



**EVALUATION OF ANTI-ASTHMATIC ACTIVITY OF ETHANOLIC EXTRACT OF
PISTIA STRATIOTES LINN (ROOTS)**

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ABSTRACT

The study investigates the effects of *Pistia stratiotes* extracts on bronchoconstriction induced by spasmogens like histamine, acetylcholine, and serotonin (5-HT), which are implicated in asthma pathogenesis. The extracts were found to inhibit tracheal contractions, with ethanol extract demonstrating the most significant anti-inflammatory activity. The ethanol extract's ability to reduce acetylcholine-induced contractions in guinea pig ileum suggests dual bioactive constituents interacting at muscarinic receptors. This interaction might contribute to enhanced anti-inflammatory effects, making the ethanol extract a promising candidate for asthma treatment. Although the extract showed less potency in inhibiting spasmogens' contractions, it effectively alleviated airway hyper responsiveness and inflammation, potentially by interfering with inflammatory mediators. The study highlights *Pistia stratiotes*' potential for ameliorating asthma symptoms, although further research is needed to elucidate its exact mechanism of action.

KEYWORDS: Asthma, Phytochemical Screening, *Pistia Stratiotes*, Ethanolic extract, Pharmacological Screening.

1. INTRODUCTION

Asthma is a chronic inflammatory disease of the airways characterized by recurrent symptoms, including wheezing, coughing, chest tightness, and shortness of breath, often triggered by exercise or exacerbated at night. It results from a combination of genetic and environmental factors, including exposure to allergens, air pollution, and certain medications. Diagnosis is based on symptom patterns, therapy response, and spirometry, and asthma can be classified based on symptom

frequency, forced expiratory volume (FEV1), and peak expiratory flow rate. Treatment aims to control symptoms through avoidance of triggers and medications such as inhaled corticosteroids, long-acting beta agonists (LABA), and antileukotriene agents. Rapid symptom worsening is managed with short-acting beta-2 agonists and corticosteroids, while severe cases may require intravenous treatment and hospitalization. Currently, there is no cure for asthma, but it can be managed effectively with appropriate care.

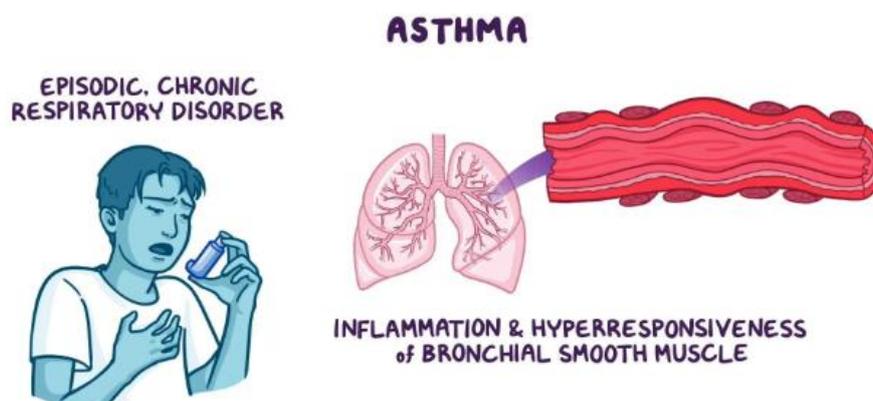


Fig. 1: Asthma.

2. PLANT PROFILE

Pistia stratiotes Linn., commonly known as water lettuce, is an aquatic plant belonging to the Araceae family. It is native to the Americas but has spread to many parts of the world, including Africa, Asia, and Oceania. This floating plant typically thrives in slow-moving or stagnant waters, such as ponds, lakes, and marshes. It is characterized by rosette-like leaves that are light green, spongy, and water-repellent. The plant has a distinctive appearance, with its leaves resembling a lettuce head, and it produces small flowers that are generally not conspicuous.

Kingdom	-	Plantae
Order	-	Alismatales
Family	-	Araceae
Subfamily	-	Aroideae
Genus	-	Pistia L
Species	-	P.stratiotes

2.1 Chemical Constituents

- ✚ Stigmasta-4, 22-dien-3-one
- ✚ Stigmasterol
- ✚ Stigmasteryl stearate
- ✚ Palmitic acid

2.2 Medicinal Uses

Pistia stratiotes has been traditionally used in various cultures for its potential therapeutic benefits. It is believed to have anti-inflammatory, antimicrobial, and antidiabetic properties. Some studies have also explored its use in treating respiratory conditions like asthma due to its potential to reduce bronchoconstriction and airway inflammation. Extracts of *Pistia stratiotes* have shown promise in inhibiting the effects of spasmogens like histamine and acetylcholine, suggesting its role in managing conditions related to airway hyper responsiveness.



