



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Research Article

Exploring Therapeutic Potentials of *Wedelia chinensis*: An *in vitro* Anti-Asthmatic Investigations

Sakshi Vasant Pawar*, Saurabh Gangadhar Pawar, Amol Kailas Pawar, Aniket Pravin Pawar, Dhanashree Vijay Pawar, Durgesh Toliram Gautam

Loknete Dr. J. D. Pawar College of Pharmacy Manur, Savitribai Phule Pune University, Maharashtra, India.

ARTICLE INFO

Published: 28 July 2025

Keywords:

Wedelia chinensis, anti-asthmatic, Thin Layer Chromatography, flavonoids, Retention factor, Acetylcholine

DOI:

10.5281/zenodo.16519373

ABSTRACT

This research work provided the basis for the *in vitro* anti-asthmatic benefits of *Wedelia chinensis* through *in vitro* evaluation using isolated tissue preparations. In asthma, elevation of inflammatory mediators like LTs, IL, histamines, PAF, eosinophils, etc. in the respiratory tract and contraction of airway bronchial smooth muscles. The potential therapeutic benefits of the herbal plant *Wedelia chinensis* leaves are investigated for anti-inflammatory and antispasmodic activity using chicken ileum tissue preparation. This *in vitro* evaluation provided good results by the aqueous extract of *Wedelia chinensis* leaves in isolated tissue preparations like chicken ileum etc. The aqueous leaves extract of *Wedelia chinensis* provided the inhibitory contraction response of the isolated chicken ileum tissue preparation by acetylcholine. The present laboratory findings of *Wedelia chinensis* extract provided the basis for its anti-asthmatic properties by the phytoconstituents. These results revealed that the aqueous extract of *Wedelia chinensis* significantly inhibited dose-dependent acetylcholine-induced contractions in an isolated chicken ileum tissue preparation. The study confirmed that the traditional use of *Wedelia chinensis* leaves extract can be a remedy for respiratory disorders including asthma. *Wedelia chinensis*, a traditional medicinal plant, was investigated for its potential interaction with acetylcholine using analysis method using Thin Layer Chromatography. The spectroscopical evaluation by Thin Layer Chromatography profile revealed changes in the retention factor values and spot intensity, indicating a possible interaction between phytoconstituents of *Wedelia chinensis* and acetylcholine. This research work suggesting that *Wedelia chinensis* may modulate acetylcholine activity, providing insights into its potential benefits in the asthma management. This study demonstrates the anti-asthmatic benefits of *Wedelia chinensis* extract, coupled with its use as a natural remedy for the prevention and minimization of the severity of asthma.

***Corresponding Author:** Sakshi Vasant Pawar

Address: Loknete Dr. J. D. Pawar College of Pharmacy Manur, Savitribai Phule Pune University, Maharashtra, India.

Email ✉: sakshivasant22@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



INTRODUCTION

Asthma is a chronic respiratory disease that is characterized by episodic airway obstruction, which is reversible either spontaneously or with treatment, by bronchospasm, and mucus hypersecretion. The effect it causes in millions of people across the globe, in terms of symptoms ranging from wheezing, coughing, breathlessness, and chest tightness, has been noted. The symptoms of asthma are wheezing, a high-pitched whistling sound in the breathing, coughing- sometimes dry, other times productive, shortness of breath (dyspnea), tightness or constriction of the chest, trouble speaking or breathing. Allergic asthma is the most common type of asthma induced by exposure to certain allergens, including dust, mites, pollens, or pet dander. Non-allergic asthma, by contrast, is not provoked by allergens; instead, it is brought on by stimuli such as cold air, exercise, or tension. Mixed Asthma combines some features of both allergic and non-allergic types. Occupational Asthma is a form precipitated through workplace exposure to chemicals, dust, or other irritants. Exercise-induced bronchospasm is an asthma triggered by physical activity. Other classification of asthma is according to severity, i.e., from mild to severe. The well-known therapeutic interventions are available, like beta 2 adrenergic, methyl xanthine's, anticholinergics, mast cell stabilizers, and leukotriene antagonists (LTs) for symptomatic treatment and management of asthma. Currently available drugs have some limitations & adverse effects, including corticosteroids, etc. Use of herbal drug remedies or phytoconstituents from plant origin is comparatively safer and has similar efficacy with slower response. The use of the plant *Wedelia chinensis*, better known as the Chinese Wedelia, is one of the flowers belonging to the family Asteraceae as a perennial plant. It generally occurs in most parts of Asian countries, notably in China

