

EVALUATION OF ANTISPASMODIC ACTIVITY OF AQUEOUS EXTRACT OF *TARAXACUM OFFICINALE* ON CHICKEN ILEUM

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ABSTRACT

Spasmodic disorders involve involuntary and excessive contractions of smooth muscles, mainly caused by overactivity of the cholinergic system and an increase in calcium levels inside cells. These contractions can cause discomfort and affect the functioning of different parts of the body. Although medicines that are made in a lab are commonly used to treat spasms, they often have side effects, which makes it important to find safer alternatives from natural sources. Dandelion, or *Taraxacum officinale*, has been used in traditional medicine for its health benefits, but its ability to prevent spasms has not been thoroughly studied. This study aimed to check how effective the water-based extract of dandelion is in preventing spasms, using a model made from chicken intestines. The whole plant was collected, identified, and processed into an extract. It was then tested for the presence of certain plant chemicals. Spasms were created using a substance called acetylcholine, and different amounts of the extract were used to see how much they could reduce the spasms. The results were analyzed using statistical methods, with results considered significant if the value was less than 0.05. The extract showed a stronger effect as the amount used increased, with notable reductions in spasms at higher doses. The plant chemicals found included flavonoids, phenolic compounds, tannins, and saponins, which may help in relaxing the muscles. Overall, the study shows that the water extract of dandelion has strong potential to prevent spasms, possibly by affecting the cholinergic system and reducing calcium levels. This supports the idea that dandelion could be a useful natural treatment for common spasmodic conditions.

KEYWORDS: *Taraxacum officinale*, Antispasmodic activity, Aqueous extract, Isolated ileum, Phytochemicals, Smooth muscle relaxation.

INTRODUCTION

Spasmodic disorders are characterized by sudden, involuntary, and excessive contractions of smooth muscle, resulting in pain, functional disturbance, and reduced quality of life. These disorders may involve various organ systems including the gastrointestinal, respiratory, urinary, and reproductive tracts. Smooth muscle contraction is tightly regulated by intracellular calcium (Ca^{2+}) homeostasis, autonomic neurotransmission, and inflammatory mediators. Dysregulation of these pathways leads to enhanced contractility and recurrent spasmodic episodes.^[1]

Cholinergic hyperactivity represents a major mechanism underlying smooth muscle spasm. Activation of muscarinic M3 receptors stimulates the phospholipase C–inositol triphosphate (IP3) signaling pathway, leading to increased intracellular Ca^{2+} release from the sarcoplasmic reticulum and subsequent muscle contraction.^[2] In addition, extracellular calcium influx through voltage-dependent calcium channels further amplifies contractile responses.^[3] Inflammatory mediators such as histamine, leukotrienes, and prostaglandins also enhance smooth muscle reactivity by modulating calcium signaling and sensitizing contractile proteins.^[4] Oxidative stress and cytokine-mediated pathways further contribute to smooth muscle hyperresponsiveness in spasmodic conditions.^[5]

Currently available antispasmodic agents exert their effects through muscarinic receptor antagonism, calcium channel blockade, phosphodiesterase inhibition, or direct smooth muscle relaxation. Drugs such as atropine, hyoscine, and dicycloverine effectively inhibit acetylcholine-induced contractions; however, their clinical use is frequently limited by adverse effects including dry mouth, blurred vision, tachycardia, constipation, and urinary retention.^[2,6] Calcium channel blockers and nitric oxide donors are also employed in certain conditions, yet prolonged administration may result in hypotension, dizziness, and drug interactions.^[1] Importantly, many synthetic agents primarily provide symptomatic relief without addressing underlying inflammatory and oxidative mechanisms involved in spasmodic disorders.

In recent years, growing attention has been directed toward plant-derived therapeutics due to their multi-target pharmacological properties and comparatively favorable safety profiles. Phytoconstituents such as flavonoids, phenolic acids, terpenoids, and alkaloids have demonstrated smooth muscle relaxant activity through calcium antagonism, potassium channel activation, antioxidant effects, and anti-inflammatory mechanisms.^[7] These properties make medicinal plants promising candidates for the development of safer and more comprehensive antispasmodic therapies.

