

SOME IMPORTANT MEDICINAL PLANTS USED IN THE TREATMENT OF ASTHMA - A REVIEW.

Sheela Kumar, V. K. Agnihotri, Sunita Thakur, Anita Verma¹, R. C. Saxena and Kapil K. Soni*

Pest Control and Ayurvedic Drug Research Laboratory,
Dept. of Zoology, S.S.L. Jain P.G. College, Vidisha (M.P.) 464001

*Email - kapilsoni14@gmail.com

And

Govt. Model Science P.G. College Pachpedi, Jabalpur (M.P.)

Abstract

Ayurveda, Siddha, Unani and Folk (Tribal) medicines are the major systems of indigenous medicines. Over three-quarters of the world population relies mainly on plants and plant extracts for health care. Unlike many diseases, which can be attributed to the life style of modern man, asthma is an ancient illness. Mast cells play an important role in some type of allergic reaction because the antibody that causes the allergic reaction that is Ig E have the mast cells which contains about a thousand tiny granules. These granules are loaded with dozens of potent chemicals or mediators, the most powerful in which are histamine and a newly discovered group called leukotrienes. From the present laboratory, there are number of medicinal plants have been reported for antihistaminic/anti-asthmatic activities. Some of them are *Achyranthes aspera*, *Tephrosia purpurea*, *Dolichos lablab*, *Eclipta alba*, *Jasminum sambac*, *Balanites aegyptiaca*, *Viscum album*, *Tridax procumbens*, *Glycyrrhiza glabra* and *Cassia fistula*. Recently, Soni (2009-2011) has reported 100% inhibition of Leukotrienes (which cause asthma) from the EtoAC fraction of *Bacopa monnieri* extract. It is suggested that formulation and patent of the reported medicinal plants is mandatory for further use against asthma and if possible, clinical trials should be done of these plants for their appropriate use.

Key words: Medicinal plants, Asthma, Mast cells, Antihistaminic, Leukotrienes.

1. Introduction

Herbs are staging a comeback and herbal 'renaissance' is happening all over the globe. The herbal products today symbolize safety in contrast to the synthetics that are regarded as unsafe to human and environment. Although herbs had been prized for their medicinal, flavouring and aromatic qualities for centuries, the synthetic products of the modern age surpassed their importance, for a while. However, the blind dependence on synthetics is over and people are returning to the naturals with hope of safety and security. Over three-quarters of the world population relies mainly on plants and plant extracts for health care. More than 30% of the entire plant species, at one time or other was used for medicinal purposes. It has been estimated that in developed countries such as United States, plant drugs constitute as much as 25% of the total drugs, while in fast developing countries such as China and India, the contribution is as much as 80%. Thus, the economic importance of medicinal plants is much more to countries such as India than to rest of the world. These countries provide two third of the plants used in modern system of medicine and the health care system of rural population depend on indigenous systems of medicine. Ayurveda, Siddha, Unani and Folk (tribal) medicines are the major systems of indigenous medicines. Among these systems, Ayurveda is most developed and widely practiced in India (Joy *et al.* 1998).

Unlike many diseases, which can be attributed to the life style of modern man, asthma is an ancient illness. The term asthma actually comes from the Greek term *Panos* which means to pant or to breathe with an open mouth. Asthma is disease of the larger and medium sized airways of the lungs and there is obstruction to outflow of air from the lungs. Since, enough air does not reach the lungs for the exchange of gases, there is hurried breathing to compensate it. Cough is a frequent symptom in asthmatics. This occurs in order to throw out the excessive secretions produced in the lungs. This is particularly so in those who have respiratory infection as well. cough gets relieved by the same measures as breathlessness. Bronchial asthma, commonly called asthma, consists of breathlessness and wheezing. When the patient is not in an attack, he feels normal. When an asthma patient comes in contact with an allergic substance, it behaves as an antigen and reacts with the corresponding antibodies already present in his bodies. The Histamine and other substances liberated during the allergic reactions cause the following changes in the bronchi:

1. Bronchi muscles are constricted to the extent of lessening of the diameter (Calibre) of the bronchi.
2. Mucous membrane of the bronchi gets swollen, which further restricts the lumen of the bronchi.