and India, from the tropics to the subtropics. *Wedelia chinensis*, used traditionally in the folk medicine industry, has anti-inflammatory, antipyretic, and antispasmodic property¹⁴. The variety of bioactive molecules like flavonoids, alkaloids, and terpenoids of this plant is reported for their medicinal properties. *Wedelia chinensis* has received recent attention due to its potential as a medicinal plant for possible modern therapeutic applications, including anti-asthmatic, anti-allergic, and anti-inflammatory activities; antimicrobial, antioxidant, and hepatoprotective activities were also recently reported. In general, *Wedelia chinensis* is a medicinal plant of great value with much traditional medicinal usage and promising modern applications. The *Wedelia chinensis* leaves are beneficial in managing asthma due to their anti-inflammatory, antispasmodic, and bronchodilator properties. Its bioactive compounds, including flavonoids and terpenoids, may be responsible for its anti-asthmatic properties, making it a potential complementary therapy for asthma management, which could ultimately reduce the need for conventional medications and improve the quality of life for asthma patients.

2. METHODS

2.1 Reported Methods for Evaluation of Anti-asthmatic Activity:

2.1.1 Preclinical Evaluation (*In-vitro* Methods)

1. Receptor binding assay *in vitro* β 2-adrenergic receptor
2. Enzyme inhibition assay of phosphodiesterase
3. Cellular assays of histamine release from mast cells
4. Animal model of asthma, mouse model, ovalbumin-induced asthma



2.2 In vivo Methods

1. Animal models of asthma, such as ovalbumin-induced asthma in mice.
2. Animal model for goat tracheal preparation.
3. Bronchial provocation tests, such as methacholine challenge.
4. Pulmonary function tests, such as spirometry, plethysmograph
5. Inflammatory cell counting, such as eosinophil count.

3. MATERIALS & METHODS

3.1 Animal model:

The chicken ileum preparation is one of the most used *in vitro* models for studying smooth muscle physiology and pharmacology. It is the final section of the small intestine in chickens.

3.2 Procedure for Tissue Preparation: Fresh chicken ileum was brought from a slaughterhouse, then it was cleaned using a syringe with the help of Tyrode physiological salt solution (PSS). Then made the small fragments (pieces) of 2-3 cm and tied them to the oxygen tube using thread was suspended in an organ bath containing Tyrode's solution with continuous aeration by one bubble using an aerator.

3.3 Preparation Of Plant Extract:

A dried coarse powder of *Wedelia chinensis* plant material was ground using a mixer grinder. A 25g of coarse powder was accurately weighed and dissolved in 100 ml of distilled water for maceration. The mixture was heated gently at 50-80°C consecutively for 30 mins. Later, the filtrate was separated and collected from the plant extract using Whatman filter paper. The concentrated

liquid extract was dried using a rotary evaporator. The extracts were collected for further *in vitro* experimentation and stored in the refrigerator.

