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Research Article

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COX2 Inhibitory Activity of Abutilon Indicum

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ABSTRACT

Objective : The present study aimed to analyse the COX2 inhibitory activity of Abutilon indicum. Background : Prostaglandins are among the major mediators of the body's response to pain and inflammation, and are constituted of essential fatty acids existing in cell membranes. This reaction was catalysed by cyclooxygenase, a membrane associated enzyme in two isoforms- COX-1 and COX-2. Abutilon indicum, commonly known as the Indian mallow, is famous for its therapeutic values, and further study of its COX-2 inhibitory activity is beneficial. Conclusion : Medicinal plants and shrubs which have little or no side effects have to be further investigated. Further study on its COX-2 inhibition will also increase its therapeutic value as an anti-inflammatory with added benefits.

Key words: *Ethnomedicinal, Anti-Arthritic, COX2 Inhibition, Medicinal Uses, Prostaglandin.*

INTRODUCTION

Prostaglandins (PGs) which are used in various physiological and pathological processes, are hormone-like bioactive materials that moderate autocrine and paracrine signalling over the short distances. High-affinity G protein-coupled receptors are needed for their performance which include : four EP receptors for PGE2 termed EP1-EP4, IP receptor for prostacyclin, DP receptor for PGD2, FP receptor for PGF2α. These receptors are connected to distinct signal transduction pathways [1]. Additionally, peroxisome proliferator-activated receptors (PPAR) have been recognized as new intracellular PG receptors [2]. Both in the parent cells and closely neighbouring cells, a prostanoid after being formed, comes out of the cell and interacts with G protein-coupled receptors to change the second messenger levels [3]. Prostanoids get involved in a lot of physiological and pathophysiological responses despite the dependence of their tissues on the cellular enzymatic material [4]. Although NSAIDs have been widely used over the last century, there was not a full understanding of the mechanism of their action until 1971 when their molecular target and the COX enzyme were recognized by Vane. In the early 1990s, a second isoform (COX-2) which was different from the first one, was discovered, renamed as COX-1. COX-1 and COX-2 are isoenzymes [5].
Abutilon indicum (Linn.) Sweet (Malvaceae) is a shrub found in India, Sri Lanka, topical areas of America and Malaysia [6]. In Sanskrit, it is called Atibala. It grows like weeds and is found abundantly in wastelands and seashores.
Various tribal communities and forest dwellers have extensively used different parts of the plant including leaves, roots, seeds and seed oil for curing several ailments [7].
Since the ancient times, the leaves of A. indicum have been used for the treatment of piles and toothache. The extract of A. indicum leaves has been applied in catarrhal bilious diarrhoea, bronchitis, gonorrhoea, fevers and bladder inflammation [8]. The extract has been prescribed as a mouthwash in different cases of tender gums and

toothache. Bark of A. indicum is used in strangury and urinary complaints and is valued as a diuretic. Seeds are used as tonic [9].

A recent study declared that the aqueous alcoholic extract of A. indicum aerial parts is favourable in dentistry because of containing promising antibacterial substances which act against E. faecalis. E. faecalis that cause root canal failure during endodontic treatment [10].

Thus, the plant's COX2 inhibitory activity can be studied and further used for added benefits, as medicinal plants have lesser side effects than other allopathy medicines.

MATERIALS AND METHODS

Plant materials :

Abutilon indicum extract used in the study was obtained from Green Chem Herbal extracts and formulations, Bengaluru, India.

Chemicals used :

DMEM, FBS, and pioglitazone were obtained from Sigma Aldrich.co.India. All the other chemicals used in the study were up to analytical grade.

Assay for Screening of Cyclooxygenase (COX) Inhibition

$PGF_{2\alpha}$ is directly measured by the COX Inhibitor Screening Assay through reducing stannous chloride of COX-derived PGH_2 produced in the COX reaction. The reaction buffer, haem, enzyme and plant extract pre-incubated at 37 ˚C for twenty minutes are included in the reaction system with background and enzyme controls. The reaction was started by adding arachidonic acid, then incubated for two minutes at 37 °C. The saturated stannous chloride solution was added to stop the reaction, then it was kept at room temperature for five minutes. EIA was used to measure the prostaglandins. An aliquot of these reactions was added to the pre - coated plates in triplicates along with AChE tracer and antiserum, and incubated for 18hours at room temperature on an orbital shaker. Finally, the plate was developed with Ellman's Reagent and kept on an orbital shaker at room temperature for 60 minutes in dark. The absorbance was read at 420 nm. A 4-parameter logistic curve fit was used to plot the data as %B/B0 (Standard Bound / Maximum Bound) versus log concentration. The concentration of each sample was determined from a standard curve with appropriate dilutions, and used to calculate the percent inhibition as per the formula given below :

Percent Inhibition (%) = (Activity of Control – Activity of Test) / Activity of Control x 100

The percent inhibition was plotted against the inhibitor concentration to measure the IC_{50} value (concentration at which there was 50% inhibition).

