 51 ±1.66 mm, and 30 ±1.15 mm at a 10 µL concentration against *A. niger*, *P. chrysogenum,* and *F. verticillioides,* respectively. Ethyl acetate extracts (22±1.15 mm, 50±1.15 mm, and 32±1.15 mm), dichloromethane (30.6±0.66 mm, 44±2.30 mm, and 22±1.15 mm), and n-hexane (20.6±0.66 mm, 37.3±1.3 mm, and 30±1.15 mm) also showed strong antifungal activity against *A. niger, P. chrysogenum,* and *F. verticilloides,* respectively, and frequently outperformed standard antibiotics. Methanolic leaf extracts moderate antifungal activity with 7.3 ± 1.15 mm against *A. niger*, 18 ± 1.15 mm against *P. chrysogenum,* and 12 ± 1.15 mm against *F. verticillioides* (Fig. 2, Table 2). The antifungal activity of the corm extract exhibited lower activity across all the fungal strains. The corm extracts of n-hexane, ethyl acetate, and methanol showed moderate activity. Whereas aqueous dichloromethane and chloroform extracts exhibited negligible activity.

The seed extracts of *I. magnifica* showed remarkable antifungal activity, which supports natural ethnomedicinal antifungal sources. Methanol and ethyl acetate were found to be the most effective solvents for extracting antifungal constituents. Among the different fungal strains, *P. chrysogenum* was more susceptible than *F. verticillioides*. Similar solvent-dependent antifungal patterns have been reported for other medicinal plants, such as *Annona cherimola*, *Piper chaba,* and *Olea africana* (Rahman *et al.,* 2011; Masoko and Makgapeetja, 2015; Méndez-Chávez *et al.,* 2022).

## Antioxidant activity of *Iphigenia magnifica*

The DPPH free radical scavenging activity (RSA) of the crude extracts of leaves, seeds, and corms was determined at various concentrations, with ascorbic acid as the standard antioxidant (Table 3). All plant part showed considerable DPPH radical scavenging activity; among them seed and leaf extracts showed higher activity than the corm. Antioxidant capacity was quantified using $IC_{50}$ values; lower $IC_{50}$ values showed strong antioxidant activity. Among all the solvents, ethyl acetate extract showed the strongest antioxidant potential, with the lowest $IC_{50}$ values across all the plant parts. The maximum scavenging potential was recorded in the seed extract of ethyl acetate (54.5 ± 0.3 µg/mL), followed by leaf (58.3 ± 0.5 µg/mL) and corms (58.6 ± 0.2 µg/mL) extracts. Hexane extracts also presented relatively high antioxidant activity, especially in seeds (58.2±0.5 µg/mL) and leaves (61.8±0.7 µg/mL). Ethanolic and Butanolic extracts exhibited moderate antioxidant potential with $IC_{50}$ values ranging from 67.3 to 81.4 µg/mL. Methanolic extracts exhibited the highest $IC_{50}$ values and the weakest DPPH scavenging activity, particularly in seeds (95.2 ± 0.04 µg/mL) and leaves (88.9 ± 0.29 µg/mL). In all solvents and plant parts used, significant differences were observed, which revealed that antioxidant potential depended on both solvent and plant part.

DPPH radical scavenging activity in *I. magnifica* confirms the occurrence of bioactive compounds with antioxidant potential. Ethyl acetate extracts showed the highest potential, indicating major antioxidant constituents are mostly medium- to nonpolar phytochemicals. Variations in antioxidant potential among plant parts suggest differential accumulation of bioactive compounds, with seeds and leaves showing higher activity than corms. Similar results were reported in *Albizia adianthifolia, Crassocephalum bauchiense, Rosmarinus officinalis*, *Piper retrofractum, Dioscorea pentaphylla,* and *Cymodocea serrulata* (Tamokou *et al.,* 2012; Mouokeu *et al.,* 2014; Hyun *et al.,* 2015; Jadid *et al.,* 2017; Mondal *et al.,* 2019; Narayanan *et al.,* 2023). The comparatively high activity of hexane extracts also confirms this potential, whereas methanolic extracts showed weaker performance, indicating less contribution of polar compounds.

