# ANTIMICROBIAL AND ANTIOXIDANT POTENTIAL OF LEAVES, BARK AND INFLORESCENCE OF *IPOMOEA ERIOCARPA*

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**خلاصہ**

*Ipomoea eriocarpa*R.Br. کی پتیوں کی چھال،اور پھولوں کی موجودہ تحقیق میں antimicrobialاور antioxidantصلاحیت ایتھنول سالوینٹس کے طور پر استعمال کر کے، کھوج کی تشکیل کے لیے، تشخیص کیا گیا تھااور Maceration کے طریقہ کار کا استعمال کیا گیا تھا۔ *I. eriocarpa* کی اینٹی مائکروبیل صلاحیت مختلف بیکٹیریا اور کوکی تناؤ کے خلاف طے کی گئی تھی۔ *I. eriocarpa* کے antimicrobialصلاحیت 9.6 ± 1.2 ملی میٹر سے 6 ± 0.8 ملی میٹر تک زیادہ سے زیادہ سر گرمی کے ساتھ E. کولی کے خلاف چھال کے اتھانولک نچوڑ اور بی subtilis کے خلاف انفلوژنس انٹریلوسس انٹریکشن کے ذریعہ کم سے کم افادیت سے ظاہر ہوتا ہے۔ معیاری اینٹی بیکٹیریل ڈسکس میٹیسیلن یعنی 9.4 ± 1.22 اور اموکسیلن یعنی 9.3 ± 1.30 ملی میٹر۔ اے اور یازے کے تناؤ نے اے نائیجر کے مقابلے میں پودوں کے نچوڑ کی طرف مزاحم پیش کش کی تھی۔ I. *eriocarpa* کی پتیوں نے A. اور ائیز یعنی 14.8 ± 0.3 ملی میٹر کے خلاف سر گرمی کی نمائش کی تھی اور چھال نے A. نگر یعنی 12.6 ± 1.2 ملی میٹر کے خلاف سر گرمی کا مظاہرہ کیا تھا۔ انفلنگلز نے اے اور یز یعنی 10.3 ± 0.8 ملی میٹر کے خلاف زیادہ سے زیادہ سر گرمی اینٹی فنگل ڈسک گریزیوفولن کے مقابلے میں ظاہر کی تھی

*I. eriocarpa* کے اینٹی آکسیڈینٹ صلاحیت کا اندازہ تین طریقوں جیسے، کل فینولک مواد ( TPC)، کل flavonoids کے مواد ( TFC اور DPPH (1 ، 1- ڈفینیائل 2- (Picrylhydrazyl) بنیاد پر ستی سے متعلق اسکیوینگنگ سر گرمی سے ہوا۔ ٹی پی سی کی تشخیص کی گئی اور اس کا تھی Quن Quolvetinequivg برابر کے طور پر کیا گیا۔ اقتباس / مگرا کل فلاوونائڈ مواد کی قیمت 39.3 ± 0.85 سے 1.14 ± 0.13 µg / مگرا تک مختلف ہوتی ہے۔ پتیوں کے ایتھنولک نچوڑوں ( 39.3 ± 0.85 / µg مگرا) میں flavonoids کی سب سے زیادہ مقدار پائی گئی۔ معیاری بی ایچ ٹی یعنی 87.7 ± 0.12٪ کے مقابلے میں DPPH٪ ریڈیکل اسکیوینگنگ کی مالیت 23.3 ± 0.03 سے 76.5 ± 0.09٪ تک مختلف ہے۔ ان نتائج سے معقول antimicrobial اور antioxidant سر گرمی کا انکشاف ہوا، اس طرح اس کے دواؤں کی مالیت کی تائید ہوتی ہے

