

## EFFECT OF *Tamarindus indica* Linn. AGAINST ISOLATED GOAT TRACHEAL AND GUINEA PIG ILEUM PREPARATION

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### ABSTRACT

According to Ayurveda, *Tamarindus indica* Linn. (Caesalpiniaceae) is used in the treatment of asthma, inflammation, dysentery, vaginal and uterine complaints and variety of conditions. In the present study methanolic extract of leaves of *Tamarindus indica* Linn. in the histamine induced dose dependent contraction of goat tracheal chain and guinea pig ileum preparation was significantly inhibited ( $p < 0.01$ ) by the methanolic extract of leaves of *Tamarindus indica* Linn. (400  $\mu\text{g/ml}$  and 80  $\mu\text{g/ml}$ ). Thus the present study revealed that the methanolic extract of leaves of *Tamarindus indica* Linn. has significant antihistaminic ( $H_1$  receptor antagonist) activity. The *Tamarindus indica* Linn. by virtue of the said actions will prove to be very effective in the antihistaminic therapy of asthma.

**Keywords:** Anti-histaminic, Asthma, *Tamarindus indica* Linn.

### INTRODUCTION

*Tamarindus indica* Linn. (Caesalpiniaceae) is a commonly found plant in India. It is cultivated throughout India, self sown in waste places and forest lands in central India, Madhya Pradesh, and also planted along roadsides. The phytochemical characterization shows the presence of tannins, steroids, alkaloids, triterpens and flavonoids.<sup>1</sup>

According to Ayurveda, *Tamarindus indica* Linn. is used in the treatment of asthma, inflammations, biliousness (bad digestion), dysentery, vaginal and uterine complaints, burning sensation and other conditions.<sup>2</sup>

The methanolic extract of leaves of *Tamarindus indica* Linn. contain ascorbic acid,  $\beta$ -carotene and also used as anti-lipoperoxidant and anti-hepatotoxic.<sup>3</sup>

Asthma is a heterogeneous disorder with immunological, physiological and biochemical manifestations; its etiology is multifactorial. The present study was planned to evaluate the antihistaminic action of methanolic extract of leaves of *Tamarindus indica* Linn. using various animal models like, Isolated goat tracheal chain preparation and isolated guinea pig ileum preparation. There was no report on the test drug's anti-asthmatic activity and therefore it was thought worthwhile to screen it for the same.

### MATERIALS AND METHODS

#### Plant Material

The leaves of *Tamarindus indica* Linn. were collected from Aurangabad city region, India. The plant specimen was authenticated by Mr. P G Diwakar (Scientist 'D' for Joint Director) at the "Botanical Survey of India" Pune, India, (Voucher specimen no. TYP1).

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#### Preparation of methanolic extract of leaves of *Tamarindus indica* Linn.

The leaves of *Tamarindus indica* Linn. were air-dried. After 10 days of drying, the leaves were powdered and passed through sieve no 40. The methanolic extract was prepared by maceration method. The extract was concentrated and dried at 60°C, (yield 8.7 %).<sup>4</sup>

#### Experimental animals

All experimental procedures were carried out in strict accordance with the guidelines prescribed by the Committee for the Purpose of Control and Supervision on Experimentation on Animals (CPCSEA) and were approved by the Institutional Animal Ethics Committee.

Goat trachea was obtained from the Slaughter house. It was immersed in Krebs's solution maintained at 37 °C. Dunkin-Hartley Guinea pigs weighing between 350 to 400 gm were used. The above animals of either sex were purchased from National Toxicology Center, Pune. They were housed in groups of five under standard laboratory conditions of temperature (25  $\pm$  2°C) and 12/12 hr light/dark cycle. Animals had free access to standard pellet diet (Amrut laboratory animal feed, Sangali - Maharashtra) and water.

#### Isolated goat tracheal chain preparation<sup>5</sup>

Isolated adult Goat tracheal tissue was obtained immediately after slaughter of the animals. Trachea was cut into individual rings and tied together in series to form a chain. Trachea was suspended in bath of Krebs's solution of the composition: NaCl 6.9, KCl 0.35, CaCl<sub>2</sub> 0.28, MgSO<sub>4</sub> 0.28, NaHCO<sub>3</sub> 2.1, KH<sub>2</sub>PO<sub>4</sub> 0.16 and Glucose 2.0 gm/litre, which was continuously aerated and maintained at 37  $\pm$  0.5 °C.<sup>6</sup> Tissue was allowed to equilibrate for 45 min. under a load of 400 mg.<sup>7</sup> A dose response curve for histamine was recorded at variant molar concentrations, by maintaining 15 min time cycle. After obtaining a dose

response curve of histamine (30 µg/ml) on trachea, the *Tamarindus indica* Linn. extract (400 µg/ml) was added to the reservoir and the same doses of histamine were repeated. Graph of percentage of maximum contractile response on ordinate and negative logarithm of molar concentration of histamine on abscissa was plotted to record dose response curve of histamine, in absence and in presence *Tamarindus indica* Linn. extract.

