Contents lists available at ScienceDirect

Asian Pacific Journal of Tropical Medicine

journal homepage:www.elsevier.com/locate/apjtm

Document heading doi:

Mast cell stabilizing and antiallergic activity of *Abrus precatorius* in the management of asthma

DJ Taur[1*], RY Patil[2]

[1]*Department of Pharmacognosy, S.V.P.M's College of Pharmacy, Malegaon (bk), Baramati-413115, Maharashtra, India*
[2]*Department of Pharmacognosy, PDEA's S.U. College of Pharmaceutical Sciences and Research Center, Kharadi, Pune-411014, Maharashtra, India*

ARTICLE INFO

Article history:
Received 2 September 2010
Received in revised form 27 October 2010
Accepted 15 December 2010
Available online 20 January 2010

Keywords:
Abrus precatorius
Asthma
Mast cell
Allergy

ABSTRACT

Objective: To investigate effects of ethanol extract of *Abrus precatorius* leaves (EAPL) on egg albumin induced mast cell degranulation in mice and passive cutaneous anaphylaxis in rats. **Methods:** In present study ethanol extract of *Abrus precatorius* leaves (EAPL) at doses of 100, 125, 150 mg/kg i.p were evaluated for preliminary phytochemical screening, acute toxicity studies and egg albumin induced mast cell degranulation in mice and passive cutaneous anaphylaxis in rats. **Results:** The results of present investigation showed that the LD_{50} of EAPL is more than 1 300 mg/kg. EAPL (100-150 mg/kg, i.p.) significantly protect egg albumin induced degranulation of mast cell and inhibit area of leakage of dye in passive cutaneous anaphylaxis. Phytochemical studies observed presence of saponin, alkaloids, flavonoids, and glycosides. **Conclusions:** In conclusion EAPL possesses anti asthmatic potential.

1. Introduction

Asthma is a common disease and its prevalence rising worldwide, with the highest prevalence in industrialized countries. Asthma affect about 300 million people worldwide and it has been estimated that a further 100 million will be affected by 2025[1,2]. Asthma is a complex inflammatory disease cause's airway narrowing and associated with change in the levels of mast cells, lymphocytes, cytokines and other inflammatory cell products. *Abrus precatorius* Linn (Fabacease) (*A. precatorius*) is climbing shrubs; leaves are pinnate with many pairs of leaflets. Leaves 5-10 cm long, leaflets 10-20 pairs, opposite, flowers are pink clustered. The leaves and roots are sweetish and traditionally used to cure fever, stomatitis, asthma and bronchititis[3]. The roots, stems, and leaves also contain glycyrrhizin[4]. It possesses different pharmacological activities antimicrobial[5,6], antifertility[7], anti-implantationp[8], antibacterial activity[9], anti-tumor[10], immunopotentiating[11], sperm antimotility[12] and antidiarrhoeal[13]. Lectins derived from abrus shows immunostimulant activity[14]. Two triterpenoid saponins isolated from the aerial parts of *A. precatorius* exhibited anti-inflammatory activity[15]. The steroidal fraction of seeds of *A. precatorius* causes decrease in production and release of testosterone in testis of rats[16]. Abruquinone A, an isoflavanquinone isolated from *A. precatorius* significantly reduces the bradykinin- and substance P-induced plasma extravasations in normal as well as in compound 48/80-pretreated mice[17]. Three new triterpenoids (20S, 22S)-3-β, 22-dihydroxycucurbita-5(10),24-diene-26,29-dioic acid δ-lactone, 3-O-[6′-methyl-β-D-glucuronopyranosyl]-3β, 22β-dihydroxyolean-12-en-29-oic acid methyl ester and 3-O-β-D-glucuronopyranosylsophoradiol methyl ester isolated from methanol extract of leaves[18]. A new biologically active flavonol glycoside 7,3′,5′-trimethoxy-4′-hydroxy flavone-3-O-β-D-galactosyl-(1→4)-alpha-L-xyloside isolated from chloroform soluble fraction of methanol extract of the seeds of *A. precatorius*[19]. The seed proteins are rich in most of the essential amino acids, and they are deficient only in cystine and threonine[20]. A four abrusoside A-D novel sweet-tasting triterpene glycosides isolated n-butanol soluble extract from the leaves of *A. precatorius*[21]. In present study effect of ethanol extract of *A. precatorius* leaves (EAPL) was studied on egg albumin induced mast cell degranulation in mice and passive

*Corresponding author: Mr. Dnyaneshwar J. Taur, Department of Pharmacognosy, S.V.P.M's College of Pharmacy, Malegaon (Bk), Tal. Baramati, Dist. Pune, India.
Tel: +91-09960464957
E-mail: dnyaneshtaur@gmail.com

cutaneous anaphylaxis in rats.