**Abstract**

In present research antimicrobial and antioxidant potential of leaves, bark and inflorescence of *Ipomoea eriocarpa* R. Br. was assessed and maceration method was used for the formation of extracts, by using ethanol as solvent. Antimicrobial potential of *I. eriocarpa* was determined against different bacterial and fungal strains. The antimicrobial potential of *I. eriocarpa* ranges from 9.6 ± 1.2 mm to 6 ± 0.8 mm with maximum activity showed by ethanolic extract of bark against *E. coli* and minimum efficacy by ethanolic extract of inflorescence against *B. subtilis* as compared to the zone of inhibition of standard antibacterial discs Methicillin, i.e. 9.4 ± 1.22 and Amoxicillin, i.e.9.3 ± 1.30 mm. The *A. oryzae* strain showed more resistance towards the plant extracts in comparison to *A. niger*. The leaves of *I. eriocarpa* had exhibited activity against *A. oryzae*, i.e. 14.8 ± 0.3 mm and bark demonstrated activity against *A. niger*, i.e. 12.6 ± 1.2 mm. The inflorescence had showed maximum activity against *A. oryzae*, i.e.10.3±0.8 mm in comparison to antifungal disc Griseofulvin.

Antioxidant potential of *I. eriocarpa* was evaluated by three methods, viz., Total phenolic content (TPC), Total flavonoids content (TFC) and DPPH (1, 1- Diphenyl-2-Picrylhydrazyl) radical scavenging activity. The TPC was evaluated and expressed as Quercetin µg equiv. /mg of extract. The value of total flavonoid contents varied from 39.3 ± 0.85 to 1.14 ± 0.13µg/mg. The highest amount of flavonoids was found in the ethanolic extracts of leaves (39.3 ± 0.85 µg/mg). The value of % DPPH radical scavenging varied from 23.3 ± 0.03 to 76.5 ± 0.09% as compared to standard BHT, i.e. 87.7 ± 0.12%. These results revealed reasonable antimicrobial and antioxidant activity, thus supporting its medicinal worth.

**Keywords:** *Ipomoea eriocarpa*, antimicrobial, antioxidants, crude extract

## Introduction

To prevent the toxic effects of antibiotics and to enhance the multiple drug resistance the use of phyto-medicines is increasing in this era (Shahzadi *et al.*, 2018). Throughout the world about 80 % of individuals obtain many effective and powerful drugs from herbal resources. To overcome the problem of multiple drug resistance the alternative antimicrobials drugs are discovered (Ajaib *et al.*, 2017; Maqbool *et al.*, 2021).

Antioxidants are natural or synthetic molecules that play a significant part in body defensing against free radicals that damage cells through oxidation reactions, they are being added as stabilizers in several food systems and cease the rate of lipid oxidation reactions and quench the free radicals (Ajaib *et al.*, 2016; Shahzadi *et al.*, 2018). During oxidation reactions, they interrupt the deterioration of substances caused by peroxides or oxygen. Antioxidants refer to organic enzymatic materials, for example β-carotene also called provitamin A or vitamin C & E, polyphenols, selenium, lycopene, lutein, and other carotenoids that are able to neutralize the destructive effects of oxidation in tissues (Aruoma, 1998; Shahzadi *et al.*, 2018). Few species of reactive oxygen are biologically important they help in production of energy, phagocytosis, intra cellular signaling, proper cell growth, etc. (Süleyman *et al.*, 2007). Some free radicals that are produced during metabolic reactions, ionizing radiations, UV light, sun light and chemical reactions have pathological effects (Yildirim *et al.*, 2001).

The largest genus of the family Convolvulaceae is *Ipomoea* and consists upon more than 500 species (Wilkin, 1999; Noshad *et al.*, 2021). It includes mostly herbs, climbing veins, trailer, twiner, shrubs and small trees. The presence of whitish sap is special diagnostic feature of *Ipomoea* (Shukla, 1979). Plants belonging to this genus are used in medicinal, ritual, ornamental, agricultural purposes and as environmental indicators (Noshad *et al.*, 2020). Leaves of *I. aquatica* are used as a source of food on large scale in various countries of the world. Roots of some species of *Ipomoea* are used to treat constipation (Gill, 1988). *Ipomoea eriocarpa* R.Br. is annual and pserennial plant, also known as annual morning glories (Fig. 1). It is distributed all over the South American, African and Asian tropical areas and Northern Australia. *I. eriocarpa* is a prostrate or twinning herb, have butterfly shaped cotyledons. First true leaves are large, heart shaped, with deep lobes at the base, alternate, ovate-cordate to linear-oblong, having almost 1-4 cm long petiole and about 1-2 m long stems. Inflorescence axillary, flowers are small, funnel-shaped, regular, penta-merous, bisexual; pedicel about 3-5 mm long. Fruit are pods and seeds are released through slits (Austin and Ghazanfar, 1979).The plants are used in traditional medicines for treatment of illness, epilepsy, sores, rheumatism, fevers, Hansen's disease, seizers, headache, leprosy, cancer, eczema and ulcer (Ajaib *et al.*, 2021; Ishtiaq *et al.*, 2021; Kumar, 2013).