**Isolated guinea pig ileum preparation<sup>8,9</sup>**

Overnight fasted guinea pig was sacrificed and ileum was mounted in an organ bath containing Tyrode solution. The composition of Tyrode solution was such as: NaCl 8.0, KCl 0.2, CaCl<sub>2</sub> 0.2, MgCl<sub>2</sub> 0.1, NaHCO<sub>3</sub> 1.0, NaH<sub>2</sub>PO<sub>4</sub> 0.05 and Glucose 1.0 gm/liter. which was continuously aerated and maintained at 37 ± 0.5°C. The tissue was allowed to equilibrate for 30 min. under a load of 500 mg. Contact time of 30 sec. and 5 min time cycle was followed for recording the response of Histamine. After obtaining a dose response curve of histamine (10 µg/ml) on ileum, the *Tamarindus indica* Linn. (80 µg/ml) was added to the reservoir and same doses of histamine were repeated in

presence of *Tamarindus indica* Linn. extract. Graph of percentage of maximum contractile response on ordinate and negative logarithm of molar concentration of histamine on abscissa was plotted to record dose response curve of histamine, in absence and presence of *Bauhinia variegata* Linn. extract.

**Statistical Analysis**

All observations were presented as Mean ± SEM. (Standard error of mean). The data was analyzed by Student's t-test . P<0.05 was considered as significant.

**RESULTS**

**Isolated goat tracheal chain preparation**

In the present study, histamine (30 µg/ml) produced dose dependent contraction of goat tracheal chain preparation as indicated in the graph of maximum percentage of contractile response v/s negative log molar concentration of histamine. The modified physiological salt solution containing methanolic extract of *Tamarindus indica* Linn. (400 µg/ml) significantly inhibited (p<0.01) the contractile effect of histamine.

**Table 1. Effect of methanolic extract of *Tamarindus indica* Linn. (400 µg/ml) on Histamine induced contraction of isolated goat tracheal chain preparation.**

S no	Dose of Histamine (30 ug/ml) (ml)	- ve Log molar concentration of Histamine	% Maximum Response	
			Control	Test
1	0.1	6.61	18.9 ± 0.90	9.25 ± 0.61**
2	0.2	6.31	42.06 ± 1.69	20.11 ± 0.84**
3	0.4	6.01	62.51 ± 1.28	30.88 ± 0.83**
4	0.8	5.71	73.45 ± 0.89	42.45 ± 1.14**
5	1.6	5.40	84.04 ± 1.13	47.05 ± 0.85**
6	3.2	5.10	97.45 ± 0.89	55.03 ± 2.11**

Values in Mean ± SEM, n= 6; Control = D.R.C. of Histamine in absence of *Tamarindus indica* Linn extract.

Test = D.R.C. of Histamine in presence of *Tamarindus indica* Linn extract (400 µg/ml).

Statistical analysis done by using Student's t - test. \*\* p< 0.001, significantly different from control.

**Table 2. Effect of methanolic extract of *Tamarindus indica* Linn. (80 µg/ml) on Histamine induced contraction of Isolated Guinea Pig Ileum Preparation.**

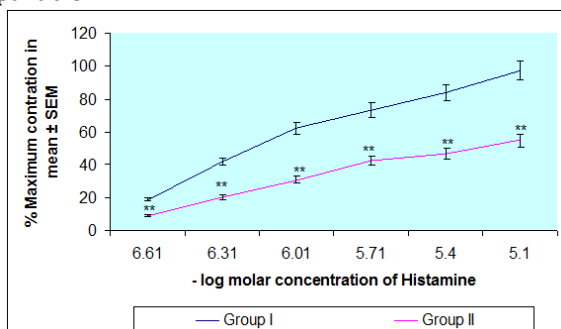
S no	Dose of Histamine (10 ug/ml) (ml)	- ve Log molar concentration of Histamine	% Maximum Response	
			Control	Test
1	0.1	6.61	24.35 ± 1.410	11.7 ± 0.612*
2	0.2	6.31	49.81 ± 1.428	24.7 ± 1.056*
3	0.4	6.01	69.21 ± 1.574	36.93 ± 1.637**
4	0.8	5.71	91.76 ± 1.808	47.55 ± 0.969**
5	1.6	5.40	98.0 ± 0.638	53.4 ± 1.362*

Values in Mean ± SEM, n=6, Control = D.R.C. of Histamine in absence of *Tamarindus indica* Linn extract.