Taraxacum officinale F.H. Wigg., commonly known as dandelion, belongs to the family *Asteraceae* and is widely distributed across temperate regions of Europe, Asia, and North America.^[8] The plant is characterized by deeply lobed basal leaves, hollow scapes bearing bright yellow ligulate flowers, and a thick taproot containing milky latex. Various parts of the plant—including roots, leaves, and flowers—are traditionally used for medicinal purposes. Phytochemical investigations have identified bioactive constituents such as flavonoids (luteolin, apigenin), phenolic acids (caffeic acid, chlorogenic acid), sesquiterpene lactones, triterpenoids, sterols, and inulin.^[9] These compounds are associated with antioxidant, anti-inflammatory, and smooth muscle modulatory activities.

Traditionally, *Taraxacum officinale* has been employed in Ayurveda, Traditional Chinese Medicine, and European herbal medicine as a digestive stimulant, diuretic, hepatoprotective, anti-inflammatory, and mild laxative agent.^[8] It has also been used for the management of abdominal discomfort and cramp-related conditions, suggesting potential antispasmodic properties. Experimental studies have demonstrated antioxidant and anti-inflammatory effects of

dandelion extracts, attributed largely to phenolic compounds.^[9] Additionally, flavonoid-rich fractions have been reported to exhibit calcium channel blocking activity, which may contribute to smooth muscle relaxation.^[7] Aqueous extracts have shown favourable safety profiles with minimal toxicity in experimental models.^[10]

Despite these findings, most pharmacological investigations have focused on hepatoprotective, antioxidant, and anticancer properties, while direct evaluation of antispasmodic activity remains limited. Furthermore, many studies utilize organic solvent extracts, whereas traditional medicinal preparations primarily involve aqueous decoctions or infusions. Scientific validation of aqueous extract is therefore essential to bridge traditional usage with contemporary pharmacological evidence. Considering the high global prevalence of spasmodic disorders, limitations associated with synthetic antispasmodic drugs, and the presence of biologically active phytoconstituents in *Taraxacum officinale*, systematic evaluation of its smooth muscle relaxant potential is warranted. Therefore, the present study aims to investigate the antispasmodic activity of the aqueous extract of *Taraxacum officinale* using appropriate experimental models, thereby providing pharmacological evidence to substantiate its traditional claims and exploring its potential as a safer herbal alternative in the management of spasmodic disorders.

MATERIALS AND METHODS

Plant Material Collection and Authentication

Fresh whole plants of *Taraxacum officinale* F.H. Wigg. were gathered from a local cultivated field and confirmed by a qualified taxonomist from the Department of Botany. A voucher specimen was made and kept in the departmental herbarium for future reference. The collected plant material was washed thoroughly with distilled water to remove soil and debris.

It was then shade-dried at room temperature (25–30°C) for 10–14 days to ensure that the thermolabile components were not degraded. The dried material was coarsely ground using a mechanical grinder and stored in an airtight container until it was needed again. Proper identification and confirmation were carried out according to standard Pharmacognostical guidelines.

Preparation of Aqueous Extract

The ground plant material was used to prepare an aqueous extract using the maceration method. Approximately 2-3 kg of coarse powder was soaked in distilled water (in sufficient quantity) for 48–72 hours with occasional shaking. The mixture was then filtered first using muslin cloth and then with Whatman No.1 filter paper. The filtered liquid was evaporated using a water bath at a temperature not exceeding 50°C to produce a semi-solid mass. The concentrated extract was dried, weighed to determine the percentage yield, and stored in a refrigerator (2–8°C) for experimental use. The extraction process was carried out following standard methods as described in pharmacognosy literature.^[10]

Preliminary Phytochemical Screening

The ground plant material was used to prepare an aqueous extract using the maceration method. Approximately 2-3 kg of coarse powder was soaked in distilled water (in sufficient quantity) for 48–72 hours with occasional shaking. The mixture was then filtered first using muslin cloth and then with Whatman No.1 filter paper. The filtered liquid was evaporated using a water bath at a temperature not exceeding 50°C to produce a semi-solid mass. The concentrated extract was dried, weighed to determine the percentage yield, and stored in a refrigerator (2–8°C) for experimental use. The extraction process was carried out following standard methods as described in pharmacognosy literature.^[10]

Experimental Animals

Healthy adult chickens (*Gallus gallus domesticus*) of both sexes, weighing approximately 2-3 kg, were used for the study. They were obtained from a local poultry source and were kept under standard laboratory conditions (temperature $25 \pm 2^\circ\text{C}$; relative humidity 45–55%; 12-hour light/dark cycle).