2. Materials and methods

2.1. Plant material

Leaves of *A. precatorius* were collected in December 2008, from Baramati localities, (Maharashtra, India), and plant was authenticated by Prof. R. B. Deshmukh, Dept. of Botany, Shardabai Pawar Mahila Mahavidyalaya, Baramati, (plant specimen number PASR 114).

2.2. Extraction

Dried and coarsely powder of *A. precatorius* leaves (500 g) extracted successively with ethanol (95 %) in soxhlet extractor. Solvent was evaporated in rotary evaporator dryness under reduced pressure to produce ethanol extract of *A. precatorius* leaves (EAPL) 10.26 % ethanol extract.

2.3. Animals

Swiss albino mice of either sex weighing 25-30 g and rats weighing 150-170 g were housed under standard laboratory conditions. The animals had free access to food and water. The animal ethical committee of the institute approved all the protocols of the study (Registration No.1214/ac/08/CPCSEA).

2.4. Drugs and chemicals

Egg albumin, aluminium hydroxide and evan blue were purchased from (Himedia, India), disodium chromoglycate and dexamethasone.

2.5. Preliminary phytochemical screening

The EAPL was subjected to preliminary phytochemical analysis using described methods[22,23].

2.6. Acute toxicity studies

In acute toxicity study of EAPL, mice of either sex were divided into seven groups (n=6) and fasted for 18 h with water *ad libitum*. EAPL administered at six different doses of 800, 900, 1000, 1100, 1200 and 1300 (mg/kg, i.p). Control group was given the vehicle only (Tween-80, 1%) solution. The animals were observed for 72 h, and the LD_{50} was calculated[24,25].

2.7. Passive cutaneous anaphylaxis test

The homologous antiserum used was prepared according to method described by Gautam *et al*. [26]. Briefly, albino rats were sensitized by subcutaneous injection of 100 mg egg albumin and 12 mg aluminium hydroxide, as adjuvant, on day 1, 3 and 5. On day 10, animals were bled and antiserum was collected. The separated antiserum was stored at -20 ℃. The rats were divided in to five groups (n=5). The rat homologous antiserum (100 μL) was injected into the shaved back skin of rats. After 24 h, group-I control received 5 mL/kg Tween-80 1%, groups II-IV received EAPL (100-150 mg/kg i.p.) and group-V, received disodium chromoglycate (50 mg/kg i.p.). The entire groups were injected with 0.5 mL of mixed solution of 0.5% Evan Blue, and 1% egg albumin (1:1) through tail vein 30 minutes after treatment. The area of blue dye leakage was determined and expressed as the longest and shortest diameter of blue spots in mm^2[26].

2.8. Mast cell degranulations

Mice were divided into five groups (n=6). A three days treatment schedule was followed. Group-I received vehicle Tween-80 1%, (5 mL/kg, i.p.). Group-II-IV were treated with EAPL (100-150 mg/kg i.p.), and group-V received standard drug disodium chromoglycate (50 mg/kg. i.p.). On day 4, each animal was injected with 10 mL/kg, 0.9% saline solution, into peritoneal cavity, by gentle massage, peritoneal fluid was collected after five minute and transferred in to test tube containing 7-10 mL RPMI 1640 buffer medium (pH 7.2-7.4). This solution was then centrifuged at 400-500 rpm. Pellets of mast cells were washed with same buffer medium twice by centrifugation, discarding supernatant. The cell suspension from all the groups of rats were challenged with egg albumin (100 μg/mL) and incubated at 37 ℃ for 10 minute the cell suspension was stained with 1% toludine blue and observed under microscope. Total 100 cells were counted from different visual areas. Percent protection against degranulations was calculated[27].