Fig: 2 *Pistia stratiotes* Linn.

3. MATERIALS AND METHODS

3.1 Extraction

The collected roots was cleaned, dried in the shade and ground in to a fine powder from which 500g was extracted repeatedly with 2 litres of ethanol using soxhlet extractor at 50°C for 72 h. The extracts were filtered using whatmann filter paper (no.1) and concentrated in vacuum at 40°C using a rotary evaporator and the residues obtained was stored in a freezer at -80°C until further tests.

3.2 Preliminary Phytochemical Studies

The Ethanolic extract of the roots of *Pistia stratiotes* linn is subjected to preliminary phytochemical screening.

- Test for Alkaloids
- Test for Terpenoids
- Test for Steroids
- Test for Tannin
- Test for Saponin
- Test for Flavonoids

- Test for Phenols
- Test for Protein
- Test for Carbohydrate
- Test for Glycosides
- Test for Starch
- Test for Gum
- Test for Fixed oil

3.3 Animal specification

- No. of animal required : 42
- Species : Albino
- Gender : Either sex
- Weight : Rats (150-200gm), Guinea pigs (400-450gm)
- Duration of study : 45 days
- Animal will be housed : 1 month
- Disposal animals : Burried

3.4 *In Vivo* Study

Table 1: Anti Inflammatory Test.

Group	No. of Animals	Treatment
I	6	Control (0.5 % CMC) + Carrageenan 1% (0.1ml)
II	6	Diclofenac sodium (20 mg / kg) (Std) p.o + Carrageenan 1 % (0.1 ml)
III	6	EEPS I (100 mg /kg p.o.) in 0.5 % CMC + Carrageenan 1 % (0.1ml)
IV	6	EEPS II (200 mg / kg p.o.) in 0.5% CMC + Carrageenan 1 % (0.1ml)

Table 2: Histamine & Acetylcholine Induced Bronchospasm In Guinea Pigs.

Group	No. of Animals	Treatment
I	6	Control (0.5 % Ach, 0.25 % Histamine)
II	6	Ketotifen (1 mg / kg) (std) orally
III	6	EEPS I (100 mg / kg) orally
IV	6	EEPS II (200 mg / kg) orally

3.5 *In Vitro* Study

Name of the preparation

- Guinea pig trachea and ileac preparation
- Rat stomach strip preparation

Table 3: Composition of Physiological Solution.

Compounds	Tyrode	Kerbs-Hensleit
Sodium chloride(58.45)*	137 (8.0)**	118 (6.9)
Potassium chloride (74.56)	2.7 (0.2)	4.7 (0.35)
Calcium chloride (110.99)	1.8 (0.2)	2.5 (0.28)
Magnesium chloride (95.23)	0.1-1.0	-
MgSO ₄ .7H ₂ O (Magnesium sulphate hepta hydrate)	-	1.2 (1.28)
Sodium bicarbonate	11.9 (1.0)	25.0 (2.1)
Sodium dihydrogen phosphate (119.97)	0.4 (0.05)	-
Potassium dihydrogen phosphate (136.08)	-	1.2 (0.16)
Glucose (180.16)	5.55 (1.0)	5.55(1.0)

4. RESULTS AND DISCUSSION

4.1 Preliminary Phytochemical studies

Preliminary phytochemical analysis of ethanol extract of *Pistia stratiotes* revealed the presence of carbohydrate,

glycoside, phenolic compound, tannins, proteins and amino acid, sterols, flavonoids, saponins, alkaloids, fixed oils and fats, gum and mucilage.

Table 4: Preliminary Phytochemical Test For EEPS.

