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# Isolation, Characterisation and Evaluation of Anti-Asthmatic Activity Of *Caesalpinia Pulcherrima L.*

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**ABSTRACT**

Caesalpinia pulcherrima is also commonly known as peacock flower, belongs to the family Caesalpiniaceae. Reported biological activities of the plant Caesalpinia pulcherrima L.are antimicrobial, antiulcer, anti-inflammatory, antinociceptive, antibacterial, antiwrinkle. The present study was undertaken to isolate, characterise and evaluate the in-vitro anti-asthmatic activity of the whole plant of Caesalpinia pulcherrima L using goat tracheal chain method. Presence of phytoconstituents such as alkaloids, glycosides, saponins, carbohydrates, proteins, amino acids, flavonoids, tannins, steroids were observed in whole plant of Caesalpinia pulcherrima L. The main components identified were 8-methoxybonducellin, 6-methoxypulcherrimin, myricitroside and isobonducellin. The structure of the isolated compounds was elucidated on the basis of FTIR spectrum and GC-MS spectrum as well as by comparison with available data in the literature. It was observed that ethanolic extract (300 µg, 400 µg) of Caesalpinia pulcherrima showed significant dose dependent antiasthmatic activity in goat tracheal chain model. While chloroform extract (300 µg, 400 µg) and petroleum ether (300 µg , 400 µg) showed satisfactory activity. Thus results reported in the present work shows evidence that the ethanol extract of C. pulcherrima shows potent anti-asthmatic activity.

Keywords: Caesalpinia pulcherrima L, Caesalpiniaceae anti-asthmatic activity, histamine.

## I. INTRODUCTION

Asthma is a chronic disease with spastic contraction of smooth muscle in the bronchioles characterized by difficult breathing with wheezing. Asthma, a common, chronic inflammatory disorder of the airways, associated with pronounced health and economic consequences, has been identified as one of the five pressing global lung problems.[1] It has many causes but more specifically due to inflammation of air passage, hypersensitivity of afferent glossopharyngeal and vagal ending in the nose, pulmonary edema and

congestion of lungs caused by left ventricular failure. Theprevelance of childhood with wheezy and/or wheezy bronchitis ranges from 9.9 to 33% .[2] There is considerable mortality and morbidity due to asthma the majority of which is avoidable.[3]Herbal medicines are naturally occurring, plant derived substances used to treat illness. Traditional medicines have received attention in global health debates.[4] *Caesalpinia pulcherrima* is commonly known as peacock flower. The plant is an evergreen shrub which grows 3m tall. The leaves are bipinnate, 20-40 cm long, 3-11 pairs of pinnae, each with 6-10 pairs of leaflets with oblong to ovate shape. [5] In ayurvedic system this plant has been used for asthma and it reported biological activites are antimicrobial [6], antiulcer [7], anti-inflammatory, antinociceptive [8], antibacterial [9], anti-wrinkle [10]. Phytochemical investigations on *Caesalpinia pulcherrima* have revealed the presence of various phytoactive constituents such as glycosides, rotenoids, isoflavones, flavanones, chalcones, flavanols, flavones and sterols[8]. Previously no scientific work has been reported on anti-asthmatic activity of whole plant of *Caesalpinia pulcherrima*. Therefore present study was undertaken to evaluate the anti-asthmatic activity of *Caesalpinia pulcherrima* extracts on goat tracheal chain.

## II. METHODS AND MATERIAL

**Plant material:**

The plant was collected in the month of November (2015) from Kolhapur, Tal-Hatkangale, Dist-kolhapur, Maharashtra, India. After collection the plant material was identified, confirmed and authenticated by Dr. M.Y. Bachulkar, Plant Taxonomist, Principal Shri Vijaysingh Yadav Arts and Science College, Peth Vadgaon, Tal-Hatkangale, Dist-kolhapur, Maharashtra, India.