4. Experimental Procedure^[6]:

4.1 Dose-response curve of acetylcholine:

The chicken ileum was brought from the slaughterhouse (as shown in Fig. 2) and isolated tissue i.e. chicken ileum, was cut into small pieces, with the removal of excess connective tissue and fat. (as shown in Fig. 3). The isolated tissue preparation was mounted in the organ bath containing a physiological solution (e.g., Tyrode solution) at 37°C and pH 7.4 (as shown in Fig. 4). The 30 sec baseline taken by applying tension of 500mg, the standard drug solution was prepared by with accurately weigh 0.01gm of acetylcholine, and added in 20ml of distilled water. Standard acetylcholine solution in to the tissue organ bath in increasing concentrations- 500 (e.g. 0.1 0.2, 0.4, 0.8, 1.6ml doses were added) (as shown in fig.5). The DRC were performed with a contact time for 60sec, and the speed of the drum is 0.25mm/sec was maintained. The responses were measured and recorded in dose dependent manner with double dose (as shown in Fig. 6). After the DRC, the graph was plotted against the log concentrations (log scale) to % response (tension or contraction force). The results were calculated and data were analyzed by measuring height of responses, % response, and other parameters as required (as shown in Fig. 7). Same responses were repeated and verified: The experiment was repeated multiple times to ensure consistent results and verified the findings⁵.

4.2 PA₂ value of *Wedelia chinensis* by using acetylcholine:

The PA₂ value was determined by performing DRC (Dose-response curve) for acetylcholine was



added cumulatively in the organ bath in an increasing concentration (e.g., 10^{-8} to 10^{-4} M). The concentrations were recorded for both acetylcholine as standard drug and *Wedelia chinensis* extract as a test drug at a fixed concentration (e.g., 0.1, 0.2, 0.4ml). The DRC of acetylcholine was performed and observation was recorded in the presence of the plant extract and the steps were repeated till the ceiling effect was obtained. The calculation of pA_2 value and determined by considering the log concentration of Ach vs. drug response (contraction) for both curves (without and with extract) and graph was plotted. The pA_2 value is the negative logarithm of the concentration of extract that reduces the Ach response by 50%.

5. Observations:

The contractile effect of acetylcholine was prevented by *Wedelia chinensis* on chicken ileum tissue preparation, and we obtained the opposite effects to those of acetylcholine on chicken ileum preparation. Normally, acetylcholine (Ach) causes contraction of the chicken ileum smooth muscle by increasing the tone and contractility of the ileum muscle, by stimulating the muscarinic receptors (M_3) in the ileum, leading to increased intracellular calcium and muscle contraction. Compared to that of Ach, the plant extract of *Wedelia chinensis* produced relaxation of the ileum smooth muscle by blocking the acetylcholine-induced contractility. Thus, plant extract dose samples decrease the tone of the ileum muscle and block the muscarinic receptors (M_3) in the ileum, leading to decreased intracellular calcium and muscle relaxation. In the presence of *Wedelia chinensis*, the effects of acetylcholine are antagonized, and the ileum muscle relaxes. These results may be due to the phytoconstituents present in the plant extract binding to the muscarinic receptors (M_3), blocking the action of

acetylcholine. The standard preparation of Acetylcholine produces a contraction of chicken ileum tissue preparation and *Wedelia chinensis* shows the relaxation, which indicate the antagonistic property of *Wedelia chinensis* on the same isolated tissue preparation. These results suggested the antiasthmatic property.

6. Preparatory Thin Layer Chromatography (TLC)^[20]:

The preparatory TLC plates were prepared and cleaned the plate and a thin layer of Silica gel was applied onto the plate. At the bottom 1cm above the edge of the plate made a marking line was made by pencil¹². A small quantity of the sample drops (*Wedelia chinensis*, Ach.) was applied using a capillary tube just over the baseline, onto the TLC plate. The TLC plates were kept in the developing chamber with solvent ethyl acetate, the solvent system: formic acid: butanol (5:3:1). The samples of extract and standard acetylcholine, atropine allowed to move into the previously saturated TLC chamber by capillary action. The clear spots of separation were visualized after removal of the TLC plate from the chamber and allowed to air dry. The separated spots of both *Wedelia chinensis* and acetylcholine were visualized and detected in an iodine chamber. Finally, the R_f value of individual spots were calculated.