S. No.	Phytochemical Tests	Results
1	Alkaloids	Present
2	Carbohydrates	Present
3	Glycosides	Present
4	Phenolic compound	Present
5	Tannins	Present
6	Proteins and amino acids	Present
7	Saponins	Present
8	Gums and mucilage	Absent
9	Sterols	Present
10	Fixed oils and fats	Present
11	Flavonoids	Present

4.2 Effect Of Ethanolic Extract Of *Pistia Stratiotes* On CRC Of Histamine On Guinea Pig Trachea

Table 5: Effect Of Ethanolic Extract Of *Pistia Stratiotes* On CRC Of Histamine On Guinea Pig Trachea.

S. No.	Extract Dose (mg/ml)	Contraction Of Tissue (Height Measured In mm.) By Histamine			
		10µg	20µg	40µg	80µg
1	0	8	10	14	15
2	10	6	7	9	12
3	20	4	5	7	9

4	30	3	4	6	8
5	40	2	3	5	6

Table 6: Log Dose Vs Percentage Inhibition Of Maximal Contraction Induced By Histamine.

S. No.	Log Dose	% Inhibition Of Maximal Contraction Induced By Histamine (% Inhibition \pm SEM)
1	-	0.00 \pm 1.33
2	1	26.00 \pm 3.4**
3	1.3010	42.18 \pm 1.81**
4	1.4771	53.53 \pm 0.27**
5	1.6020	62.64 \pm 0.33**

4.3 Effect Of Ethanolic Extract Of *Pistia Stratiotes* On CRC Of Acetyl Choline Using Guinea Pig TracheaTable 7: Effect Of Ethanolic Extract Of *Pistia Stratiotes* On CRC Of Acetyl Choline Using Guinea Pig Trachea.

S. No.	Extract Dose (mg/ml)	Contraction Of Tissue (Height Measured In Mm.) By Acetyl Choline			
		10 μ g	20 μ g	40 μ g	80 μ g
1	0	7	9	11	13
2	10	5	7	9	11
3	20	4	7	8	9
4	30	3	5	5	7
5	40	2	3	4	6

Table 8: Log Dose Vs Percentage Inhibition Of Maximal Contraction Induced By Acetyl Choline.

S. No.	Log dose	% Inhibition Of Maximal Contraction Induced By Acetyl Choline (% Inhibition \pm SEM)
1	-	0.00 \pm 0.63
2	1	20.00 \pm 1.32**
3	1.3010	30.00 \pm 1.82**
4	1.4771	50.00 \pm 0.62**
5	1.6020	62.50 \pm 0.52**

4.4 Effect Of Ethanolic Extract Of *Pistia Stratiotes* On CRC Of Histamine Using Guinea Pig IleumTable 9: Effect Of Ethanolic Extract Of *Pistia Stratiotes* On CRC Of Histamine Using Guinea Pig Ileum.

S. No.	Extract Dose (mg/ml)	Contraction Of Tissue (Height Measured In Mm.) By Histamine			
		10 μ g	20 μ g	40 μ g	80 μ g
1	0	36	37	40	46
2	10	30	32	35	44
3	20	30	33	36	41
4	30	29	31	33	35
5	40	26	27	30	32

Table 10: Log Dose Vs Percentage Inhibition Of Maximal Contraction Induced By Histamine.

S.No.	Log dose	% Inhibition Of Maximal Contraction Induced By Histamine (% Inhibition \pm SEM)
1	-	0.00 \pm 0.20
2	1	10.33 \pm 3.14**
3	1.3010	13.53 \pm 1.62**
4	1.4771	22.95 \pm 0.13**
5	1.6020	29.86 \pm 0.06**

4.5 Effect Of Ethanolic Extract Of *Pistia Stratiotes* On CRC Of Acetyl Choline Using Guinea Pig IleumTable 11: Effect Of Ethanolic Extract Of *Pistia Stratiotes* On CRC Of Acetyl Choline Using Guinea Pig Ileum.

S.No.	Extract Dose (mg/ml)	Contraction Of Tissue (Height Measured In mm.) By Acetyl Choline			
		10 μ g	20 μ g	40 μ g	80 μ g
1	0	24	25	33	34
2	10	23	26	30	33
3	20	22	25	28	31
4	30	22	23	26	29
5	40	20	21	23	27

Table 12: Log Dose Vs Percentage Inhibition of Maximal Contraction Induced By Acetyl Choline.

