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PHYTOCHEMICAL SCREENING AND ANTIOXIDANT EVALUATION OF *LANTANA CAMARA* FLOWER EXTRACTS

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ABSTRACT

Lantana camara, popularly called as Spanish flag and wild sage, belonging to the family Verbenaceae, is majorly distributed across India, notably in Jammu and Kashmir, South India, Himachal Pradesh, Uttar Pradesh, Maharashtra, and several other regions. *Lantana camara is* most widespread ornamental flowering shrub which is erect, hairy with unique variegated flowers. It is widely distributed in roadsides, railway tracks, and canals, also serves as both ornamental and medicinal plant. *Lantana camara* was popularly utilized in traditional medicine, with its extracts applied to cuts, wounds, skin ailments and eczema. The plant is abundant source of bioactive compounds such as alkaloids, steroids, glycosides, saponins, terpenoids, flavonoids, and coumarins, contributing to its wide range of pharmacological effects such as antioxidant, antimicrobial, antiulcer genic, anti-hyperglycaemic and anticancer. The present study was aimed to analyse the phytochemical profile and antioxidant activity of *Lantana camara* flower extract. Standard qualitative methods were employed to screen phytochemicals and antioxidant activity of aqueous extracts was assessed through DPPH assay. Phytochemical analysis revealed the presence of diverse secondary metabolites including alkaloids, saponins, tannins, glycosides and terpenoids. The DPPH assay exhibited strong antioxidant potential, indicates that *Lantana camara* may serve

valuable nutritional and medicinal values, with promising various disease conditions.

KEYWORDS: *Lantana camara*, Plant extract, Phytochemical, Antioxidant, DPPH Assay.

INTRODUCTION

Medicinal plants are vital source for diverse bioactive compounds, used to treat various health conditions. Scientific analysis of medicinal plants reveals it as a major source of numerous therapeutic compounds. Numerous pharmacological analysis of plants confirm its therapeutic properties like antimicrobial, antioxidant, anticancer, antidiabetic, anti-inflammatory and larvicidal properties (Kalita *et al*., 2012). Secondary metabolites are plant-derived bioactive compounds which is vital in supporting human health and disease prevention. These phytochemicals influences plant colour, aroma, and flavour also enhance therapeutic properties (Kumar *et al*., 2023). The excessive reactive oxygen species disrupts the antioxidant balance of body and contributes to chronic and acute diseases. Antioxidants neutralize free radicals, inhibiting cellular damage and promoting anti-aging and anticancer functions. Plant-derived compounds namely phenols, carotenoids, flavonoids, tannins, and vitamins are widely used in medicine, food and cosmetics for health protection (El-Sayed *et al*., 2017).

The ornamental plant *Lantana camara* first described by Carl von Linnaeus in 1753 and belongs to Verbenaceae family. The shrub grows up to 2–3 m tall, with spiny stems, rough green aromatic leaves, and clusters of small tubular flowers in varied colors like red, pink, orange, yellow and white which blooms between March to August (Thorat *et al*., 2021). Native to tropical zones including Asia, America and Africa and which is invasive in nature with 650 varieties colonized 60 countries. *Lantana camara* plant produces small two-seeded drupes fruits that mature from green to purple before turning dark blue-black. The plant is known by various names including Unnichedi in Tamil, Natahu and Kakke in Kannada, Chaturang in Sanskrit, Lantana, Wild sage and Spanish flag in English, Pulikampa in Telugu, Raimuniya in Hindi, Wandelroschen in German, Cambara de espinto in Brazil and Big sage, Ayam and Black sage in Malaysia (Mahesh., & BP Harini,. 2025). Beyond their invasive nature it possess excellent therapeutic properties including antimicrobial, anticancer, antidiabetic, anti-inflammatory, antioxidant and antiepileptic. The medicinal properties of *Lantana camara* is due to the abundance of flavonoids, anthocyanins, coumarins, lignans, alkaloids, tannins, saponins, catechins and isocatechins (El-Sayed *et al*., 2017). The current study was aimed to examine the phytochemical and antioxidant activity of *Lantana camara*

flower extracts.

