

## Pharmacology of an Ayurvedic Indian medicinal plant for mast cell degranulation activity

SUNITA SHARMA, KAPIL KUMAR SONI, R.C. SAXENA, RAHUL SAXENA\*,  
SARIKA SHRIVASTAVA, R.T. PALIWAL, S.I. INGLE, VEDANT MISHRA and ZEESHAN HASAN

Pest Control and Ayurvedic Drug Research Laboratory,  
Department of Zoology, S.S.L. Jain P.G. College, Vidisha (India).  
College of Pharmacy, IPS Academy, Indore (India).  
LNCT College of Pharmacy, Bhopal (India).

(Received: October 08, 2008; Accepted: November 24, 2008)

### ABSTRACT

Ayurveda, an ancient system of Indian medicine has recommended a number of drugs from indigenous plant sources for the treatment of bronchial asthma and allergic reactions. Importance of natural products in modern pharmacology is decreasing and a substantial part of drugs are still based on compounds originally isolated from the natural products. Many pharmacologically active natural products isolated from plants which have been used in traditional medicine. Some plants have been reported in India for antiasthmatic, antihistaminic and smooth muscle relaxant activities including *Achyranthes*, *Eclipta*, *Balanites*, *Viscum*.

*Tephrosia purpurea* of family Leguminosae popularly known as "Sarpunkha" has been used in Ayurvedic medicine as cardiac stimulant. In the present laboratory antihistaminic activity has been tested in the experimental guinea pigs in which asthma was induced by horse serum (0.5 ml). Subcutaneously for 14 days duration. The effect of the herbal extract isolated from the stem of the plant was noticed in the kymograph followed by tracheal chain preparation method. Maximum effect was noticed in the kymograph at 4mg/kg body weight dose of alcoholic extract of *Tephrosia purpurea*.

**Key words:** Ayurveda, *Tephrosia purpurea*, pharmacology.

### INTRODUCTION

Asthma is an allergic reaction mainly associated with air pollution and improper ventilation. Histamine secreted by the mast cells plays an important role in the constriction of smooth muscles of airways. Their number increases during asthma which causes bronchospasm, thus narrowing down the respiratory passage.

In India, several medicinal plants have been traditionally used in the treatment of respiratory disease. Tripathi and Sas (1977) have mentioned the antiasthmatic activity of medicinal plants *Albizia*

*labbeck*. Bergendroff *et al.*, (1995) have reported 7 European plants found useful in asthma. Mitra *et al.*, (1999) have reported a poly herbal formulation on degranulation of mesenteric mast cell in albino rats. Abbasoglu and Tukog (1945) have reported that saponin having various pharmacological effects are widely distributed in plants.

In the present study, phytoparmacology of "Saponin" isolated from the leaves and stem of *Tephrosia purpurea* Linn of family Leguminosae was observed on smooth muscles (Tracheal) relaxant activity which is caused due to mast cell deregulation using guinea pig experimental model.

## EXPERIMENTAL

### Plant Material

*Tephrosia purpurea* Linn. of family Leguminosae is a shrub widely distributed throughout north and central part of India. The plant was identified by the Botanists of the Institute and a Voucher specimen was deposited in herbarium sheet of the laboratory at S. No. 7. The villagers of the remote areas of Raisen District of Madhya Pradesh in India have been using decoction of fresh leaves of this plant in severe cold, cough and throat infection (Khare and Saxena 1999). Fresh plant materials was collected from the villages of Raisen district, washed thoroughly and shade dried at room temperature.

### Extraction and Isolation

40 to 60 mesh size powdered plant material was extracted in Soxhlet apparatus using 90% ethanol and water successively. The percentage yield, ash content, moisture content, saponifiable value of the plant material was recorded (Table 1).