**Preparation of extract:**

The whole plant of *Caesalpinia pulcherrima* was dried in shade (400 g), separated and made to dry powder. The powdered material was charged in soxhlet extractor for continuous extraction using petroleum ether, chloroform and ethanol the extract was evaporated under reduced pressure using rotary evaporator.

**Preliminary phytochemical screening**

After obtaining of dry extract, qualitative preliminary phytochemical screening was performed to find out the presence of various phytochemicals such as steroids, saponins, alkaloids, flavonoids, tannins, phenolic compounds, and glycosides.[11]

**Characterisation of isolated compounds by spectral data:**

Isolated compounds from the petroleum ether extract, chloroform extract and ethanol extract were analysed by GC-MS (shimazdu QP 2010) and FTIR (Agilent cary 630).

**Animals:**

Isolated adult goat tracheal tissue was used for studies. Pieces of trachea were collected in ice cold oxygenated Krebs solution.

**Anti-asthmatic activity:**

**Isolated goat tracheal chain preparation [12]:**

The goat tracheal tissue was obtained immediately after slaughter of animals. Pieces of trachea were collected in freshly prepared ice-cold oxygenated Krebs's solution (Composition (mM): NaCl, 115; KCl, 4.7; $CaCl_2$, 2; $NaHCO_3$, 25; $KH2PO_4$, 1.2; $MgCl_2$, 1.2; glucose, 11.5). Goat trachea was then cut into individual rings and tied together in series to form a chain. It was suspended in bath containing Krebs solution and maintained at 37°C, a stream of air was bubbled through the organ tube (1bubble/sec). One end of the tracheal muscle was attached to S-shaped aerator and the other attached to isotonic frontal writing lever to a drum. The tissue was allowed to equilibrate for 45 min under a load of 1000 mg. A dose response curve for histamine was recorded at variant molar concentrations by maintaining 15 min time cycle.

**Stastical analysis:**

All the results were expressed as mean ± SEM. Data was analysed using one-way Anova. The p value of <0.05 was considered as the criteria of statistically significant values.

## III. RESULTS AND DISCUSSION

It was observed that ethanol extract inhibits contraction produced by histamine in these tissue preparations. Histamine was taken at (2.5µg/ml) different dose levels. Study revealed that ethanol extract of *Caesalpinia pulcherrima* L. significant percentage decreased contraction at concentration 300 µg/ml and 400 µg/ml in goat tracheal chain preparation. Dose dependent response relationship was seen. (Table-1)

**TABLE.1 :** Effect of extracts on histamine induced contraction on isolated goat tracheal chain preparation.

| Sr No. | Drug | Dose (µg/ml) | Height (Mean ± SEM) |
|---|---|---|---|
| 1 | Histamine | 2.5 | 15.500 ± 0.469 |
| 2 | Petroleum ether | 300 | 10.400 ± 0.704 |
| 3 | Chloroform | 300 | 7.940 ± 0.270 |
| 4 | Ethanol | 300 | 4.760 ± 0.365 |
| 5 | Petroleum ether | 400 | 15.500 ± 0.469 |
| 6 | Chloroform | 400 | 7.120 ± 0.164 |
| 7 | Ethanol | 400 | 3.340 ± 0.439 |

Phytochemical screening-After obtaining of dry extract, qualitative preliminary phytochemical screening was performed to find out the presence of various phytochemicals such as steroids, saponins, alkaloids, flavonoids, tannins, phenolic compounds, and glycosides.

**Characterisation of isolated compounds by spectral data:**

The spectrum of the unknown component was compared with the spectrum of the known components. These compounds were also characterised by FTIR.

Compound 1: The molecular weight of the compound is 312, GC-MS fragment, had a mass [M+H] + 312. The daughter ion spectra of these compounds revealed the characteristic fragment m/z 27, 43, 98, 157, 199, 213, 269. In IR spectral analysis is presence of C=O (peak at 1733.76), C-H (peak at 3210.47), C-O (peak at 972.44) and are in plane and out of plane bonding.