2.9. Statistical analysis

The results were reported as mean ± SEM and analyzed for statistical significance using one way ANOVA followed by student Newman-Keuls test P<0.05 was considered significant.

3. Results

3.1. Preliminary phytochemical screening

Preliminary phytochemical investigation of EAPL observed the presence of steroids, saponin, alkaloids, flavonoids, and glycosides.

3.2. Acute toxicity studies

The LD_{50} value of EAPL when given intraperitoneally and tested in albino mice was found to be more than 1 300 mg/kg body weight.

3.3. Passive cutaneous anaphylaxis test

EAPL (100–150 mg/kg i.p.) showed significantly (P<0.001) reduction in the area of dye leakage in dose dependently when compared with control group as shown in Figure 1. EAPL at dose 150 mg/kg showed (16.60±1.08) reduction of area of dye leakage was comparable to standard drug disodium chromoglycate.

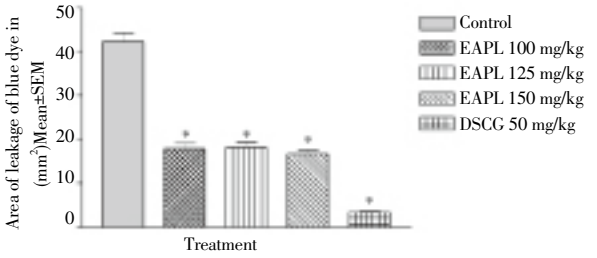

Figure 1. Effect of EAPL on passive cutaneous anaphylaxis in rats. Values are mean ± SEM, P< 0.001when compare with control.

3.4. Mast cell degranulations

The control group showed (74.000 ± 1.932) degranulation of mast cell while groups treated with EAPL (100–150 mg/kg, i.p.) and disodium chromoglycate significantly (P<0.001) protect degranulation of mast cells. EAPL at dose (150 mg/kg) showed (28.000±0.860) and disodium chromoglycate (22.500± 1.118) protection against degranulation as shown in Figure 2.

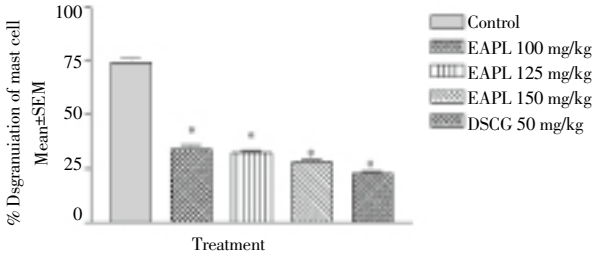

Figure 2. Effect of EAPL on egg albumin induced degranulation of mast cell in rats.
Values are mean ± SEM, P< 0.001when compare with control.

4. Discussion

Phytochemical screening of EAPL showed the presence of saponin, flavonoids, alkaloids and glycosides. Saponin are reported to possesses mast cell stabilizing, antiallergic and antihistaminic activities[28–30]. Glycosides isolated from various plants reported to have antiasthmatic activity through several mechanisms i.e spasmolytic activity by relaxation of tracheal smooth muscle[31], and antiallergic activity[32]. Several flavonoids have been shown to possess smooth muscle relaxant and bronchodilator activity[33]. The flavonoids including apigenin and luteolin were known to inhibit basophil histamine release and neutrophil betaglucuronidase release, and thereby possess *in vivo* antiallergic activity[34–36]. These flavonoids also inhibited the histamine release induced by 48/80[37]. The anaphylactic allergic reaction is a life-threatening induces release of mediators such as histamine and pro-inflammatory cytokines and can be elicited by various stimuli. EAPL at doses (100–150 mg/kg) significantly inhibit egg abumin induced leakage of dye from dorsal skin of rat when compare to control group. Control group showed (42.400 ± 1.806) mm² area of dye leakage while EAPL at dose 150 mg/kg reduces area of dye leakage (16.600± 1.080) mm^2. Hence EAPL shows antihistaminic and anti-inflammatory mechanism by inhibiting egg albumin induced leakage of dye. The degranulation of mast cell occurs in response to the immunological stimuli in which antigen antibody reactions are predominant. EAPL at doses (100–150 mg/kg) significantly protect egg albumin induced degranulation of mast cell in a dose dependent manner. EAPL at 150 mg/kg protect mast cell comparable to disodium chromoglycate. Hence antiasthmatic activity of EAPL may be due to presence of flavonoids and saponin. In conclusion EAPL are effective in treatment of asthma as it shows antiallegic and mast cell stabilizing potential.