The crude extract was evaporated to dryness under low temperature and reduced

pressure. The yield was recorded. The alcoholic extract was portioned successively and sub feeted to Si-gel 'G' cc using  $\text{CHCl}_3$ - MeOH in different proportions. The fractions collected from  $\text{CHCl}_3$ : MeOH (11 : 8) gave dark red needles of 120 mg with mp 236°C [M<sup>+</sup>] m/z 545; UV max 266, 325 nm. IR bands (Kbr - Elmar Model) gave 1664,  $\text{cm}^{-1}$ . <sup>1</sup>H NMR (3000 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.81 (1 H, H<sub>2</sub>), 6.94 (1 H, S, H-8), 6.2 (1H, S, H-6), 7.12 (2H, S, H-2' and H6'). <sup>13</sup>C NMR (DMSO); 155.9 (C-2); 120.6 (C-3) 180.7 (C-4), 162.2 (C-5), 99.1 (C-6), 164.2 (C-7), 93.6 (C-8), 157.9 (C-9), 154.4 (C-2'), 115.6 (C-3'), 156.5 (C-4'), 76.0 (C-5') and 60.4 (C-6').

### Biological assays

Male guinea pigs about 200 gm and kept under standard laboratory conditions were used in all experiments. They were maintained as per guidelines of CPSEA vide letter No. 804/CA/CPCSEA and IAEC. Asthma was induced by injecting subcutaneously 0.5 ml of Triple antigen and 0.5 ml of horse serum for 14 days. The sacrificed animals were divided in the sex groups with 3 in each. On day 14, they were stunned by blow on the head and exsanguinated. Trachea was dissected out, freed from other tissue and cut into two cartilage

**Table 1: Chemical characteristics of *Tephrosia purpurea***

S.No	Characteristics	Percentage in each
1.	Percentage loss in weight on shade drying	45
2.	Percentage of Ash contents	33.4
3.	Water Soluble ash contents	65
4.	Acid Soluble ash contents	3.10
5.	Fibre value	Not more than 35
6.	Saponifiable value	70
7.	Percentage yield in 90% alcohol	1.82
8.	Water	3.86

**Table 2: TLC of alcoholic extract of *Tephrosia purpurea***

Extract used	Solvent system	Fraction	Colour characterization			Rf value
			VL	Iodine	U.V.	
90% Alcoholic extract	$\text{CHCl}_3$ :MeOH (11:8)	T <sub>1</sub>	Dark green	Green	Yellowish	09.0
		T <sub>2</sub>	Yellow	Yellowish green	Yellow	0.70
		T <sub>3</sub>	Light green	Green	Light yellow	0.40

**Table 3: Effect of herbal drug of *Tephrosia purpurea* on mast cell degranulation in activity sensitized guine pigs**

Groups	Treatment	Dose (Mg/kg) for 14 days	Mast cells	
			% Intact	% disrupted
I	Control	-	21	79
II	Tephrosia Extract	25	40	60
III	Tephrosia Extract	50	59	41
IV	Tephrosia Extract	75	72	28
V	Tephrosia Extract	100	73	27
IV	Prednisolone (Standard Drug)	10	74	26

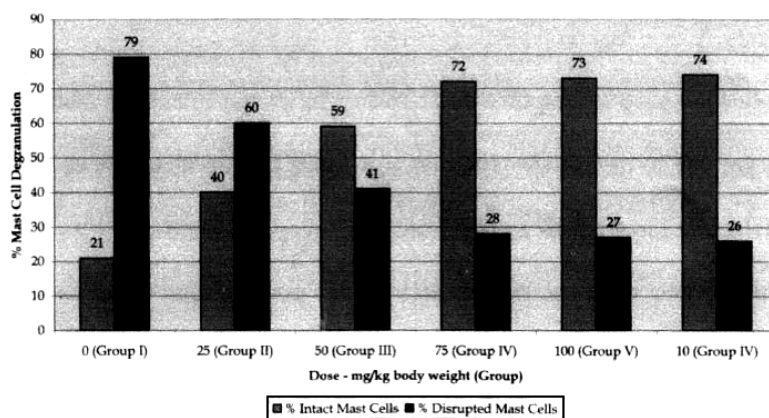
rings. Cotton threads were fastened to both ends of the cartilage bridge which was then cut open ventrally. The preparation was mounted in a water jacketed organ both in Ringer Locke solution. The mesenteries pieces were kept separately in the above solution and challenged with 5% horse serum for 10 mins. Mast cells were stained and examined microscopically for the number of intact and degranulated mast cells. Action of herbal extract on isolated guinea pig tracheal chain and contraction was recorded on smoked drum using frontal writing lever.