Compound 2: The molecular weight of the compound is 370, GC-MS fragment, had a mass [M+H] + 370. The daughter ion spectra of these compounds revealed the characteristic fragment m/z 41, 57,

84,112,199,241,259. In IR spectral analysis is presence of C=O (peak at 1733.76), C-H (peak at 3210.47), C-O (peak at 972.44) and are in plane and out of plane bonding.

Compound 3: The molecular weight of the compound is 464, GC-MS fragment, had a mass [M+H] + 464. The daughter ion spectra of these compounds revealed the characteristic fragment m/z 43,113,155,196,253,281. In IR spectral analysis is presence of C=O (peak at 1735.20), C-H (peak at 2851.64), O-H (peak at 2954.98) and are in plane and out of plane bonding.

Compound 4: The molecular weight of the compound is 282, GC-MS fragment, had a mass [M+H] + 282. The daughter ion spectra of these compounds revealed the characteristic fragment m/z 27, 85, 127, 264, 282. In IR spectral analysis is presence of O-H (peak at 3267.88), C=O (peak at 1730.52), C-H (peak at 2854.34), C-O (peak at 1214.98) and are in plane and out of plane bonding. From above spectra tentatively

identified 4 compounds. The spectral analysis enabled us to identify 4 known compounds, 8-methoxybonducellin, 6-methoxypulcherrimin, myricitroside, isobonducellin. The structure of these compounds was confirmed by comparison with published data.

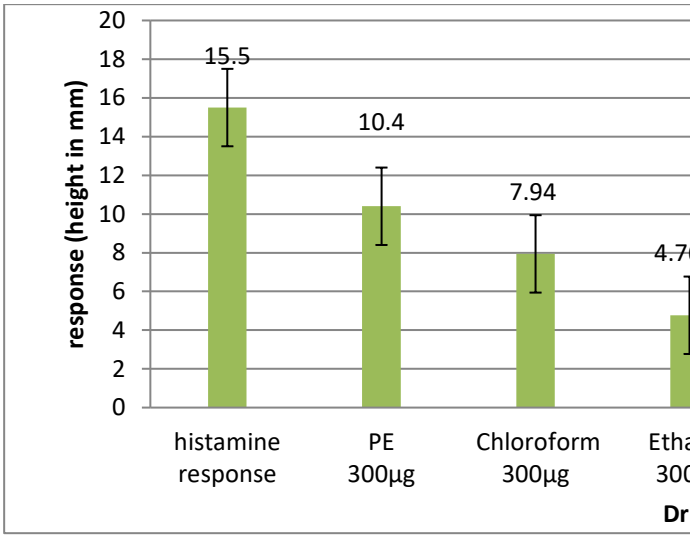


**FIG.1: Effects of *Caesalpinia pulcherrima* extracts in histamine induced contractions on isolated goat tracheal chain preparations.**

**DISCUSSION:**

Histamine contracts the tracheo-bronchial muscle of guinea pig, goat, horse, dog and man. Goat tracheal chain is easier to handle and to prepare; it is also much more sensitive than guinea pig tracheal chain. In the present study ethanolic extract (300 µg, 400 µg) of *Caesalpinia pulcherrima* L. showed significant dose dependent antiasthmatic activity in goat tracheal chain model. While chloroform extract (300 µg, 400 µg) and petroleum ether (300 µg , 400 µg) showed satisfactory activity. Thus *Caesalpinia pulcherrima* L. can prevent the release of inflammatory mediators or inflammation in asthma.

## IV. CONCLUSION

The present study confirmed that the ethanolic extract of *Caesalpinia pulcherrima* L. exhibits dose dependent anti-asthmatic activity in goat tracheal chain model and further supports the traditional claim of plant in the treatment of asthma. Further studies are infact underway to isolate and characterize the active principle responsible for the anti-asthmatic activity.

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