Procurement of Tissue

Fresh chicken ileum was obtained from a local slaughterhouse immediately after the animals were sacrificed and transported to the laboratory in ice-cold, oxygenated Tyrode solution. The tissue was cleaned of any mesenteric attachments and used without delay for the experimental procedures.^[11]

Drugs and Chemicals

Histamine and acetylcholine were used as spasmogenic agents. Chlorpheniramine maleate (CPM) and atropine were used as standard antagonists for histamine and acetylcholine, respectively. The aqueous extract of *Taraxacum officinale* was tested at concentrations of 50 $\mu\text{g/mL}$ and 100 $\mu\text{g/mL}$. All drugs were freshly prepared in Tyrode solution before being used.

Preparation of Tyrode Solution

A Tyrode solution with the following composition (in mM) was used: NaCl 136.7, KCl 2.68, CaCl_2 1.8, NaHCO_3 11.90, NaH_2PO_4 0.42, MgCl_2 1.05, and glucose 5.55. The solution was kept at $37 \pm 0.5^\circ\text{C}$ and continuously aerated.

Histamine-Induced Contraction of Chicken Ileum

The isolated ileum (2–3 cm) was mounted in an organ bath containing Tyrode solution maintained at $37 \pm 0.5^\circ\text{C}$. A continuous stream of air (1 bubble/sec) was supplied for aeration. One end of the tissue was attached to an S-shaped aerator and the other to an isotonic frontal writing lever connected to a Sherrington's recording drum (kymograph).

The tissue was allowed to equilibrate for 45 minutes under a resting tension of 500 mg, with regular washing at 15-minute intervals. A contact time of 60 seconds and a baseline cycle of 30 seconds were maintained for proper recording.

Cumulative dose response curves (DRC) for histamine (1 mg/mL) were recorded in the absence and presence of aqueous extract of *Taraxacum officinale* (50 $\mu\text{g/mL}$ and 100 $\mu\text{g/mL}$). The same protocol was repeated using chlorpheniramine maleate as the standard antihistaminic drug.

The percentage inhibition produced by the extract and the standard drug was calculated. Graphs were plotted by taking log dose on the X-axis and height of response on the Y-axis.^[12]

Acetylcholine-Induced Contraction of Chicken Ileum

The isolated ileum was mounted in the organ bath under identical experimental conditions as described above. After equilibration for 45 minutes under 500 mg tension, cumulative dose response curves (DRC) for acetylcholine (1 mg/mL) were recorded in the absence and presence of aqueous extract of *Taraxacum officinale* (50 $\mu\text{g/mL}$ and 100 $\mu\text{g/mL}$).

Atropine (0.6 mg/mL) was used as the standard anticholinergic drug. Percentage inhibition of contraction was calculated for both extract and standard drug. Dose response curves were plotted by taking log dose versus height of response.^[11,13]

RESULTS AND DISCUSSION

Preliminary phytochemical screening of the aqueous root extract of *Taraxacum officinale* showed the presence of alkaloids, flavonoids, tannins, saponins, glycosides, and phenolic compounds. These constituents are known for their smooth muscle relaxant and antispasmodic properties. The percentage yield of the aqueous extract was found to be 25% w/w.

The antispasmodic activity of the extract was evaluated using isolated chicken ileum by histamine- and acetylcholine-induced contraction models. Both histamine and acetylcholine produced dose-dependent contractions of the ileum. The cumulative dose response curve (DRC) was recorded in the absence and presence of the aqueous extract (50 µg/mL and 100 µg/mL).

In the histamine-induced contraction model, the aqueous extract significantly reduced the height of contraction compared to control. The inhibition was dose dependent, with 100 µg/mL producing greater reduction than 50 µg/mL. Chlorpheniramine maleate (CPM), used as the standard antihistaminic drug, showed marked suppression of histamine-induced contraction.