METHODOLOGY

Plant sample collection

Lantana camara flowers were collected from Palakkad, Kerala, India. The collected plant sample was rinsed with tap water and subsequently washed with distilled water to remove the adhering impurities. The plant sample air dried at room temperature, powdered into fine form and stored in airtight container.

Preparation of plant extract

The plant aqueous extract was obtained by dispersing 5 grams of dried powder in 100 mL of distilled water, followed by boiling at 50-60 °C in water bath until the liquid volume diminished. The resulting solution was filtered using Whatman No. 1 filter paper, and the filtrate was centrifuged at 5000 rpm for 10 minutes to obtain the extract and stored to further studies.

Phytochemical Screening

Preliminary qualitative phytochemical screening of *Lantana camara* flower extract was subjected to qualitatively identify the tannins, saponin, flavonoids, steroids, terpenoids, alkaloids, anthraquinones, polyphenols, glycosides and coumarins based on standard procedures of Sofowara., 1993.

a) Detection of Tannins

1ml of plant extract is combined with 5 ml of distilled water, gently heated and then cooled. 0.1% of ferric chloride added to the above solution. Appearance of Blackish blue and greenish black colour indicates the presence of tannin (Sofowara., 1993).

b) Detection of Saponins

2 ml of plant extract mixed with 3 ml of hot distilled water, diluted with addition of 5 ml of distilled water. After shaking the mixture and standing for 15 minutes, the formation of foamy layer confirms the presence of saponins (Sofowara., 1993).

c) Detection of Flavonoids

To qualitatively analyse the presence of flavonoids, 1ml of the plant extract was mixed with 2.5 ml of ammonia, after which few drops of concentrated Sulphuric acid added. The appearance of a yellow color considered as the presence of flavonoids (Sofowara., 1993).

d) Detection of Steroids

0.5ml of the plant extract mixed with 1ml of acetic anhydride, followed by the mixing of 2 ml of concentrated Sulphuric acid. Appearance of violet to blue or green color indicates the presence of steroids (Sofowara., 1993).

e) Detection of Terpenoids

Terpenoid presence confirmed by adding 5ml of plant sample with 2ml of chloroform, subsequently few drops of concentrated Sulphuric acid added. Reddish brown colour formation indicates the presence of terpenoids (Sofowara., 1993).

f) Detection of Alkaloids (Mayer's Test)

For the qualitative identification of Alkaloids 5 drops of Mayer's reagent added to 1 ml of the plant extract. The development of a creamy, off-white precipitate indicates the presence of alkaloids (Sofowara., 1993).

g) Detection of Antraquinones

To test for anthraquinones, add 2 ml of the sample with 1 ml of concentrated Sulphuric acid, followed by the addition of 1 ml of ammonia. A rose-pink color formation in the solution confirms their presence (Sofowara., 1993).

h) Detection of Polyphenols

1ml of the plant sample is mixed with 4ml of ethanol and boiled in water bath for 15 minutes. Following cooling, three drops of ferric chloride solution were added. Formation of Blue-green colour signifies the presence of polyphenols (Sofowara., 1993).

i) Detection of Glycosides

1ml of plant extract added to 1ml of acetic acid, continuously few drops of ferric chloride and 1ml of concentrated Sulphuric acid added to the above mixture. Appearance of a brown ring confirms the presence of glycosides (Sofowara., 1993).

j) Detection of Coumarins

3 ml of 10% sodium hydroxide solution added to the 2 ml of the plant extract. The appearance of a yellow coloration indicates the confirmation of coumarin presence (Sofowara., 1993).