Acknowledgement

The authors are thankful to the Management and Principal of S.V.P.M's College of Pharmacy, Malegaon (Bk), Baramati for providing necessary facilities and also to the Prof. R. B. Deshmukh, Dept. of Botany, Shardabai Pawar Mahila Mahavidyalaya, Shardanagar for the authentication of the plant.

Conflict of interest statement

We declare that we have no conflict of interest.

References

[1] Masoli M, Fabian D, Holt S, Beasley R. The global burden of asthma: executive summary of the GINA Dissemination Committee report. *Allergy* 2004; **59**: 469–8.

[2] Bousquet J, Bousquet PJ, Godard P, Daures JP. The public health implications of asthma. *Bull World Health Organ* 2005; **83**: 548–4.

[3] Kirtikar KR, Basu BD. *Indian medicinal plants*. 2nd ed. Dehradun: International book distributor; 1987, p. 763–7.

[4] Windholz M. *The Merck Index: an encyclopedia of chemicals, drugs, and biologicals*. 10th ed. Rahway: Merck and Co., Inc.;1983.

[5] Adelowotan O, Aibinu I, Adenipekun E, Odugbemi T. The *in vitro* antimicrobial activity of *Abrus precatorius* (L) fabaceae extract on some clinical pathogens. *Niger Postgrand Med J* 2008; **15**(1): 32–7.

[6] Bobbarala V, Vadlapudi V. Abrus precatorius L. seed extracts antimicrobial properties against clinically important bacteria. *Int J PharmTech Res* 2009; **1**(4): 1115-8.

[7] Ross IA. *Medicinal plants of the world: chemical constituents, traditional and modern medicinal uses*. New Jersey: Humana Press Inc.; 2005; p. 15-31.

[8] Okoko II, Osinubi AA, Olabiyi OO, Kusemijiu TO, Noronha CC, Okanlawon AO. Anti-ovulatory and anti-implantation potential of the methanolic extract of seeds of *Abrus precatorius* in the rat. *Endocr Pract* 2010; **11**: 1-21.

[9] Zore GB, Award V, Thakre AD, Halad UK, Meshram NS, Surwase BS, et al. Activity-directed-fractionation and isolation of four antibacterial compounds from *Abrus precatorius* L roots. *Nat Prod Res* 2007; **21**(9): 838-5.

[10]Ghosh D, Maiti TK. Immunomodulatory and anti-tumor activities of native and heat denatured *Abrus agglutinin*. *Immunobiology* 2007; **212**(7): 589-9.

[11]Ramnath V, Kuttan G, Kuttan R. Immunopotentiating activity of abrin, a lectin from *Abrus precatorius* Linn. *Indian J Exp Biol* 2002; **40**(8): 910-3.

[12]Ratnasooriya WD, Amarasekera AS, Perera NS, Premakumara GA. Sperm antimotility properties of a seed extract of *Abrus precatorius*. *J Ethnopharmacol* 1991; **33**(1-2): 85-90.

[13]Nwodo OF, Alumanah EO. Studies on *Abrus precatorius* seeds. II: antidiarrhoeal activity. *J Ethnopharmaco* 1991; **31**(3): 395-8.

[14]Bhutia SK, Mallick SK, Maiti TK. *In vitro* immunostimulatory properties of *Abrus lectins* derived peptides in tumor bearing mice. *Phytomedicine* 2009; **16**(8): 776-82.

[15]Anam EM. Anti-inflammatory activity of compounds isolated from the aerial parts of *Abrus precatorius* (Fabaceae). *Phytomedicine* 2001; **8**(1): 24-7.

[16]Sinha S, Mathur RS. Effect of steroidal fraction of seeds of *Abrus precatorius* Linn. on rat testis. *Indian J Exp Biol* 1990; **28**(8): 752-6.