**Figure.1** Antibacterial activity of leaves, corm, and seed extracts of *Iphigenia magnifica* (A. *S. aureus* and B. *E. coli*)

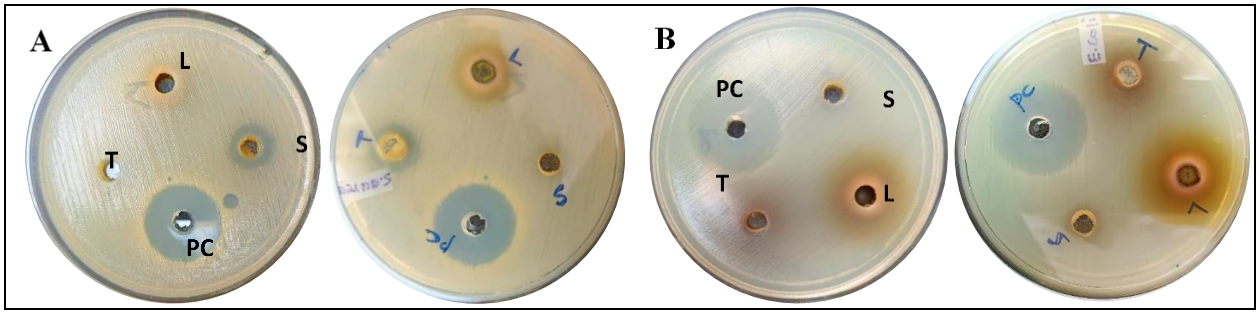



**Table.1** Antibacterial analysis for *Iphigenia magnifica*

| Sample Name | Solvent system | Conc. (µl) | Inhibition Zone (diameter in mm) | |
|---|---|---|---|---|
| | | | ***Staphylococcus aureus*** | ***Escherichia coli*** |
| **Leaves extract** | Water | 30µl | 5.3±0.66$^{d}$ | 4.6±0.33$^{de}$ |
| | Dichloromethane | 30µl | 4.6±0.66$^{de}$ | 6.3±0.88$^{d}$ |
| | n-Hexane | 30µl | 6±1.15$^{cd}$ | 8.6±0.66$^{cd}$ |
| | **Ethyl acetate** | 30µl | **14±1.15$^{b}$** | **11.33±0.66$^{b}$** |
| | Methanol | 30µl | 12±1.15$^{b}$ | 10±1.15$^{c}$ |
| | Chloroform | 30µl | 4.6±0.66$^{de}$ | 4.0±0.57$^{de}$ |
| | Streptomycin (Positive control) | 10 mg | 16.33±0.88$^{a}$ | 14±1.15$^{a}$ |
| | DMSO (Negative control) | 30µl | 2.6±0.66$^{e}$ | 3.3±0.88$^{e}$ |
| **Corm Extract** | Water | 30µl | 4.6±0.66$^{f}$ | 3.3±0.33$^{e}$ |
| | Dichloromethane | 30µl | 5.3±0.33$^{e}$ | 6±1.15$^{d}$ |
| | n-Hexane | 30µl | 6.6±0.66$^{d}$ | 9.3±0.66$^{bc}$ |
| | **Ethyl acetate** | 30µl | **14.3±1.20$^{a}$** | **12±1.15$^{a}$** |
| | Methanol | 30µl | 12±1.15$^{bc}$ | 5.3±0.66$^{e}$ |
| | Chloroform | 30µl | 4±0.57$^{f}$ | 3.3±0.66$^{e}$ |
| | Streptomycin (Positive control) | 10 mg | 16±1.0$^{a}$ | 12±1.15$^{a}$ |
| | DMSO (Negative control) | 30µl | 2.6±0.33$^{g}$ | 2.6±0.66$^{f}$ |
| **Seed Extract** | Water | 30µl | 2.6±0.66$^{d}$ | 3.3±0.66$^{cd}$ |
| | Dichloromethane | 30µl | 4.0±1.15$^{bc}$ | 3.3±0.33$^{cd}$ |
| | n-Hexane | 30µl | 2.6±0.66$^{d}$ | 3.3±0.66$^{cd}$ |
| | **Ethyl acetate** | 30µl | **10±1.15$^{b}$** | **8±1.15$^{b}$** |
| | Methanol | 30µl | 4.6±0.88$^{c}$ | 6.6±0.66$^{bc}$ |
| | Chloroform | 30µl | 2.6±0.33$^{d}$ | 3.3±0.33$^{cd}$ |
| | Streptomycin (Positive control) | 10 mg | 12.6±0.66$^{a}$ | 11.3±0.66$^{a}$ |
| | DMSO (Negative control) | 30µl | 2.6±0.66$^{d}$ | 2.6±0.33$^{d}$ |