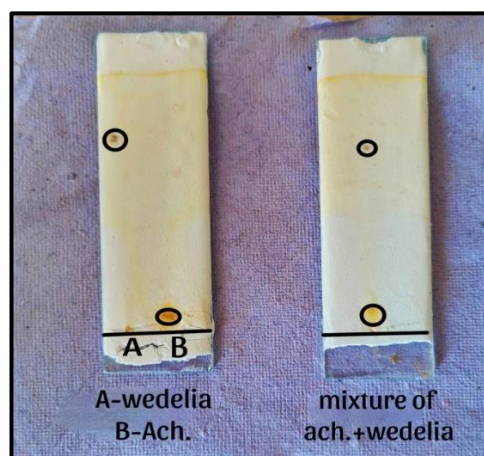


Figure 6.1.1: Noticeable interaction between Acetylcholine and *Wedelia chinensis*. Extract is observed on the TLC plate

6.2 Observation table:

Table 1: Rf Value of Acetylcholine and *Wedelia chinensis* sample

Sr. No.	Sample	Distance traveled by solute from origin line(cm)	Distance traveled by solvent front(cm)	Rf value
A	<i>Wedelia chinensis</i>	4.1	5.3	0.77
B	Ach.	0.4	5.3	0.07
C	Mixture of <i>Wedelia chinensis</i> + Ach. (1:1)	3.9	5.3	0.73

7. RESULTS:

According to the results of log molar concentration compared to that of standard acetylcholine solution (Table 4), we found a lower pA₂ value of *Wedelia chinensis* against acetylcholine-induced contractions than 6.8 using chicken ileum isolated tissue preparation. Therefore, these results indicate that *Wedelia chinensis* has a considerable antagonistic effect against acetylcholine-induced

contractions using isolated chicken ileum tissue preparation, meaning that this is a low-potency antagonist for acetylcholine. Results of TLC analysis for both acetylcholine and *Wedelia chinensis* extract revealed the presence of active phytoconstituents, with the calculated Rf value considered for the presence of active phytoconstituents, i.e., the flavonoid or phenolic compound apigenin could be responsible for antiasthmatic therapeutic benefits.

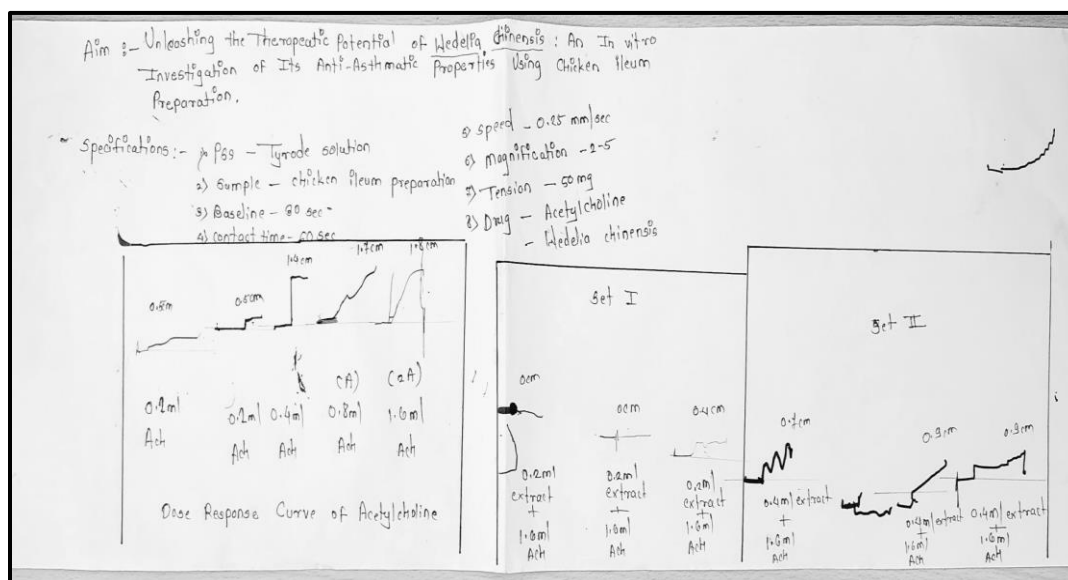


Figure 7.1: Dose-response curve of Acetylcholine and effect of *Wedelia chinensis*.

Table 2: Effect produced by acetylcholine on isolated chicken ileum preparation.