**Fig.1. *I. eriocarpa* R. Br. in Natural Habitat**

## Materials and Methods

### Collection of plant material

Fresh leaves, bark and inflorescence of *I. eriocarpa* belonging to the family to Convolvulaceae was collected from District Kotli Azad Kashmir in the month of August, 2017. The plant material was authenticated from MUST, Botany herbarium with a voucher specimen no. MUST.BOT. 5372

The leaves, bark and inflorescence of *I. eriocarpa* were separated from main plant body and dried at room temperature under optimum environmental conditions (shady condition) for 15- 20 days. The fully dried plant material was ground to powder by using mortar and pestle. Maceration procedure was selected due to the nature of biological activities to be performed. Maceration is a Latin word it means "To soak". The plant powder was soaked in ethanol for 7 days due to the extraction of potentially active bio-constituents present in it. Then the macerated plant material containing solvent was filtered and dried.

50 gm of bark powder, 500g powder of leaves and inflorescence of *I. eriocarpa* was weighed and soaked in ethanol. The plant material was then filtered by What man filter paper. Finally, the extracts were concentered at rotary evaporator. This extract was further used for evaluation of antimicrobial and antioxidant activities.

**Evaluation of antimicrobial activity of *I. eriocarpa***

The microbes used for evaluation of antimicrobial activity of plant are both gram positive and gram negative bacteria were fresh cultured on the nutrient agar medium. The medium was prepared with the APHA standards and the ingredients were used according to Cruick-Shank *et al.*(1975) and Ajaib *et al.* (2014). The fungal strains were cultured on PDA medium using preparation of medium was given by Johansen (1940) and Maqbool *et al.,* (2021) in accordance to the APHA standards.

**Determination of antioxidant activity of plant**

The total phenol content was determined by the Folin Ciocalteu procedure by Makkar *et al.*,(1993) and Shahzadi *et al.,* (2018).The total flavonoid content of *I. eriocarpa* was determined by the Aluminium chloride calorimetric assay by using the Dewano *et al.*,(2002). 1, 1- Diphenyl-2-Picrylhydrazyl radical (DPPH) scavenging activity was carried out with the maximum value of its lambda, i.e. 515 nm. As it is mixed with sample its purple colour goes lighter and turns into yellow due to antioxidant property of sample. The sample was prepared as in the Total phenolic content.

Accurately weigh 0.024 g of DPPH was added in flask and then mixed with small amount of ethanol. The final volume of solution is 1000 ml. The solution can be stored at 4 $^{o}$C. BHT was used as standard solution. Same as of DPPH the different concentrations of BHT were prepared by serial dilution method. 0.1 g of BHT was weighed and mixed with ethanol to raise final volume of solution up to 100 mL. The % radical scavenging potential of plant extracts was determined by using following method. By using pipette 0.1 ml of plant part added in test tube then 3.9 mL of DPPH. The mixture in test tube was fully shaken and incubated for half an hour in the dark at 25 0c. The absorbance was measured at 517 nm through spectrophotometer. As a control / blank only 3.9ml of DPPH was used. The % DPPH value of samples was found by using following formula:

**% DPPH scavenging activity =** Abs. of control – $\frac{\text{Abs. of sample x 100}}{\text{Absorbance of control}}$

**Results and Discussion**

The current investigation was carried out to evaluate the antimicrobial efficacy and antioxidant significance of leaves, bark and inflorescence of *I pomoeaeriocarpa.* Now a day, there has been a rebirth of scientific investigations in the use of plants in our daily life matters. This study was also carried out to assess the active, safe, low-cost and best quality phytomedicine. The plant was collected; different parts of plant were separated, dried and ground to powder. The maceration method was adopted because of its low cost and to yield best quality extracts in comparison to other methodologies. Ethanol was used as solvent in maceration method.