3. Secretions are poured out from the swollen mucous lining into the constricted lumen of the bronchi.
4. When the bronchi are constricted and they are full of secretions, the patient has difficulty in breathing and his breath has a wheezing sound in it which is more on breathing out because then the bronchi get narrower.

Mast cells play an important role in some type of allergic reaction because the antibody that causes the allergic reaction that is IgE have the mast cells and basophils. Hannaway (1996) stated that the mast cell is a loaded gun which contains about a thousand tiny granules. These granules are loaded with dozens of potent chemicals or mediators, the most powerful of which are histamine and a newly discovered group called leukotrienes. Recently, Soni (2009-2011) has completed post doctoral research work from the University of Illinois at Chicago on such newly discovered group of leukotrienes and have noticed 100% inhibition of Leukotrienes from the ethyl acetate extract of *Bacopa monnieri*.

From the present laboratory, a large number of medicinal plants have been investigated for anti-asthmatic, anti-histaminic, smooth muscle relaxant and mast cell de-granulation or stabilizing activities by various workers including Saxena and Khare (1999); Saxena (2003); Soni *et al.* (2004); Rashmi (2004); Soni *et al.* (2006); Soni (2007); Sharma *et al.* (2008); Lone (2010); Urmaliya *et al.* (2011) and Agnihotri *et al.* (2011). Hence in the present study, it was proposed to prepare the review based information of only those herbs which have already been investigated as Ayurvedic drugs used for the treatment of asthma at Pest Control and Ayurvedic Drug Res. Lab., S. S. L. Jain P.G. College, Vidisha (M.P.). Moreover, these herbs can be used as medicine after toxicity testing, formulation and clinical trials.

2. Experimental Bioassay

Phytochemistry of plant materials

From the present laboratory, Saxena, Khare and Soni (2001-2004) have started studies on phytochemistry and formulation of anti-asthmatic herbal medicines under the project Z-15/93 of MPCST, Bhopal (M.P.) and have selected three ethnomedicinal plants viz. *Tephrosia purpurea* *Eclipta alba* and *Achyranthes aspera* for their anti-asthmatic activities.

The plant materials were collected from local surrounding of Vidisha City and were kept in the laboratory for shed drying. The dried plant material of each plant was loaded separately in the Soxhlet apparatus along with solvent of increasing order of polarity for extraction of plant extract. All the extracts were evaporated to get semisolid crude by using vacuum evaporator. The column and thin layer chromatography of the extract were done for the isolation of purified active fractions. Obtained active fractions were sent to the SAIF, IIT, Madras for spectral analysis viz. IR, UV, CNMR, HNMR and Mass spectroscopy. On the basis of spectral analysis, active principles were elucidated of the compounds present in the active fractions.

Histopathology for observations of mast cells

For this investigation, Wister albino rats of both the sexes were housed in standard conditions viz. temp. $22\pm 2^{\circ}\text{C}$, relative humidity $60\pm 5\%$, 12 hrs light & 12 hrs dark cycles, fed with pellet (standard diet of Lipton India Ltd., Pune) and water *ad libitum* which were sensitized by horse serum and triple antigen (0.5 ml each) intra peritoneal injection on day 0, 7 and 14 for the induction of asthma. Sensitized rats were divided into 6 groups (8 animals in each group). Group I was served as control. Rats of group II, III IV & V were used for herbal administration. Rats of group VI received 10 mg/kg bw. prednisolone as standard or reference drug. The sensitized groups were challenged with 5% horse serum for 10 minutes 1 hr prior to treatment. Rats were treated with herbal extract at 50, 100, 250, 500 mg/kg body weight orally with Acacia gum. On day 14th 2 hrs after the treatment all rats were sacrificed and the intestine, mesenteries and trachea were taken out for the study of mast cells. Mesenteries and intestinal pieces of sacrificed rats were kept in Ringer Locke Solution at 37°C . Histopathology of all tissues was done by using the procedure of microtome section cutting and staining. During this investigation, mast cells were stained with Hemotoxylene, Eosine and Toluidine blue and counted microscopically. Observed mast cells were found to take dark purple color. Blue color indicated the presence of metachromasia in mast cells. Secretion of histamine around mast cells was also seen during the study. Histamine secretion was inhibited by applying herbal extract. This study was done by Saxena and Khare (1999).