Sr. No.	Dose of acetylcholine in ml	Concentration of the drug	Height of response in cm	% dose response
1.	0.2	500	0.5	27%

2.	0.2	500	0.5	27%
3.	0.4	500	1.4	77%
4.	0.8	500	1.7	94%
5.	1.6=2A	500	1.8	100%

Table 3: Effect produced by *Wedelia chinensis* (extract) in the presence of acetylcholine on isolated chicken ileum preparation.

Sr. No.	Dose	Concentration of drug	Height of response in cm	% dose response
1.	2A	50ppm	1.8	100%
2.	A1	50ppm	0.4	22%
3.	A	50ppm	0.9	50%

Table 4: Log molar concentration of *Wedelia chinensis*.

Sr. No.	Dose of antagonist (<i>Wedelia chinensis</i>)	Molar concentration	-log molar concentration
1.	0.2	0.00079M	0.462
2	0.4	0.00039M	0.462

Graph:

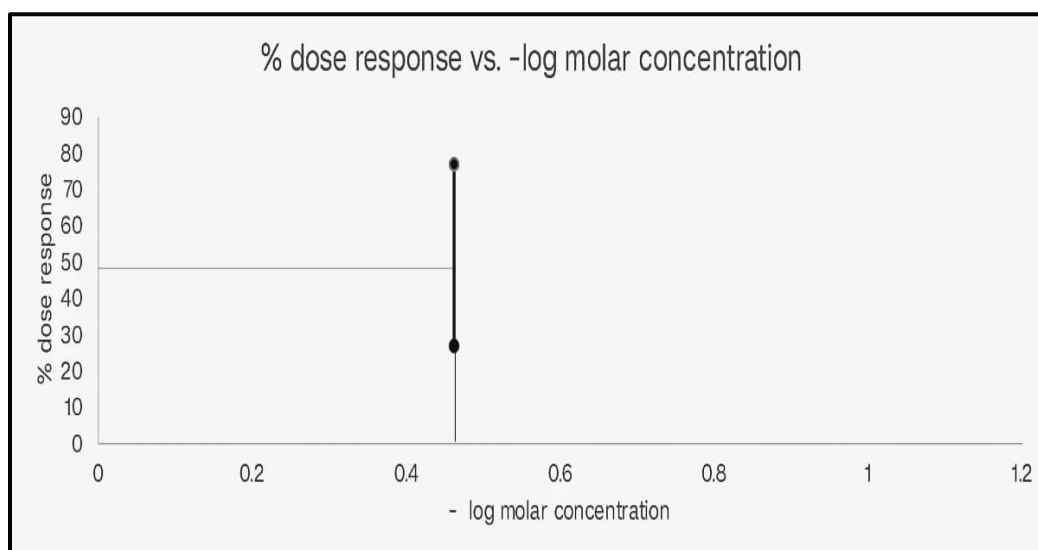


Figure 7.2: Estimation of PA_2 value of *Wedelia chinensis* using Acetylcholine as agonist.

8. CONCLUSION:

The effects of acetylcholine and histamine drug experiments were performed using chicken ileum and goat tissue preparation, with the observation of inhibitory effects of drugs on contraction induced by agonists like acetylcholine and

histamine. This study gives an idea about the anti-asthmatic activity of *Wedelia chinensis* leaves extract. Our experimental results confirmed that, the use of chicken ileum and goat tracheal tissue preparation would be an effective method in experimental pharmacology for *in vitro* evaluation of anti-asthmatic activity of synthetic and natural



phytocomponents of plant extracts. This preliminary experimental study could be helpful for further in-depth investigation of the potential benefits of herbs for the evaluation of anti-asthmatic activity in animals.