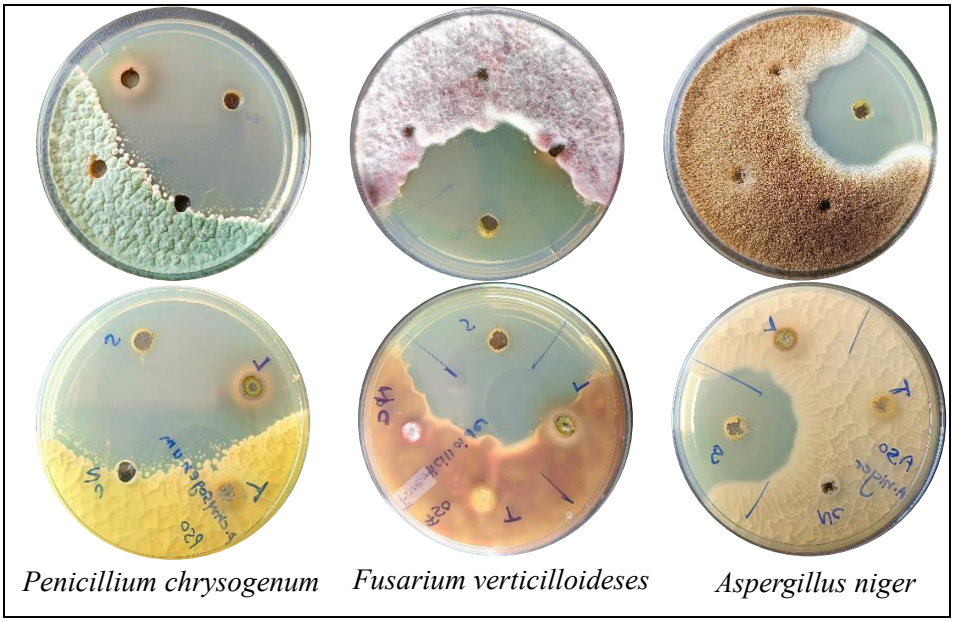
**Table.2** Antifungal analysis for *Iphigenia magnifica*

| Sample Name | Solvent system | Conc. (µl) | Inhibition Zone (diameter in mm) | | |
|---|---|---|---|---|---|
| | | | ***Aspergillus niger*** | ***Penicillium chrysogenum*** | ***Fusarium verticilloides*** |
| **Leaves extract** | Water | 10µl | 5 ±0.57$^{cd}$ | 5±0.57$^{e}$ | 4±0.57$^{f}$ |
| | Dichloromethane | 10µl | 4.6 ±0.33$^{d}$ | 3.6 ±0.33$^{f}$ | 3.6 ±0.33$^{gh}$ |
| | n-Hexane | 10µl | 6 ±0.57$^{b}$ | 5±0.57$^{e}$ | 4±0.57$^{f}$ |
| | Ethyl acetate | 10µl | 6 ±1.15$^{b}$ | 12±1.15$^{c}$ | 7.6±0.33$^{d}$ |
| | **Methanol** | 10µl | **7.3 ±1.15$^{a}$** | **18±1.15$^{a}$** | **12±1.15$^{a}$** |
| | Chloroform | 10µl | 5 ±0.55$^{cd}$ | 8±1.15$^{d}$ | 6±1.15 $^{e}$ |
| | Oxytetracycline (test cont.) | 10µl | 7.3±0.33$^{a}$ | 16±1.15$^{b}$ | 10.6±0.66$^{c}$ |
| | Nystatin (Positive control) | 10µl | 6±1.15$^{b}$ | 12±1.15$^{c}$ | 11.3±0.66$^{b}$ |
| | DMSO (Negative control) | 10µl | 4.6±0.66$^{d}$ | 6±0.57$^{de}$ | 6±1.15$^{e}$ |
| **Corm Extract** | Water | 10µl | 1.33±0.66$^{f}$ | 1.6±0.88$^{ef}$ | 3±0.57$^{b}$ |
| | Dichloromethane | 10µl | 0.66±0.66$^{gf}$ | 2±1.15$^{d}$ | 0.0±00$^{f}$ |
| | n-Hexane | 10µl | 3.0±0.57$^{d}$ | 5.3±0.66$^{b}$ | 2.3±0.33$^{cd}$ |
| | Ethyl acetate | 10µl | **4.6±0.66$^{c}$** | **4.6±0.33$^{c}$** | **3.3±0.66$^{b}$** |
| | **Methanol** | 10µl | 4.0±1.15 $^{c}$ | 4.6±0.66$^{c}$ | 2.6±0.66$^{c}$ |
| | Chloroform | 10µl | 2±0.0$^{ef}$ | 2.6±0.66$^{d}$ | 1.3±0.66$^{e}$ |
| | Oxytetracycline (test cont.) | 10µl | 6±1.15$^{b}$ | 4.6±0.33$^{c}$ | 2.6±0.66$^{c}$ |
| | Nystatin (Positive control) | 10µl | 10±1.15$^{a}$ | 13.3±1.76$^{a}$ | 8.6±0.66$^{a}$ |
| | DMSO (Negative control) | 10µl | 3.3±0.66$^{d}$ | 4.6±0.66$^{c}$ | 2.6±0.33$^{c}$ |
| **Seed Extract** | Water | 10µl | 15.0±1.15$^{g}$ | 18±1.15$^{hi}$ | 13.3±0.33$^{gh}$ |
| | Dichloromethane | 10µl | 30.6±0.66$^{c}$ | 44±2.30$^{d}$ | 22±1.15$^{ef}$ |
| | n-Hexane | 10µl | 20.6±0.66$^{g}$ | 37.33±1.3$^{e}$ | 30±1.15$^{b}$ |
| | Ethyl acetate | 10µl | 22±1.15f$^{g}$ | 50±1.15$^{ab}$ | 32±1.15$^{a}$ |
| | **Methanol** | 10µl | **42±1.15$^{a}$** | **51±1.66$^{a}$** | **30±1.15$^{b}$** |
| | Chloroform | 10µl | 26±1.15$^{e}$ | 30±1.15$^{f}$ | 19±0.66$^{f}$ |
| | Oxytetracycline (test cont.) | 10µl | 32±1.15$^{d}$ | 48.6±0.6$^{c}$ | 24±1.15$^{c}$ |
| | Nystatin (Positive control) | 10µl | 34±1.15$^{b}$ | 50±1.15$^{ab}$ | 24±1.15$^{c}$ |
| | DMSO (Negative control) | 10µl | 24.6±0.6$^{ef}$ | 28±1.15$^{fg}$ | 20±1.15$^{d}$ |