RESULTS

As illustrated in figure 1, different concentrations (15.625, 31.25, 62.5, 125, 250, 500, 1000µg/ml) of Abutilon indicum extract were evaluated for their inhibitory effect on the activity of COX. The plant extracts exhibited potent inhibition of the COX – 2 enzyme. Concentration based inhibition was observed against COX – 2 activity. The IC_{50} was found to be 116.6µg/ml. Maximum inhibition was found to be 95.33% at 1000µg/ml as represented in figure 1.

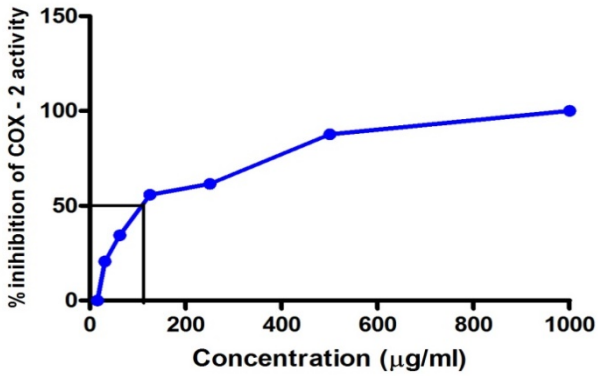

Figure 1. COX2 inhibitory assay

DISCUSSION

Malvaceae family includes almost 244 genera with 4225 species of herbs, shrubs and trees [11]. Around 22 genera of the family have been reported from India, many of which have ethnomedicinal value e.g., Abutilon indicum, Gossypium herbaceum, Hibiscus mutabilis, Hibiscus sabdariffa, Hibiscus rosa-sinensis, and several others [12].

Phytoconstituents isolated from Malvaceae members, belongs to categories such as flavonoids, phenolics, acids, and polysaccharides exhibit therapeutic activities.

More than 15 phenolics have been identified in A. indicum [13], and among these, eugenol was reported to have analgesic activity [14] while syringic acid and methyl caffeate were recognized to be cytotoxic.

Aqueous and alcohol extracts of leaf of A. indicum increased insulin production in moderately diabetic rats [15]

In another study, the plant extract of A. indicum has been tested in vitro for anti-arthritic activity which demonstrated a dose dependant effect on protein denaturation, membrane stabilisation and inhibition of proteinases. More potent analgesic activity was shown by herbal extract compared to acetyl salicylic acid which is a well-established analgesic drug for arthritis [16].

In a study, the exact toxicity of dried powder of aerial parts and also fresh juice of leaves of A. indicum were measured in Swiss mice. Either of the above plant material did not affect significantly on body weight [17]. The exact oral toxicity of the aqueous extract and aqueous suspension of the ethanolic extract of A. indicum leaves was assessed in Swiss albino mice. They were found to be safe at dose of 4000 mg/kg and 2000 mg/kg respectively and did not cause death in mice. Therefore, it proves that Abutilon indicum being a natural plant doesn't have much toxic effect unlike its counterparts. A firm proof that A. indicum extract shows anti-inflammatory property is a study conducted by Surendra Sharma and Naveen Goyal with the root extract on Carrageenan induced rat paw oedema model [18].

Proteinases have been implicated in arthritic reactions. Neutrophils are known to be a rich source of proteinases containing many neutral serine proteinases in their lysosomal granules. Leucocyte proteinases were previously reported to be very effective in the development of tissue damage during inflammatory reactions, and proteinase inhibitors provide significant level of protection. In a study done by Vallabh.D and Varsha.M, Abutilon indicum exhibited significant anti- proteinase activity [19].

In the present study, as illustrated in Fig 1, different concentrations of Abutilon indicum extract was evaluated for the inhibitory effect of the COX activity. Concentration based inhibition was observed against COX – 2 activity. The IC_{50} was found to be 116.6µg/ml. The maximum inhibition was found to be 95.33% at 1000µg/ml.