S. No.	Log dose	% Inhibition Of Maximal Contraction Induced By Acetyl Choline (% Inhibition \pm SEM)
1	-	0.00 \pm 0.5
2	1	4.16 \pm 0.82*
3	1.3010	13.33 \pm 0.32**
4	1.4771	17.50 \pm 1.64**
5	1.6020	24.16 \pm 0.38**

4.6 Effect of Ethanolic Extract of *Pistia Stratiotes* on CRC Of Serotonin (5-HT) Using Rat Fundus Strip Preparation

Table 13: Effect of Ethanolic Extract of *Pistia Stratiotes* on CRC Of Serotonin (5-HT) Using Rat Fundus Strip Preparation.

S. No.	Extract Dose (mg/ml)	Contraction Of Tissue (Height Measured In mm.) By Serotonin			
		10 μ g	20 μ g	40 μ g	80 μ g
1	0	9	11	13	14
2	10	7	8	11	12
3	20	6	7	10	10
4	30	4	6	8	9
5	40	3	5	7	8

Table 14: Log Dose Vs Percentage Inhibition Of Maximal Contraction Induced By Serotonin.

S. No.	Log Dose	% Inhibition Of Maximal Contraction Induced By Serotonin (% Inhibition \pm SEM)
1	-	0.00 \pm 0.01
2	1	18.65 \pm 1.03**
3	1.3010	31.35 \pm 2.32**
4	1.4771	42.56 \pm 2.84**
5	1.6020	50.00 \pm 4.26**

4.7 Effect Of *P.Stratiotes* On Carageenan Induced Rat Paw Edema

Table 15: Effect of *P.Stratiotes* on Carageenan Induced Rat Paw Edema.

Treatment	Dose (mg/kg)	% Increase Volume Of Paw (% Anti-Inflammatory Effect)		
		1 h	3 h	5 h
Control		5.124 \pm 1.28	22.414 \pm 1.423	25.16 \pm 1.621
<i>P. stratiotes</i>	100	4.876 \pm 0.043* (17.75)	15.28 \pm 0.681* (20.64)	14.82 \pm 0.07** (43.35)
<i>P. stratiotes</i>	200	3.193 \pm 0.128* (47.87)	10.387 \pm 1.141** (49.37)	8.40 \pm 0.429** (67.89)
Diclofenac sodium	20	2.186 \pm 0.461** (64.31)	8.175 \pm 1.17** (60.15)	5.52 \pm 0.013** (78.9)

Values are expressed as mean \pm SEM (n=6);

Significantly different from control. *P<0.05, **P<0.01

Values in parenthesis indicates percentage inhibition of paw edema.

Data were analysed by using ANOVA and Dunnett's t-test and expressed as mean \pm SEM.

4.8 Effect Of *P.Stratiotes* On Ach & Histamine Induced Bronchospasm In Guinea Pigs

Table 16: Effect Of *P.Stratiotes* On Ach & Histamine Induced Bronchospasm In Guinea Pigs.

S. No.	Treatment	% Increase In Acetylcholine	Preconvulsion Time Histamine
1	Control(0.25% histamine,0.5% Ach)	61.24 \pm 2.33	55.22 \pm 1.56
2	EEPS I (100mg/kg p.o.)	56.47 \pm 4.64*	42.84 \pm 3.43*
3	EEPS II (200mg/kg p.o.)	43.37 \pm 2.36*	35.13 \pm 2.57*
4	Ketotifen fumarate (1mg/kg p.o.)	24.81 \pm 1.32**	32.29 \pm 2.40*

Values are expressed as mean \pm SEM (n=6);

Significantly different from baseline. *P<0.05, ** P<0.01.

Data were analysed by using Dunnett's t-test and expressed as mean \pm SEM.

5 CONCLUSION

Asthma is a chronic inflammatory lung disease that affects 18.7 million U.S adults. Electronic health records (EHRs) are a unique source of information that can be

leveraged to understand factors associated with asthma in real-life population. There is no cure for asthma symptoms can be prevented by avoiding triggers such as allergens and irritants and by the use of inhaled

corticosteroids. Long -acting beta agonists (LABA) or anti-leukotriene agents may be used in addition to inhaled corticosteroids. It asthma symptoms remain uncontrolled. In present study, significant increase in pre-convulsion time was observed due to pre-treatment with *Pistia stratiotes*, when the guinea pigs were exposed to either Acetylcholine or Histamine aerosol. This broncho dilating effect of *Pistia stratiotes* was compared with control Further studies needed for its exact mechanism of action.

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