**Table.3** DPPH scavenging effect of *Iphigenia magnifica* extracts from different plant parts

| Plant Extracts | IC50 (µg/mL) | | | | |
|---|---|---|---|---|---|
| | **Methanol** | **Ethanol** | **Butanol** | **Hexane** | **Ethyl acetate** |
| **Leaves** | 88.9±0.29 $^{ab}$ | 80.1±0.03$^{bc}$ | 77.2±0.5 $^{c}$ | 61.8±0.7 $^{f}$ | 58.3±0.5 $^{g}$ |
| **Seeds** | 95.2±0.04$^{a}$ | 81.4±0.6 $^{b}$ | 67.3±0.5$^{e}$ | 58.2±0.5 $^{g}$ | 54.5±0.3 $^{h}$ |
| **corms** | 88.3±0.04$^{ab}$ | 76.8±0.3 $^{cd}$ | 71.2±0.6 $^{d}$ | 70.5±0.3 $^{de}$ | 58.6±0.2 $^{g}$ |

**Figure.2** Antifungal activity of leaf, corm and seed extract of *Iphigenia magnifica*




Similar solvent-dependent observations were recorded for several medicinal plants for antioxidant potential, such as *Olea africana*, *Peumus boldus*, *Andrographis paniculate*, *Clausena heptaphylla*, *Rumex abyssinicus,* and *Merremia borneensis*, supporting the reliability of the present findings (Quezada *et al.,* 2004; Premanath and Devi, 2011; Fakruddin *et al.,* 2012; Masoko and Makgapeetja, 2015; Amzad and Shah, 2015; Kengne *et al.,* 2021). The present finding highlights *I. magnifica* as a promising antioxidant source when extracted using medium-polarity solvents.

In conclusion, the present study confirms that *I. magnifica* is a potential source of biologically active compounds with marked antibacterial, antifungal and antioxidant potential. Ethyl acetate extracts of the corms and leaves were strong antibacterial activity against *S. aureus* and *E. coli*. Methanolic seed extract showed better antifungal activity against *P. chrysogenum*, surpassing both the positive and test controls.

Remarkable DPPH radical scavenging activity of corm extract presented greater antioxidant activity, with an IC50 value, indicating superior antioxidant capacity.

The outcome of this research support ethnomedicinal relevance of *I. magnifica* and its potential as a valuable biological resource for isolation of bioactive compounds and future pharmaceutical applications.

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## Author Contributions

Pravin Sangale: Plant collection and Photographs. Pravin Sangale, Hiralal Sonawane, Shailendra Kamble, Vikas Naikawadi, Rahul Zanan: Designed the experiment and writing the manuscript. Pravin Sangale, Vikas Naikawadi, Rahul Zanan: Manuscript edited and made corresponding figures and tables. Vikas Naikawadi, Rahul Zanan: Final revision of the manuscript.

## Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Ethical Approval** Not applicable.

**Consent to Participate** Not applicable.

**Consent to Publish** Not applicable.

**Conflict of Interest** The authors declare no competing interests.

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