The highest yield obtained from the ethanolic extract of the bark of *I. eriocarpa i.e.* (6.2 %)which was nearly similar to the yield extract recorded by Daud *et al.* (2011) while evaluating *Donaxgrandis* antioxidant potential and with Parekh and Chanda (2008) during the research on some Indian plants to determine their antifungal properties. Whereas, the minimum yield was obtained from the ethanolic extract of leaves of *I. eriocarpa* i.e. 4.3 %. Which was in accordance to the yield extract obtained from the leaves extract *Menthalongifolia* (L) Huds. reported by Khond *et al.* (2009) during screening of *in-vitro* antimicrobial activity of some selected medicinal plants extracts. The ethanolic extract of the inflorescence of *I. eriocarpa* shown yield about 6.16%. The difference in percentage yield might be due to different parts of plants as well as chemical nature of plant parts (Priya *et al.,* 2012).

**Physical appearance of plant extracts**

The preliminary study of plant extracts was carried out by noticing their physical features such as colour, texture and physical appearance are mentioned in table below (Table 1).

**Table 1. Physical properties of the extracts of *I. eriocarpa***

| Plant Part | Color | Appearance | Texture |
|---|---|---|---|
| **Leaves** | Blackish Green | Smooth | Sticky |
| **Bark** | Dark brown | Smooth | Sticky |
| **Inflorescence** | Dark Green | Smooth | Sticky |

**Antimicrobial Screening**

Antimicrobial screening of the *I. eriocarpa* extracts that were prepared through maceration method was used to find out the zone of inhibition.

**Antibacterial activity**

Antibacterial activity was evaluated using four bacterial strains i.e. *E. coli, S. aureus, B. subtili* sand *P. aeruginosa* by using agar well diffusion technique. The antibacterial standard discs Azithromycin, Ampicillin, and Amikacin were used as positive control aids. Maximum activity was revealed by Azithromycin against *E. coli* that is14.2 ± 1.0 mm and minimum activity was showed by Ampicillin against *E. coli* i.e. 7.6 ± 2.12 mm.Ethanol wasused as negative control, all strains of bacteria used as test organisms showed negligible response against ethanol which was used as solvent for maceration of plant material. The antimicrobial potential of *I. eriocarpa* ranges from 9.6 ± 1.2 mm to 6 ± 0.8 mm with maximum activity showed by ethanolic extract of bark against *E. coli* and minimum efficacy by ethanolic extract of inflorescence against *B. subtilis.* The antimicrobial effect of *I. eriocarpa* was determine by calculating zone of inhibition against bacterial and fungal strains and results were compared with Iqbal *et al.* (2012). The results of antifungal findings were relevant to the findings of Ajaib *et al.* (2013 and Maqbool *et al.* (2021). The leaves of *I. eriocarpa* had showed activity within the range of 0±0 to 9.2 ± 0.8 mm. The value of maximum Zone of Inhibition produced by ethanol extract of leaves i.e. 9.2 ± 0.8 mm against *S. aureus*. Bark had displayed the potential within the range of 0±0 to 9.6 ± 1.2mm. Whereas, maximum value of Zone of Inhibition of ethanol extract of bark i.e. 9.6 ± 1.2 mm against *E. coli*. The Inflorescence of *I. eriocarpa* had showed activity within the range of 0±0 to 8.7 ± 1.4 mm the maximum value of zone of inhibition of Inflorescence is 8.7 ± 1.4 against *E. coli* (Table 2) also observed by Ajaib *et al.* (2015) while investigation of the phyto-chemicals of *P. undulata.* The standard discs (Azithromycin, Amoxicillin & Amikacin) were used to compare the results of zone of inhibition.