Antioxidant Test

DPPH Assay (Mahdi-Pour et al., 2012)

The antioxidant activity of *Lantana camara* flower extract was measured using 2, 2-Diphenyl-1-picrylhydrazyl DPPH radical scavenging activity. Different volumes of plant extract were mixed with methanol to get (10 µg/mL, 25 µg/mL, 50 µg/mL, 75 µg/mL, and 100 µg/mL) dilutions. 2 ml of DPPH solution was added to each tube and incubated in the dark at room temperature for 30 minutes. Ascorbic acid was used as the standard. The absorbance of each reaction mixture was spectrophotometrically measured at 517 nm, and the percentage inhibition of DPPH radicals was calculated relative to the control. DPPH scavenging activity of plant extract was calculated using the given equation,

$$\% \text{ of DPPH Radical Scavenging Activity} = \frac{\text{Control} - \text{Sample}}{\text{Control}} \times 100$$

RESULTS AND DISCUSSIONS

Collection of samples

The *Lantana camara* flowers were obtained from Palakkad, Kerala. The flower samples were dried under shade conditions, ground into fine powder with a mortar and pestle, and subjected to aqueous extraction through boiling with water.

"Fig. 1 *Lantana camara* Plant"

"Fig. 2 Dried *Lantana camara*"

Phytochemical Analysis

Preliminary phytochemical screening of Lantana *camara* flower extract tested were summarized in the Table 1. The aqueous extract of *Lantana camara* prepared by the boiling method showed the presence of important secondary metabolites such as tannins, flavonoids, terpenoids, steroids, and polyphenols. These compounds are well known for their antioxidant, antimicrobial, anti-inflammatory, and therapeutic properties.

Table 1: Phytochemical Screening of *Lantana camara* Flower Extract.

Phytochemical Tests	Aqueous Extract of *Lantana camara*
Tannin	Positive
Saponin	Negative
Flavanoids	Positive
Steroids	Positive
Terpenoids	Positive
Alkaloids	Negative
Antraquinone	Negative
Polyphenol	Positive
Glycoside	Negative
Coumarins	Negative

Preliminary phytochemical screening of the aqueous extract of *Lantana camara* flower revealed the presence of phytochemicals including tannins, flavonoids, terpenoids, steroids, and polyphenols, while saponin, alkaloids, anthraquinone, glycosides, and coumarins were absent. These compounds are well known for their antioxidant properties. The presence of these bioactive compounds indicates that the plant possesses significant medicinal potential. Thorat et al. (2021) reported that *Lantana camara* leaf extract contains tannins, saponins, terpenoids, glycosides, and alkaloids and coumarins were absent. The metabolites signifies the plant's medicinal potential through their diverse biological activities.

5. Antioxidant Assay for antiradical activity with DPPH

The antioxidant activity of the *Lantana camara* flower extract was evaluated through DPPH radical scavenging assay. The plant extract exhibited a concentration-dependent increase in free radical scavenging activity, with inhibition values of 7.2%, 21.0%, 46.2%, 71.0%, and 96.0% at 10, 25, 50, 75, and 100 µg/mL, respectively reported in Fig 3. The IC_{50} value of 53.7 µg/mL, indicates that plant extract exhibits a potential antioxidant activity. IC_{50} value of Ascorbic acid exhibited as 27.9 µg/mL. The significant increase in DPPH radical scavenging with increasing extract concentration suggests the presence of bioactive phytochemicals found in the extract donate hydrogen atoms or electrons to neutralize free radicals. These findings indicate that the *Lantana camara* extract possesses significant antioxidant potential and may serve as a promising natural source of antioxidant compounds.