REFERENCES

1. Bhong Prabha N., Dr. Naikwade Nilofar S., Mali Pratibha. R, Bindu Madhavi. S. "In-vitro and in-vivo Evaluation of Anti-asthmatic Activity of Eugenia jambolana bark", RJPT 2020.
2. Rohit Singh, Neelesh Chaubey, Rajeev Kumar Mishra, "Evaluation of Anti-Asthmatic Activity of Ethanolic Extract of Argemone Mexicana Stem", Saudi Journal of Medical and Pharmaceutical Sciences, 2021.
3. Pravin Shelke, Diliprao Derle, Nikita Derle and Jyoti Vyawahare. "Preclinical Evaluation of Antiasthmatic Activity of Euphoria hirta Linn," International Journal of Pure and Bioscience, 2014.
4. Bolton S, Bon C. Pharmaceutical Statistics: Practical and clinical applications, revised and expanded. CRC Press; 2003 Oct 17.
5. Kulkarni SK, Dhir A. Current investigational drugs for major depression. Expert opinion on investigational drugs. 2009 Jun 1;18(6):109-111
6. Medhi B, Prakash A. Jaypee Brothers, page no.69
7. Whalen K. Lippincott illustrated reviews: pharmacology. Wolters Kluwer India Pvt Ltd; 2018 Oct 25, page no.909
8. Garg GR, Gupta S, Gupta M. Review of Pathology. JP Medical Ltd; 2011 Jun 20.
9. Tripathi KD. Essentials of medical pharmacology. Jaypee Brothers Medical Publishers; 2018 Oct 31.
10. Vogel HG, editor. Drug discovery and evaluation: pharmacological assays. Springer Science & Business Media; 2002 Jun 13.
11. Banu R, Nagarajan N. TLC and HPTLC fingerprinting of leaf extracts of Wedelia chinensis (Osbeck) Merrill. Journal of Pharmacognosy and Phytochemistry. 2014;2(6):29-33.
Nagarajan N. TLC and HPTLC fingerprinting of leaf extracts of Wedelia chinensis (Osbeck) Merrill.
12. Kumari A, Bhatnagar S. Phytochemical analysis and biological evaluation of leaf extracts of Wedelia chinensis. Pharm Pharmacol Int J. 2016;4(7):00102.
13. Bora KS, Pant A. Research Article Pharmacognostic Standardization of Wedelia chinensis Merrill Leaf.
14. Islam MA, Zaman S, Biswas K, Al-Amin MY, Hasan MK, Alam AH, Tanaka T, Sadik G. Evaluation of cholinesterase inhibitory and antioxidant potential of Wedelia chinensis: possible implications in alleviating Alzheimer's disease.
15. Warriar PK, Nambiar VP. Ramankutt. Indian Medicinal Plants. Vol. 4.
16. Council of Scientific & Industrial Research (India). The Wealth of India: a dictionary of Indian raw materials and industrial products. Council of Scientific and Industrial Research; 1972.
17. Edeoga HO, Okwu DE, Mbaebie BO. Phytochemical constituents of some Nigerian medicinal plants. African journal of biotechnology. 2005 Aug 19;4(7):685-8.
18. Das MP, Rebecca LJ, Sharmila S. Evaluation of antibacterial and antifungal efficacy of Wedelia chinensis leaf extracts. Journal of Chemical and Pharmaceutical Research. 2013 Feb;5(2):265-9.
19. Islam MA. Studies on Phytochemicals of Wedelia chinensis (Asteraceae) and Their Anticholinesterase & Antioxidant Activities (Doctoral dissertation, University of Rajshahi).



20. Khan MA, Islam MA, Biswas K, Al-Amin MY, Ahammed MS, Manik MI, Islam KM, Kader MA, Alam AK, Zaman S, Sadik G. Compounds from the Petroleum Ether Extract of *Wedelia chinensis* with Cytotoxic, Anticholinesterase, Antioxidant, and Antimicrobial Activities. *Molecules*. 2023 Jan 13;28(2):793.

HOW TO CITE: Sakshi Vasant Pawar*, Saurabh Gangadhar Pawar, Amol Kailas Pawar, Aniket Pravin Pawar, Dhanashree Vijay Pawar, Durgesh Toliram Gautam, Exploring Therapeutic Potentials of *Wedelia chinensis*: An in vitro Anti-Asthmatic Investigations, *Int. J. of Pharm. Sci.*, 2025, Vol 3, Issue 7, 3697-3704. <https://doi.org/10.5281/zenodo.16519373>