When the sacrificed animals were treated with herbal drugs (25, 50, 75 and 100 mg/kg) for two weeks and then challenged with an antigen, there was a significant reduction in the number of disrupted mast cells. The effect of alcoholic extract at 100mg/kg dose was quite comparable to the prednisolone (Table 3). In the control group of actively sensitized animals, 79% disruption of mast cell was noticed whereas it came down to 27% in the treatment with 100 mg/kg dose of alcoholic extract of *T. purpurea* (Fig. 1). The extract also causes bronchoconstrictor in isolated guinea pig tracheal chain.

**RESULTS AND DISCUSSION**

The results of the present study showed that two weeks after sensitization, the antigen challenge degranulated about 79% of the mast cells.

The results of the present study showed disruption in the mast cells due to which histamine is released which causes bronchospasm formation and constriction of the tracheal muscles consequently causing asthmatic attack.



**Fig. 1: Effect of herbal drug of *Tephrosia purpurea* on mast cell degranulation in actively sensitized rats**

The alcoholic extract of *Tephrosia* proved to be highly effective in the sense that number of degranulated cells came down to 27%. Sharma (1976) have also reported such activities in *Albizzia lebeck*. Gupta (1974) made antiasthmatic effect of saponin of *Gardenia latifolia* in rats. Mitra *et al.*, (1999) have noticed the similar effects of E-721B in anaphylactic rats. Singh *et al.*, (2008) have isolated 3,7,4'-trihydroxy flavon.

In the present study, extract of the aerial part of *Tephrosia* gave a dose dependent relaxation in tracheal muscles as well as cell stabilizing potential Maximum of 100 mg/kg body weight dose. The report of the present study support the findings of Agarwal and Mehta (2008) who have reported

the safety and efficacy of seed kernel of *Moringa oleifera* in the bronchial asthma. The phytochemistry of the isolated fraction was found to possess a 'Tephrosap' - a glycosidal triterpenoid saponin. This needs further of biologically active compound.

#### ACKNOWLEDGMENTS

Thanks are the MPCST for travel grants and to Head SAIF, CDRI, Lucknow for spectral analysis and Govt. of M.P., Higher Education Department for official permission to present the findings. Thanks are also due to CPCSEA, Chennai for permission use the albino rats for experimental work.

#### REFERENCES

1. Abbasoglu, U. and Turkog, S. Antimicrobial activity of saponin extract from some Indigenous plants of Turkey. *Int. J. Pharmacognosy*. **33**(4) 293-296.
2. Agarwal B. and Mehta A. Antiasthmatic activity of *Moringa oleifera* Linn clinical study. *Indian J. Pharmacol*, **40**(1): 28-31 (2008).
3. Bergandroff, O., Franzen, C. and Woldeck, B. Screening of some European medicinal plant for spasmolytic activity on isolated guinea pig trachea. *Int. J. Pharmacognocny*, **30**(4): 356-358 (1945).
4. Gupta, S.S., Some observation on the antiasthmatic effect of saponin of *Gardenia latifolia* aspect of allergy. *Applied Immunology*, **7**: 198-201 (1974).
5. Khare, M.L and Saxena, R.C. Screening of a herbal medicine *Tephrosia purpurea* (Leguminosae) for bronchial asthma. *J of the National Integrated Medicinal Association*. **41**(4): 7-9 (1999).
6. Mitra, S.K., Gopumodhavan S., Venkataranga, M.V. and Anturilikar, S.D., Antisathmatic and anaphylactic effect of E-721B-a herbal formulation. *Indian J of Pharmacology*. **31**: 133-137 (1999).
7. Padmalatha, K. Venkataraweu, B.V., Roopa R. Effect of poly herbal formulation on rat mesenteric mast cell degranulation. *Indian J of Pharmacology*. **32**: 7-10 (2000).
8. Sharma, O.D., Clinical and experimental studies on bronchial asthma (Tamakashvase) with special reference to its management with *Albizzia lebeck* benth (Shireesha), *D. Ay. AM. Thesis, Banaras Hindi University, Varanasi, Indian*. (1976).
9. Singh Vandava, Singh A.K. and Saxena R.C. Isolation of flavonoid from rural based ethnomedicinal plant *Tephrosia purpurea* of family Leguminosae. *J of Rerul Technology*. In press (2008).
10. Tripathi, R.M. and Das, P.K., Studies on antiasthmatic and anti anaphylactic activity of *Albizzia libbek*. *Indian J of Pharmacology*, **9**: 189-194 (1977).