**Table 2. The Zone of Inhibition produced by the leaves, bark and inflorescence of *I. eriocarpa* against the bacterial strains was documented in mm**

| Plant Parts/standard disc | Zone of Inhibition (mm) | | | |
|---|---|---|---|---|
| | ***S. aureus*** | ***E. coli*** | ***P. aeruginosa*** | ***B. subtilis*** |
| **Leaves** | 8.6± 1.4 | 8.9 ± 0.65 | 9.2 ± 0.8 | 6.3 ± 1.1 |
| **Bark** | 9.2 ± 1.3 | 9.6 ± 1.2 | 8.9 ± 1.1 | 7.4 ± 0.9 |
| **Inflorescence** | 8.7 ± 0.8 | 8.7 ± 1.4 | 8.2 ± 0.6 | 6 ± 0.8 |
| **Azithromycin** | 16 ±2.5 | 15±0.8 | - | 8±0.3 |
| **Amoxicillin** | 12±1.2 | 25±0.3 | - | 10±0.4 |
| **Amikacin** | 18±0.6 | - | 21±0.5 | - |

All results were run in triplicates and written as Mean ± Standard error.

**Antifungal activity**

The fungal specimens showed negligible response against ethanol that was used as negative control. The maximum potential against the respective fungal strain was exhibited by the ethanolic extract of leaves within the range of 0±0 to 14.8 ± 0.3 mm and bark had demonstrated the efficacy within the range of 0±0 to 12.6 ± 1.2 mm. The inflorescence had showed activity within the range of 0±0 to 10.3±0.8 mm (Table 3).

**Table 3. Zone of Inhibition exhibited by leaves, bark and inflorescence of *I. eriocarpa*against fungal test organisms**

| Plant Part/standard disc | Zone of Inhibition | |
|---|---|---|
| | ***A. niger*** | ***A. oryzae*** |
| **Leaves** | 10 ± 0.6 | 14.8 ± 0.3 |
| **Bark** | 12.6 ± 1.2 | 12 ± 0.5 |
| **Inflorescence** | 9.9 ± 0.3 | 10.3 ± 0.8 |
| **Nystatin** | 24±0.9 | 32±0.1 |
| **Griseofluvin** | 22±0.4 | 27±0.6 |

All results were run in triplicates and stated as Mean ± Standard error.

**Antioxidant activity**

Now a day, the interest for the search of natural source of antioxidants is increasing rapidly due to their importance in the field of apothecary and medication. The bioactive compounds of medicinal plants are effective source of novel drugs. These biological drugs are very effective against various harmful diseases. Here the methods used for the study of antioxidant potential of *I. eriocarpa* are Total phenolic content, Total flavonoids content and 1, 1- Diphenyl-2-Picrylhydrazyl radical scavenging potential.

**Determination of total phenolic content**

The total phenolic content of *I. eriocarpa* was assessed by Folin-Ciocalteau (FC) reagent. During this method due to metal oxide reduction blue colour appears, that displays an extreme broad light absorption at 760 nm. The results are showed in Gallic acid equivalents (GAE). The value of Total phenolic content (mg gallic acid equivalent per gram dry extract weight) of plant extracts was shown in Table 4. The plant extracts which displayed the value within the range 48.6 ± 0.01 to 1.96 ± 0.6 µg/ml GAE. The Total phenolic content of leaves the ethanolic extract of the *I. eriocarpa* leaves range from 48.6 ± 0.01 to 3.116 ± 1.4 µg/ml GAE. Bark extract had to 40.7 ± 0.05 to 1.96 ± 0.6 µg/ml GAE and Inflorescence extract had 39.63 ± 0.04 to 2.21 ± 0.93 µg/ml GAE. As whole maximum activity was showed by leaves extracts (Table 4), followed by bark and inflorescence. Overall activity of plant extracts exhibited as leaves> bark > inflorescence.