Tracheal Chain Preparation for pharmacology of herbal extracts.

The herbal extract isolated and purified from *Tephrosia purpurea* and *Eclipta alba* along with one extra plant *Achyranthes aspera* have been tested for its detail pharmacological properties on sensitized guinea pigs. This study was conducted at MGM Medical College, Indore under the expertise of Dr. B.K. Jain, Prof. & Head, Dept. of Pharmacology. The effects of all the three herbal extracts were manifested orally mixing with the diet as well as by injecting intravenously in to the experimental animals. Both in vivo and in vitro experiments were performed on tracheal chain preparation apparatus attached with Kymograph drum to observe smooth muscles relaxant activities of herbal extract. For the isolation of trachea method of Castillo and De Beer (1946-47) was followed and isolated tracheal rings were kept in Krebs solution. This work was done by Choudhary and Soni (2003-2004).

3. Discussion

Recently, Agnihotri *et al.* (2011) have reported chemical constituents of *Tephrosia purpurea* of Family Leguminosae and a triterpenoidal saponin was isolated. Its F2 fraction showed 84 % mast cell stabilizing activity. Agnihotri (2012) have isolated saponins and sapogenins from a medicinal plant *Cassia fistula* of Leguminosae which was found to be effective against asthma and its Cf-3 active fraction at 150 mg/kg body weight with Acacia gum showed 78.35±1.29% intact mast cells and 21.65±1.34 % disrupted mast cells during mast cells de-granulation process. Patel *et al.* (2005) have reported pharmacological and ethnomedicinal studies of *Tridex procumbens* Linn. for anti-asthmatic activities and isolated a compound Trihydroxy-6, 3 dimethoxy flavones 5-0- α -1-rhamnopyranoside. Patel *et al.* (2009) have also evaluated anti-asthmatic activity of *Glycyrrhiza glabra*. Recently, Urmaliya *et al.* (2011) isolated saponin from *Tridex procumbens* of family Asteraceae which was also found effective against asthma. Its alcoholic extract was showed 67 % inhibition of histamine released from mast cells. Soni *et al.* (2006) have reported smooth muscle relaxant activity of herbal drugs from *Dolichos lablab* and 67% inhibition of spasm in smooth muscles were observed of its alcoholic fraction at 100 mg/kg body weight. Soni (2007) has reported antihistaminic and spasmolytic effect of certain herbal extracts on guinea pigs and reported four plants for their antihistaminic properties viz. *Balanites aegyptiaca*, *Eclipta alba*, *Viscum album* and *Jasminum sambac*.

4. Acknowledgements

Authors are highly acknowledged with thanks to The Director General, MPCST for sanctioning the grant under the MRP Project Z-15/93. Soni is acknowledged to Govt. of M.P., Dept. of Backward Classes and Minority Welfare for Overseas Fellowship Award of 1 ½ Yrs.