DRC of Aqueous extract of *Taraxacum officinale* Aster using Acetylcholine (agonist) and atropine (antagonist)

Dose of Acetylcholine (ml)	Height of DRC (cm)			
	Acetylcholine	Atropine(std)+ Acetylcholine	AETO (50 µg/ml) + Acetylcholine	AETO (100 µg/ml) +Acetylcholine
0.1	2.5	2.0	1.5	2.3
0.2	5.0	2.8	3.2	3.8
0.4	7.0	3.5	5.7	6.3
0.8	10.2	6.5	8.4	9.1
1.6	12.6	8.1	10.2	11.6
3.2	15.4	10.4	12.7	13.4

DRC of Aqueous extract of *Taraxacum officinale* Aster using histamine (agonist) and Chlorpheniramine Maleate (antagonist)

Dose of Histamine (ml)	Height of DRC (cm)			
	Histamine	CPM (std)+ Histamine	AETO (50 µg/ml) + Histamine	AETO (100 µg/ml) +Histamine
0.1	2.5	1.8	1.4	2.6
0.2	4.5	2.8	2.5	3.4
0.4	6.9	4.2	3.9	6.8
0.8	9.8	7.1	8.4	10.6
1.6	11.7	9.6	10.2	12.3
3.2	13.6	11.2	12.7	14.2

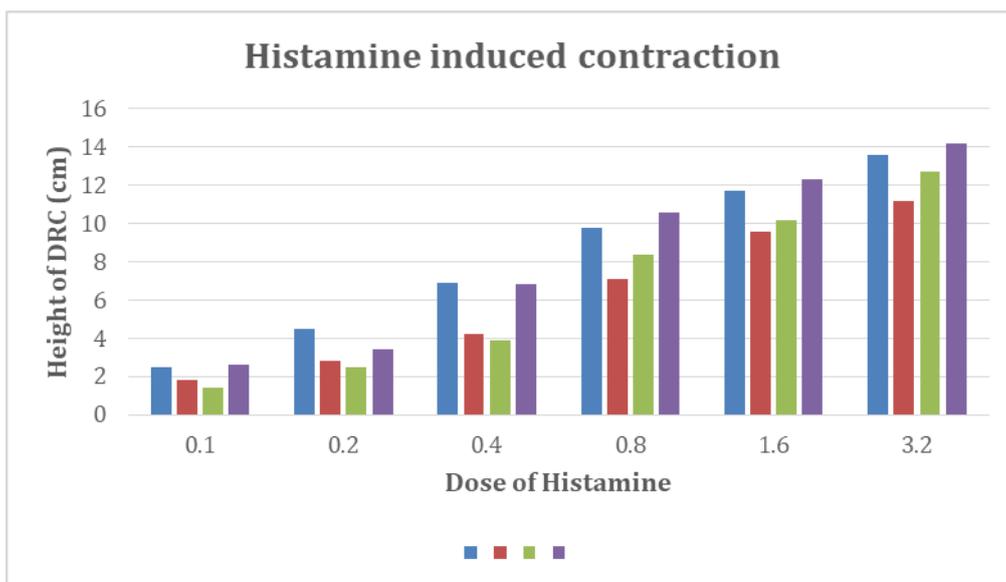


Figure 1: Graphical representation for the DRC of AETO using Histamine and Chlorpheniramine maleate.