Test = D.R.C. of Histamine in presence of *Tamarindus indica* Linn extract (80 µg/ml).

Statistical analysis done by using Student's t - test. \*\* p< 0.01, significantly different from control.

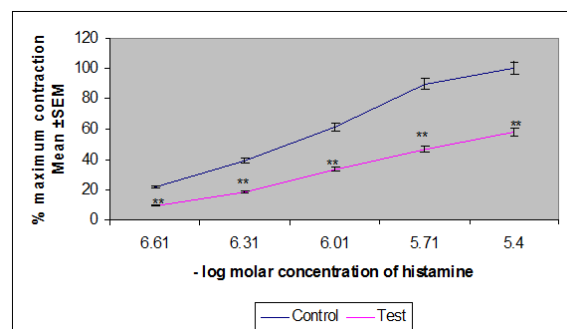
**Figure 1. Effect of methanolic extract of *Tamarindus indica* Linn. (400 µg/ml) on histamine induced contraction of isolated goat tracheal chain preparation.**



Control = D.R.C. of Histamine without *Tamarindus indica* Linn. extract.  
 Test = D.R.C. of Histamine in presence of *Tamarindus indica* Linn. extract (400 µg/ml).

\*\* p< 0.001, (Student's t-test).

**Figure 2. Effect of methanolic extract of *Tamarindus indica* Linn. (80 µg/ml) on histamine induced contraction of isolated Guinea Pig Ileum Preparation**



Control = D.R.C. of Histamine without *Tamarindus indica* Linn. extract.  
 Test = D.R.C. of Histamine in presence of *Tamarindus indica* Linn. extract (50µg/ml).

\*\* p< 0.001, (Student's t-test).

### Isolated guinea pig ileum preparation

In the present study, histamine (10 µg/ml) produced dose dependent contraction of guinea pig ileum preparation as indicated in the graph of maximum percentage of contractile response v/s negative log molar concentration of histamine. The modified physiological salt solution containing the methanolic extract of *Tamarindus indica* Linn. (80 µg/ml) significantly inhibited ( $p < 0.001$ ) the contractile effect of histamine on isolated guinea pig ileum preparation.

### DISCUSSION

Asthma is a heterogeneous disorder immunologically, physiologically and biochemically and its etiology is multifactorial. Histamine is one of the important mediators of allergy, inflammation and bronchoconstriction. Targeting histamine, either prevention of its release from mast cells or use of histaminergic receptor antagonists becomes part of antihistaminic therapy in asthma.<sup>10</sup> Histamine is an autocooid having profound physiological effect in the body.<sup>8</sup>

The contraction of tracheal or bronchial smooth muscle in vitro has often been utilized for the study of contractile / dilator responses of agonists as well as antagonist. Both goat tracheal chain and strip preparations are suitable for screening the activity of a drug on respiratory smooth muscles.<sup>7</sup> Spasmogens such as histamine, acetylcholine

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and barium chloride produced dose dependent contraction of goat tracheal chain preparation. The goat tracheal muscle has H<sub>1</sub>, M<sub>3</sub> and B<sub>2</sub> receptors. The stimulation of H<sub>1</sub> receptors caused contraction of bronchial smooth muscle.<sup>5</sup> In the present study, *Tamarindus indica* Linn. extract (400 µg/ml in the perfused PSS) significantly inhibited the histamine induced contraction of isolated goat tracheal chain preparation, indicating antihistaminic activity.

Guinea pig ileum is used for screening of antihistaminic activity. The stimulation of H<sub>1</sub> receptors produces graded dose related contraction of isolated guinea pig ileum.<sup>11</sup> In the present study, *Tamarindus indica* Linn. (80 µg/ml in the perfused PSS) significantly inhibited the histamine induced contraction of isolated guinea-pig ileum preparation indicating H<sub>1</sub> receptor antagonistic activity.

### CONCLUSION

It can be concluded that methanolic extract of leaves of *Tamarindus indica* Linn, possess significant antihistaminic (H<sub>1</sub> receptor antagonist) activity. The methanolic extract of leaves of *Tamarindus indica* Linn. by virtue of its antihistaminic activity can be used in the treatment of asthma. Hence further detailed study needs to be undertaken to evaluate the clinical efficacy of *Tamarindus indica* Linn. extract.

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