**Table 4. Total Phenolic Contents (expressed as µg/ mL of gallic acid) of *I.eriocarpa***

| Plant part | Concentration (µg/ml) | Absorbance at 760 nm | GAE (µg/ mL gallic acid ) |
|---|---|---|---|
| **Leaves** | **500** | 0.62 ± 0.12 | 48.6 ± 0.01 |
| | **250** | 0.42 ± 0.02 | 24.16 ± 0.25 |
| | **125** | 0.29 ± 0.05 | 11.416 ± 0.9 |
| | **62.5** | 0.212 ± 0.3 | 6.05 ± 1.23 |
| | **31.5** | 0.184 ± 1.21 | 3.116 ± 1.4 |
| **Bark** | **500** | 0.43 ± 0.02 | 40.7 ± 0.05 |
| | **250** | 0.37 ± 0.6 | 21.24 ± 0.1 |
| | **125** | 0.21 ± 1.3 | 9.24 ± 1.65 |
| | **62.5** | 0.17 ± 0.05 | 5.916 ± 0.85 |
| | **31.5** | 0.06 ± 0.13 | 1.96 ± 0.6 |
| **Inflorescence** | **500** | 0.42 ± 0.05 | 39.63 ± 0.04 |
| | **250** | 0.31 ± 0.12 | 18.21 ± 0.61 |
| | **125** | 0.24± 2.3 | 9.79 ± 0.03 |
| | **62.5** | 0.188 ± 0.5 | 5.621 ± 0.01 |
| | **31.5** | 0.09 ± 0.1 | 2.21 ± 0.93 |

*Results were carried out in triplicates and written as Mean ± Standard error

**Estimation of total flavonoid content**

The total content of flavonoids was evaluated and expressed as µg Quercetin equivalents (QE) /mg of extract. The value of total flavonoid contents varied from 39.3 ± 0.85 to 1.14 ± 0.13µg/mg. The highest amount of flavonoids was found in the ethanolic extracts of leaves (39.3 ± 0.85 µg/mg). Overall activity of plant extracts exhibited as leaves > bark > inflorescence. Results (Table 5) revealed that leaves extracts possessed highest flavonoid contents as compare to bark and inflorescence.

**Table 5: Total Flavonoid Contents (expressed as Quercetin equivalent) of *I.eriocarpa*.**

| Plant part | Concentration (µg/ml) | Absorbance at 510 nm | QUE (µg/ mL of Quercetin) |
|---|---|---|---|
| **Leaves** | **400** | 0.82 ± 0.13 | 39.3 ± 0.85 |
| | **200** | 0.69 ± 0.03 | 19.53 ± 0.02 |
| | **100** | 0.432 ± 0.35 | 9.5 ± 0.1 |
| | **50** | 0.33 ± 0.02 | 4.79 ± 1.5 |
| | **25** | 0.209 ± 1.2 | 2.34 ± 0.09 |
| **Bark** | **400** | 0.61 ± 0.34 | 37.31 ± 0.05 |
| | **200** | 0.45 ± 0.04 | 17.3 ± 1.02 |
| | **100** | 0.36 ± 0.5 | 3.52 ± 0.18 |
| | **50** | 0.27 ± 0.01 | 3.29 ± 0.52 |
| | **25** | 0.134 ± 0.2 | 1.94 ± 1.09 |
| **Inflorescence** | **400** | 0.52 ± 0.01 | 35.13 ± 1.03 |
| | **200** | 0.37 ± 0.13 | 12.32 ± 0.12 |
| | **100** | 0.29 ± 0.14 | 6.9 ± 0.53 |
| | **50** | 0.21 ± 0.05 | 9.8 ± 1.23 |
| | **25** | 0.192 ± 0.02 | 1.14 ± 0.13 |

*Results reported were done in triplicates and written as Mean ± Standard error

**1, 1- Diphenyl-2-Picrylhydrazyl radical scavenging property**

The % DPPH radical scavenging activity was assessed and expressed against Butylated hydroxyl toluene as standard. The control (standard BHT) showed maximum activity about (87.7 ± 0.12%). The value of % DPPH radical scavenging varied from 23.3 ± 0.03 to 76.5 ± 0.09% (Table 6). The results revealed that the ethanolic extract of the *I. eriocarpa* leaves exhibited the highest radical scavenging activity with 76.5 ± 0.09 % followed by the Bark extract of 74.4 ± 0.2 and 73.2 ± 0.14% of Inflorescence extract and minimum % DPPH radical scavenging activity i.e. 23.3 ± 0.03 % that was shown by ethanolic extract of leaf when conc. is 2 ppm.