5. References

- [1] Agnihotri V. K. (2012). Isolation and structural elucidation of saponins from a medicinal plant of Leguminosae and evaluation of their antiasthmatic activity. Thesis for Ph. D. in Chemistry. Barkatullah University, Bhopal (M.P.).
- [2] Agnihotri V.K., Sharma S.P., Agnihotri N. and R. C. Saxena. Chemical constituents of *Tephrosia purpurea*, Family: Leguminosae. *Intern. J. Chem. Sci.* 2011, 9 (3), 1045-1052.
- [3] Castillo J.C. and De Beer (1947). A method for tracheal chain preparation. *J. Pharmacology Exp.* 90: 104-109.
- [4] Choudhary Rashmi (2004). Studies on antihistaminic activities of certain medicinal plants on albino rats. Thesis for Ph. D. in Zoology. Barkatullah University Bhopal (M.P.). 1-140.
- [5] Choudhary R. and Kapil K. Soni (2003-2004). Studies on phytochemistry and formulation of anti-asthmatic herbal medicine. 2nd Year Technical Report, MPCST Project No. Z-15/93. Pp. 1-110.
- [6] Hannaway Paul J. (1996). The asthma self help book. Orient paper backs. Delhi. Pp. 235.
- [7] Joy P.P., Thomas J., Samuel Mathew and Baby P. Skaria (1998). Medicinal plants. Kerala Agricultural University. Aromatic and Medicinal Plants Research Station. Pp. 1-211.
- [8] Lone M. A. (2010). Screening of ethnomedicinal plants from Kupwara district of Kashmir valley for their antihistaminic activities. Thesis for Ph.D. in Zoology, Barkatullah University, Bhopal. Pp. 1-104.
- [9] Patel S., Saxena N., Saxena R.C., Arya N., Saxena R. and M. Tharani (2009). Evaluation of anti-asthmatic activity of *Glycyrrhiza glabra*. *Biosciences, Biotechnology Research Asia.* 6 (2): 761-766.
- [10] Patel S., Tenguria R.K. and P. K. Mishra (2005). Pharmacological and ethnomedicinal studies of *Tridex procumbens* Linn. (Family: Compositae) for anti-asthmatic activities. *Environmental Conservation Journal* 6 (1): 27-31.
- [11] Saxena R. C. (2003). Antihistaminic activity of the Saponin isolated from *Achyranthes aspera* Linn. Presented paper published in the proceeding of 3rd World Congress on Medicinal & Aromatic Plant (WOCMAP), 3-7 Feb., Chiang Mai University, Thailand. Pp. 137.
- [12] Saxena R. C. and M. L. Khare (1999). Screening of herbal medicine from *Tephrosia purpuria*. *J. of National Integrated Medical Association*, 41 (4): 7-9.
- [13] Sharma S, Soni Kapil K and RC Saxena (2008). Pharmacology of an Ayurvedic Indian medicinal plant for mast cell degranulation activity. *Biomedical & Pharmacology Journal* 1 (2): 429-32.
- [14] Soni Kapil K, Khare ML and RC Saxena (2004). Spasmolytic activity of a herbal drug isolated from *Tephrosia purpurea* in guinea pigs. *Journal of Ancient Science of Life* 23 (4):1-6. Cited in British Library.
- [15] Soni Kapil K, Uikey J & RC Saxena (2006). Smooth muscles relaxant activity of herbal drug isolated from *Dolichos lablab*. *Research Hunt* 1(1):60-4.
- [16] Soni Kapil K. (2007). Antihistaminic and spasmolytic effect of certain herbal extracts on guinea pigs. Thesis for Ph. D. in Zoology. Barkatullah University, Bhopal (M.P.). Pp. 1-136.
- [17] Soni Kapil K. (2009-2011). In Vitro and In Vivo Study of Traditional Herbal Medicine for Asthma. Post Doctoral Research, University of Illinois at Chicago, IL 60612, USA.
- [18] Soni Kapil K., Khare M.L. and R.C. Saxena (2001-2004). Studies on phytochemistry and formulation of anti-asthmatic herbal medicine. Final Technical Report, MPCST Project No. Z-15/93. Pp. 1-119.
- [19] Urmaliya S., Bharti M.D., Jain V., Agnihotri V.K., Saxena R.C., Baghel U. S. and R. Saxena (2011). Isolation of saponin from *Tridex procumbens* (Asteraceae). *Intern. J. Chem. Sci.* 9 (3), 1281-1284.