[17]Wang JP, Hsu MF, Chang LC, Kuo JS, Kuo SC. Inhibition of plasma extravasation by abruquinone A, a natural isoflavanquinone isolated from Abrus precatorius. *Eur J Pharmacol* 1995; **273**(1-2): 73-1.

[18]Kim NC, Kim DS, Kinghom AD. New triterpenoids from the leaves of *Abrus precatorius*. *Nat Prod Lett* 2002; **16**(4): 261-6.

[19]Yadava RN, Reddy VM. A new biologically active flavonol glycoside from the seeds of *Abrus precatorius* Linn. *J Asian Nat Prod Res* 2002; **4**(2): 103-7.

[20]Rajaram N, Janardhan K. The chemical composition and nutritional potential of the tribal pulse, *Abrus precatorius* L. *Plant Foods Hum Nutr* 1992; **42**(4): 285-90.

[21]Choi YH, Hussain RA, Pezzuto JM, Kinghom AD, Morton JF. Abrusosides A-D, four novel sweet-tasting triterpene glycosides from the leaves of Abrus precatorius. *J Nat Prod* 1989; **52**(5): 1118-7.

[22]Evans WC. *Trease and evans' pharmaconosy*. 15th ed. London: W.B. Sounders Company Ltd,; 2005,p.224, 230, 336, 541-5.

[23]Khandelwal KR. *Practical pharmacognosy technique and experiments*. 13th ed. Pune: Nirali Prakashan; 2005,p. 146-59.

[24]Turner RA. *Screening methods in pharmacology*. New York: Academic Press; 1971.

[25]Harish MS, Nagur M, Badami S. Antihistaminic and mast cell stabilizing activity of *Striga orobanchioide*. *J Ethnopharmacol* 2001; **76**: 197-200.

[26]Gautam AM, Ali AA, Gupta PP, Kar K. 7 Methoxy vsicinone (compound 73/602): a potentially orally active antiallergic agent. *Indian J Allegy Appl Immunol* 1989; **3**: 13-9.

[27]Okpo SO, Adeyemi OO. The anti-allergic effects of *Crinum glaucum* aqueous extract. *Phytomedicine* 2002; **9**: 438-41.

[28]John RK, Zutshi U, Kameshwaran L. Effect of quercitin and *Albizzia saponins* on rat mast cell. *Indian J Physiol Pharmacol* 1985; **29**(1): 43-6.

[29]Gupta SS, Tripathi RM. Effect of chronic treatment of the saponin of *Clerodendron serratum* on disruption of the mesenteric mast cells of rats. *Asp Allergy Appl Immunol* 1973; **4**: 177-88.

[30]Gupta SS, Paresh RM, Ram AK. Development of antiallergic and antihistaminic activity in relation to histamine releasing effects of a plant saponin from *Clerodendron serratum*. *Asp Allergy Appl Immunol* 1968; **2**: 133-2.

[31]Gupta SS, Gupta MK, Effect of *Solanum xanthocarpum* and *Clerodendron serratum* on histamine release from tissues. *Indian J Med Sci* 1967; **21**: 795-9.

[32]Park KH, Park J, Koh D, Lim Y. Effect of saikosaponin-A, a triterpenoid glycoside, isolated from Bupleurum falcatum on experimental allergic asthma. *Phytotherapy Res* 2002; **16**(4): 359-63.

[33]Hazekamp A, Verpoorte R, Panthong A. Isolation of bronchodilator flavonoid from the Thia medicinal plant *Clerodendrum petasites*. *J Ethnopharmacol* 2001; **78**: 45-9.

[34]Havsteen B. Flavonoids: a class of natural products of high pharmacological potency. *Biochem Pharmacol* 1983; **32**: 1141-8.

[35]Pathak D, Pathak K, Singla AK, Flavonoids as medicinal agents-recent advances. *Fitoterapia* 1991; **62**: 371-89.

[36]Cheong H, Ryu SY, Oak MH, Cheori SH, Yoo GS, Kim KM. Studies of structure activity relationship of flavonoids for the antiallergic actions. *Arch Pharmacol Res* 1998; **21**: 478-80.

[37]Bellanti JA. Mechanism of tissue injury produced by immunologic reactions. In: *Immunology*. Asian ed. Tokyo: W.B. Saunders Co.; 1971,p. 184.