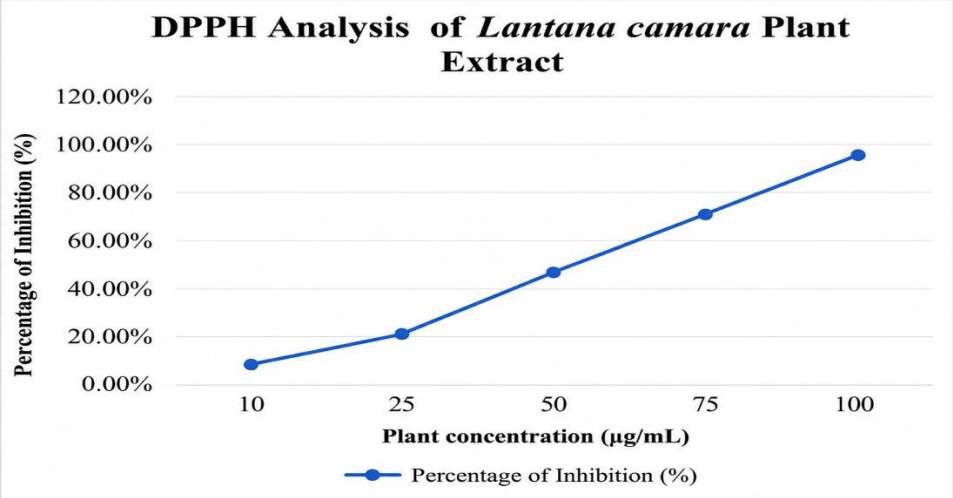

Fig. 3: DPPH radical scavenging assay of *Lantana camara* flower extract.

The findings of the current study are in consistent with the research work carried out by Mahdi-Pour *et al*. (2012), who demonstrated that *Lantana camara* possesses progressive antioxidant activity. The study signified that leaf extracts exhibited the strongest antioxidant activity with an IC_{50} value of 16.02 µg/mL, followed by flower (28.92 µg/mL), root (31.52 µg/mL), stem (46.96 µg/mL), and fruit (90.11 µg/mL). The IC_{50} value obtained in the present study (53.7 µL) differs from the values reported by Mahdi-Pour *et al*., such variations are expected because antioxidant activity is influenced by factors including the plant part used, geographical origin, extraction solvent, extraction method, and assay conditions. Manzoor et al. (2013) reported DPPH radical scavenging activity between 31.32% and 60.24%, with the highest activity in 80% methanolic extract using ultrasound-assisted extraction and the lowest in 100% methanolic extract by maceration. The improved activity was linked to better release of phenolic and flavonoid compounds. The findings of the present study are consistent with those reported by Mahesh and Harini (2025), who investigated the phytochemical composition and flavonoid content of *Lantana camara* flower and leaf extracts prepared using petroleum ether, chloroform, methanol, and water. Polar solvent extracts exhibited superior phytochemical recovery and antioxidant potential compared with non-polar solvent extracts.

The strong antioxidant activity observed in the present study may be attributed to the presence of phenolic compounds, flavonoids, tannins, and other secondary metabolites reported in *Lantana camara*. These phytochemicals are known to scavenge reactive oxygen species and protect biological systems against oxidative damage by donating hydrogen atoms or electrons to free radicals. Flavonoids and polyphenols present in the plant extract act as

powerful free radical scavengers, while tannins contribute by inhibiting lipid peroxidation and neutralizing reactive oxygen species. The combined action of these phytoconstituents may be responsible for the high DPPH radical scavenging activity observed in the extract, which increased from 7.2% at 10 µg/mL to 96.0% at 100 µg/mL, indicating a concentration-dependent antioxidant effect. The present findings confirm that *Lantana camara* is a promising natural source of antioxidant compounds. The observed DPPH radical scavenging activity supports its potential application in the development of herbal formulations and natural antioxidant-based therapeutic products.

CONCLUSION

Lantana camara has diverse biological activities and potential applications. The phytochemical screening of *Lantana camara* flower extracts indicates the presence of various secondary metabolites, such as tannins, flavonoids, terpenoids, steroids, and polyphenols. The presence of polyphenols and flavonoids particularly suggests a strong antioxidant potential, which is supported by the DPPH scavenging activity observed in the study. It has various pharmacological properties, antioxidant potential, and other relevant characteristics. However, further research is required to fully understand its mechanisms of action and to explore its therapeutic properties.

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