



### Pharmacological activities of *Abrus precatorius* Linn. – A Review.

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*Abrus precatorius* commonly known as Gunja has been used for therapeutic purpose since vaidic period. The Roots, seeds and leaves are used in traditional & folklore Medicine. In traditional system of medicine, the plant is reported to possess beneficial effects as an antidote, in avabahuk, cervical adenitis, dental caries, baldness, dandruff, erysipelas etc. Much research work has been conducted on *Abrus precatorius*. The pharmacological studies have shown that A.P. possesses a number of biological activities such as anti-bacterial, anti-cancer, anti-diabetic, anti-fertility, antimicrobial, anti-oxidant activity, anti-inflammatory, anti-arthritic, antiseratonegic, nephroprotective etc.

A wide range of active components including a glucoside abruccic acid, haemagglutinin, a quantity of urease, glycoside abralin, an albuminous substance 'abrin' the active principle have been isolated from the plant. The present review is an effort to consolidate traditional, ethnobotanical, phytochemical, and pharmacological information available on *Abrus precatorius*. It is considered as a valuable source of natural products for development of medicines against various diseases.

**Key words** – *Abrus precatorius*, pharmacological activity, abrin, extract etc.

#### Introduction –

#### PLANT PROFILE:

##### Taxonomical classification- [1, 2]

Kingdom : Plantae  
Division : Magnoliophyta  
Order : Fabales  
Family : Fabaceae  
Subfamily : Faboideae  
Tribe : Abreae  
Genus : *Abrus*  
Species : *Abrus precatorius*

##### Common names [1, 2]

<b>English</b>	:	Jequirity bean, rosary pea, prayer bean, precatory bean, Indian liquorice
<b>French</b>	:	Pois rouge
<b>Spanish</b>	:	Tento muido
<b>Arabic</b>	:	Ain-ed-dik
<b>Chinese</b>	:	Siang-sztsze (root of S.)
<b>German</b>	:	Paternostererbse
<b>India:</b>		
Sanskrit	:	Gunja
Hindi	:	Gunchi, Gunja
Gujerati	:	Gumchi
Marathi	:	Gunja
Punjab	:	Mulati

Telugu	:	Guruginia
Tamil	:	Kundumani
Urdu	:	Ghunchi

**Name of the seeds:** Prayer beads, Crab's eye

**Pharmaceutical definition:** Jequiriti semen, Abri semen

#### **BOTANICAL DESCRIPTION-**

It is a woody twinning plant of the LEGUMINOSAE family, with characteristic red and black seeds. The leaves are pinnate and glabrous, with many leaflets (12 or more) arranged in pairs. The leaflets are oblong, measuring 2.5-cm long and 1.5-cm wide. The plant bears orange-pink flowers, which occur as clusters in short racemes that are sometimes yellowish or reddish purple in color, small and typically pealike. The plant produces short and stout brownish pods, which curl back on opening to reveal pendulous red and black seeds, 4 to 6 peas in a pod.[1, 2]

#### **PLANT PARTS USED-**

Roots, seeds and leaves.<sup>1</sup>

#### **ORIGIN AND DISTRIBUTION-**

It grows wild in thickets, farms, and secondary clearings, and sometimes in hedges. It is most common in rather dry areas at low elevation throughout the tropics and subtropics.