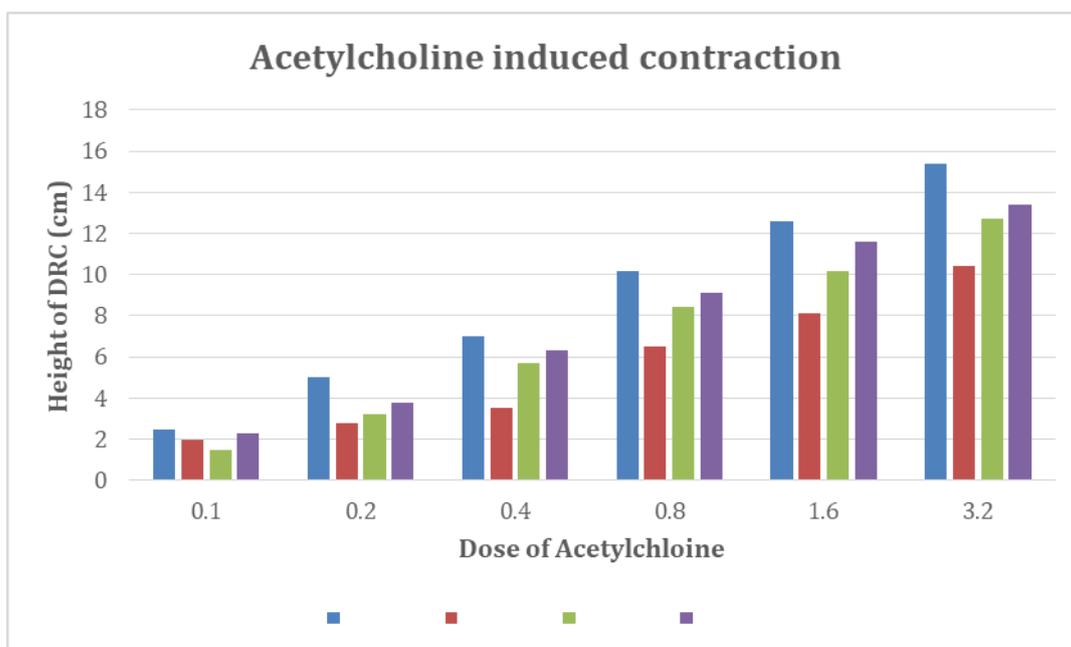


Figure 2: Graphical representation for the DRC of AETO using Acetylcholine and Atropine.

CONCLUSION

The present study concludes that the aqueous root extract of root of *Taraxacum officinale* possesses significant antispasmodic activity. Preliminary phytochemical screening confirmed the presence of alkaloids, flavonoids, tannins, saponins, glycosides, and phenolic compounds, which are known to exhibit smooth muscle relaxant properties. The extract showed inhibitory effects against histamine and acetylcholine-induced contractions, indicating its ability to relax smooth muscle spasms. The observed activity may be attributed to the presence of bioactive phytoconstituents that interfere with receptor-mediated contraction pathways. Therefore, the findings scientifically support the traditional use of *Taraxacum officinale* in the treatment of spasmodic conditions. Further studies are recommended to isolate the active compounds and to evaluate their mechanism of action and clinical efficacy.

REFERENCE

1. Rang HP, Dale MM, Ritter JM, Flower RJ, Henderson G. Rang & Dale's Pharmacology. 8th ed. London: Elsevier; 2016.
2. Goodman LS, Brunton LL, Hilal-Dandan R, Knollmann BC. Goodman & Gilman's The Pharmacological Basis of Therapeutics. 13th ed. New York: McGraw-Hill; 2018.
3. Karaki H, Ozaki H, Hori M, Mitsui-Saito M, Amano K, Harada K, et al. Calcium movements, distribution, and functions in smooth muscle. *Pharmacol Rev*, 1997; 49(2): 157–230.
4. Barnes PJ. Inflammatory mediators in airway disease. *Pharmacol Rev*, 2008; 60(4): 515–548.
5. Mittal M, Siddiqui MR, Tran K, Reddy SP, Malik AB. Reactive oxygen species in inflammation and tissue injury. *Antioxid Redox Signal*, 2014; 20(7): 1126–1167.
6. Katzung BG. Basic & Clinical Pharmacology. 14th ed. New York: McGraw-Hill; 2018.
7. Gilani AH, Shah AJ, Yaeesh S, et al. Presence of calcium channel blocking activity explains the use of some medicinal plants in hyperactive gut disorders. *Phytother Res*, 2005; 19(6): 528–532.
8. Bisset NG, Wichtl M. Herbal Drugs and Phytopharmaceuticals. 2nd ed. Stuttgart: Medpharm Scientific; 2001.
9. Schütz K, Carle R, Schieber A. Taraxacum—A review on its phytochemical and pharmacological profile. *J Ethnopharmacol*, 2006; 107(3): 313–323.
10. Harborne, J.B. *Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis*. 3rd Edition, Chapman & Hall, London, 1998; pp. 17–19.
11. Ghosh MN. *Fundamentals of Experimental Pharmacology*. 6th ed. Kolkata: Hilton & Company; 2015; p. 15–18.
12. Kulkarni, S.K. *Handbook of Experimental Pharmacology*, 4th Edition, Vallabh Prakashan, New Delhi, 2012; pp. 118–125.
13. Arunachalam, K., Parimelazhagan, T., et al. "Antispasmodic Activity of Taraxacum officinale Extract on Isolated Smooth Muscle." *Journal of Ethnopharmacology*, 2010; 130(3): 540–545. <https://doi.org/10.1016/j.jep.2010.05.045>