CONCLUSION

Medicinal plants and shrubs which have little or no side effects have to be further investigated. Selective COX2 inhibitors are used to treat pulpal pain because the risk of developing peptic ulcer disease, GI bleeding and renal toxicity are increased by non-selective NSAIDs after being used for a long time. The main purported safety advantages of COX- 2 inhibitors over non- selective NSAIDs are theoretical lack of associated gastropathy [20]. Since Abutilon indicum showed the aforementioned benefits. Further study as seen in figure 1 was done and proved on its COX-2 inhibition to increase its therapeutic value as an anti-inflammatory with added benefits.

REFERENCES

1. HataAn, Breyer RM. Pharmacology and signalling of prostaglandin receptors: Multiple roles in inflammation and immune modulation. Pharmacol and Therapeutics, 2004:103(2):147–166.
2. Kota BP, Huang TH., An overview on biological mechanisms of PPAR. Journal of pharmacological research, 2005:51(2);85–94.
3. Kota BP, Huang TH, Journal of pharmaceutical medicine and Biophysics, 1991:1083 (1);1–17
4. Griswold DE, Adams JL. Constitutive cyclooxygenase(COX-1) and inductively COX-2, Rationale for selective inhibition and progress to date. Medical care research and review; 1996:16 (2); 181–206.
5. FU JY, Masterferrer JL, Seibert K, Raz A, Needleman P. The induction and suppression of prostaglandins H2 synthase in human monocytes. Journal of Biological Chemistry; 1990:265 (8),16737-16740.

6. Kaladhar D.S.V.G.K, Traditional and Ayurvedic medicinal plants from India: Practices and treatment for human diseases.LAP LAMBERT Academic publishing; 2012:12(2);176.
7. Pradhan BK, Badola HK, Ethnomedicinal plant use by Lepcha tribe of Dzongu valley, Khangchendzonga biosphere reserve, in North Sikkim, India, Journal of Ethnobiol and Ethnomedicine,2008 :4 (22);123-125
8. S.G. Vishnu Prasanna, Lakshmi.T, Anti-arthritic activity of Abutilon indicum, International journal of pharmacological review and Research ,2017: 44 (1), 92-93
9. Jannathul Feridoz, Anitha, Aqueous alcoholic extract of Abutilon indicum of aerial parts against E. Faecalis -An invitro study, Asian Journal of Pharmaceutical and Clinical Research ,2017:10 (5); 80-81
10. Noreen Y, Ringbom T, Perera P, Danielson H, Bohlin L, Development of a radiochemical cyclooxygenase-1 and -2 in vitro assay, for identification of natural products as inhibitors of prostaglandin biosynthesis. Journal of Natural Products;1998: 61, 2–7.
11. Christenhusz M, Byng J, the number of known plants species in the world and its annual increase. Phytotaxa.,2016: 261(2), 201–217
12. Rahman A., Gondha R. Taxonomy and Traditional Medicine Practices on Malvaceae (Mallow Family) of Rajshahi, Bangladesh. Open journal of Botany ,2014:1 (2), 19–24.
13. Kashmiri M? A, Yasmin. S, Ahmad M, Mohy-ud-Din A. Characterisation, compositional studies, antioxidant and antibacterial activities of seeds of Abutilon indicum and abutilon multicultural grown wild in Pakistan. Acta chimica slovenica, 2009: 56,345–352.
14. Gaind K, Chopra K. Phytochemical investigation of Abutilon Indicom. Planta Medica ,1976:30, 174–185.
15. Krishnapun C, Peungvicha, Temisiririrkkul R, wongkrajang Y. Aqueous extract of abutilon Indicom sweet inhibits glucose absorption and stimulates insulin secretion in rodents. Journal of nutrition research,2009: 29,579-587.
16. Vallabh D, Jadhav V.M, Kadam V.J. In vitro anti-arthritic activity of Abutilon Indicum(Linn). Journal of Pharmaceutical research,2009: 2,644-645.
17. Pingale S. S, Virkar P. S, Evaluation of Acute toxicity for Abutilon indicum. Der Pharmacia Lettre 2011, 3, 37–42.
18. Surendra. K. sharma, Naveen Goyal, Anti-inflammatory effects of various extracts of root of Abutilon indicum. International Journal of Chemical Sciences,2008:8(3),1236-1240.
19. Vallabh. D, Varsha.M, In-vitro anti-arthritic activity of Abutilon indicum, Journal of Pharmacy Research ;2009, 2(4), 644-645.
20. Dr. Priyadarshini. R, Dr. Dhanraj, Dr. Karthikeyan Murthykumar, COX2 inhibitors in the management of pulpal pain, Journal of pharmaceutical Sciences and Research, 2016: 8 (6),442-449.