In India it is found all over the plains of and Ceylon.<sup>1</sup>

#### **Classical uses in Ayurveda <sup>2</sup>-**

1. Avabahuka (Pain in arma)- The part is incised with a fine reazor and paste of gunja seeds is applied thereon. It alleviates avabahuka, visvachi, sciatica and other pains caused by vata. (SG.3.11.101-2)
2. Gandamala (Cervical adenitis) – Oil cooked with root and seeds of gunja and double water destroys, by massage and snuff, chronic gandamala. (BP.ci.44.47)
3. Dental caries – Root of either gunja or asvagandha is chewed with teeth. It relieves the pain caused by dental caries. (RM.5.13).
4. Baldness – The scalp should be incised and the paste of gunja is applied thereon frequently. Along with the rasayan drug should be used. (SS.ci.20.25; also VM.57.75).
5. Dandruff –
  1. Oil cooked with gunja seeds along with bhrngaraja juice destroys itching, dandruff and other diseases of scalp. (VM.57.70)
  2. Snuffing with gunja root is useful in all types of head-diseases. (GN.3.1.61).
6. Defects of vision – Gunja root pounded with goats urine removes defects of vision and blindness. (GN.3.3.377).
7. For promoting growth of ear lobes- Butter extracted of the buffaloes milk boiled with gunja powder, by massage, promotes, growth of ear lobes. (CD.57.57)
8. Erysipelas – In erysipelas caused by pitta, paste of gunja leaves is applied. (HS.3.33.11).
9. Kustha – Application of the paste of gunja powder with butter removes kustha. If the part is pasted with butter kept in a copper vessel, it prevents relapse of diseases. (GN.2.36.157)

#### **TRADITIONAL MEDICINAL USES-**

**Yunani**-The fruit is acrid with a bad taste; tonic to the brain and the body, aphrodisiac, harmful to old man. The root and leaves are sweet with flavor; their properties and those of the oil are the same as the properties of the fruit. The root is considered emetic and alexiteric. The watery extract is useful in relieving obstinate coughs. The roots are employed both in the east and in the West Indies as a substitute for liquorice.

**Ceylon** - the root is taken for sore throat and rheumatism; the juice of the green leaves is taken for purifying the blood. If the leaves are steeped in warm mustered oil and applied over the seat of pain in rheumatism, much benefit will be derived. The juice of the fresh leaves, mixed with some bland oil, and applied externally, seems to relive local pain.

**Konkan-** they are given to relieve hoarseness.

**Guinea** - the leaves are used as a substitute for liquorice.

**Zulus** - use a decoction of the root or leaf as a remedy for pain in the chest.

Internally, the seeds are described as poisonous and useful in affection of the nervous system, and externally, in skin diseases, ulcers, affections of the hair. Etc. The seeds reduced to a paste are recommended to be applied locally in sciatica, stiffness of the shoulder joint, paralysis, and other nervous diseases. In white leprosy, a paste composed of the seed and plumbago root is applied as a stimulant dressing. In alopecia a paste of the seed recommended to be rubbed on the bare scalp. The seeds are used as a purgative, but in large doses are as an acrid poison, given rise to symptoms resembling those of cholera. Taken internally by women, the seeds disturbs the uterine function and prevent conception. The powered seeds are taken as snuff in cases of violent headache arising from cold. Reduced to a paste they are used for contusions and inflammations. Deprived of their outer coating and powdered with sugar-candy. They are swallowed to expel intestinal worms.

The seeds are often used criminally for killing cattle. They are powdered and formed into a paste, with which the darts or arrows are dressed. Boiling render the seed harmless.

**Java & German East Africa** - The seeds are used as a poison.

**Brazil** - they have been for centuries a popular cure for granular lids & panus.

**Cambodia** - the roots are used in the treatment of diarrhea and the bark is prescribed in the dysentery; the leaves and the seeds are given in ophthalmia; the seeds are considered a cure for paludism.

The root applied externally and leaves given internally are useless in the treatment of snake-bite (Mhaskar & calus).<sup>3</sup>

## PHYTOCHEMISTRY-

### Chemical constituents

Seed contain poisonous proteins, a fat-splitting enzyme, a glucoside abruassic acid, haemagglutinin, a quantity of urease and an albuminous substance 'abrin' the active principle, which is of the nature of toxalbumin similar in action to the ricin of castor oil seeds.

Root contains about 15% glycyrrhizin & 8% of an acid resin.