As whole maximum activity was showed by leaves extracts (Table 6), followed by bark and inflorescence. Overall activity of plant extracts exhibited as leaves> bark > inflorescence.

**Table 6. DPPH scavenging activity of *I. eriocarpa,* compared with the standard antioxidant**

| Plant part | Concentration (ppm) | Absorbance | % DPPH remaining |
|---|---|---|---|
| **Leaves** | **10** | 0.211 ± 0.016 | 76.5 ± 0.09 |
| | **8** | 0.313 ± 0.01 | 65.2 ± 0.23 |
| | **6** | 0.444 ± 0.02 | 50.6 ± 0.01 |
| | **4** | 0.61 ± 0.011 | 32.2 ± 0.5 |
| | **2** | 0.69 ± 0.012 | 23.3 ± 0.03 |
| **Bark** | **10** | 0.23 ± 0.02 | 74.4 ± 0.2 |
| | **8** | 0.33 ± 0.04 | 63.3 ± 0.13 |
| | **6** | 0.39 ± 0.01 | 56.7 ± 0.02 |
| | **4** | 0.471 ± 0.04 | 47.8 ±0.12 |
| | **2** | 0.51 ± 0.01 | 43.3 ± 0.03 |
| **Inflorescence** | **10** | 0.241 ± 0.01 | 73.2 ± 0.14 |
| | **8** | 0.29 ± 0.017 | 67.7 ± 0.03 |
| | **6** | 0.36 ± 0.011 | 60.2 ± 0.05 |
| | **4** | 0.467 ± 0.012 | 53.1 ± 0.06 |
| | **2** | 0.48 ± 0.02 | 48.3 ±0.4 |
| **BHT** | **10** | 0.11 ± .56 | 87.7 ± 0.12 |
| | **8** | 0.16 ± 0.23 | 82.3 ± 0.5 |
| | **6** | 0.184 ± 0.14 | 79.6 ± 0.12 |
| | **4** | 0.179 ± 0.12 | 75.2 ± 0.62 |
| | **2** | 0.168± 0.01 | 70.2 ± 0.14 |

*The results reported were run in triplicates and stated as Mean ± Standard error

Oxidative stress occurs in both plants and animals. In plants the oxidative stress is caused by photosystem. In humans, about 1-3% of the peroxisomes, mitochondria, microsomes and others the ROS formation might occur (Schemp, 2005). Many antioxidants are obtained from natural resources, that are used as free radical and active oxygen scavengers. Now a day, the use of natural antioxidants is increasing to replace the synthetic antioxidants. Antioxidants also play role in retard the progress of diseases as well as lipid oxidative process in foods (Lia and Chou 2001).

**Conclusion**

Medicinal plants signify a significant source of biological agents that are source of potent drugs. Though thousands of plant species have been verified for antimicrobial activity. The different parts of medicinal plants such as root, stem, leaves, flower and fruits are used to extract raw drugs that have diverse properties. It is a crucial requirement to regulate antimicrobial resistance by enhanced antibiotic drugs. It is necessary to develop of new drugs to sustain the antimicrobial management. The present study indicates that the ethanol extract shows antimicrobial activity against four bacterial strains i.e. *S. aureus*, *P. aeruginosa*, *B. subtilis*and *E. coli* and two fungal strains i.e. *A. oryzae*and *A. niger*. The results showed that the plant can be studied further to assess efficacy as an antimicrobial agent by clinical trials. The antioxidant potential of *I. eriocarpa* lowers the concentration of free radicals as results comparable with those of standard antioxidant, i.e. BHT. This research data more support the opinion that this plant is auspicious source of natural antioxidants and biologically useful medications.

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