Leaves also contain about 10% of glycyrrhizin & abrin. Shell of the seed contain a red colouring matter. [1]

The scarlet coloured seeds were reported as source of a non-drying oil, abrin and glycoside abralin.<sup>4</sup> The non-protein fraction of the seeds contained stigmasterol in minute amount and an amino acid besides saponins which on hydrolysis gave  $\alpha$ -myrin and ursolic acid as the aglycones. The amino acid was later identified as abrine.<sup>5</sup>

### Chemical analysis of seed<sup>6</sup> –

component	Value
Nitrogen	6.272 %
Crude protein	39.20 %
Crude fibre	9.08 %
carbohydrates	42.42 %
Water soluble carbohydrates (at room temperature)	9.91(g glucose/100 g seed)
Water soluble carbohydrates (At 100 <sup>o</sup> C temp.)	18.72(g glucose/100 g seed)
Total soluble reducing substances (at room temperature)	2.18 (g glucose/100 g seed)
Total soluble reducing substances	2.43(g glucose/100 g seed)

(At 100 <sup>o</sup> C temp.)	
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## PHARMACOLOGICAL ACTIVITIES-

Part of the plant	Type of Extract	Activity	Reference
roots, seeds and leaves	Methanol and petroleum ether	Antibacterial Activity	Reference 8
seeds	Petroleum ether	Anticancer activity	Reference 9
seeds	chloroform – methanol extract	Anti diabetic effect	Reference 12
Seeds	ethanolic extract aqueous extract	Anti-fertility activity	Reference 20
leaves	water extract	Anti-inflammatory activity	Reference 21
seeds	hexane, chloroform, methanol and water	Anti-microbial activity	Reference 22
Seeds	ethanol	Anti-oxidant activity	Reference 23
Seeds	aqueous extract	Nephroprotective activity	Reference 30
leaves	methanol	bronchodilator activity	Reference 33
Red and White seed	Ethanol	Anti-arthritic activity	Reference 34
leaves	ethyl acetate	Antiserotonergic Activity	Reference 35
Leaves	chloroform and ethanol	Cytotoxic property	Reference 36
Shoot	methanol	larvicidal activity-	Reference 37

### Antibacterial Activity

Seven bacterial strains has been isolated from the soil named *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Salmonella paratyphi A*, *Salmonella paratyphi B*, *Klebsiella pneumonia* and *Staphylococcus aureus*. Antimicrobial activity of different parts of *Abrus precatorius* like roots, seeds and leaves were studied against all above mentioned bacterial strains. Root extract of *Abrus precatorius* was found to be active against the Gram positive organism *Staphylococcus aureus*. Root extracts possess good antibacterial potential particularly against *Staphylococcus aureus*. The Minimum Inhibitory Concentration (MIC) of the Petroleum ether extract against *Staphylococcus aureus* was found to be 0.44 mg/ml (440 µg/ml) and of Methanolic extract was found to be 0.40 mg/ml (400 µg/ml) against same. It was considered that if the extracts displayed an MIC less than 100 µg/ml, the antimicrobial activity was good; from 100 to 500 µg/ml the antimicrobial activity was moderate; from 500 to 1000 µg/ml the antimicrobial activity was weak; over 1000 µg/ml the extract was considered inactive.<sup>7</sup> Thus, the antimicrobial activity of the root extract is moderate.<sup>8</sup>

### Anticancer activity

In Preliminary phytochemical screening of PEEAP (petroleum ether extract of *Abrus precatorius* Linn) phytoconstituents like Flavonoids, Alkaloids, tannins, phenolic compounds, saponins, triterpenoids were detected. Oral administration of PEEAP increased the mean survival time of EAC (Ehrlich Ascitis Carcinoma) bearing mice. In the EAC control group the mean survival time was  $18.16 \pm 0.4773$ , while it increased to  $20.5 \pm 0.6009$  (250mg/kg),  $20.33 \pm 0.4944$  (500mg/kg) and  $21.166 \pm 0.6009$  (1000mg/kg) respectively in PEEAP treated groups. The group treated with standard 5-FU (20mg/kg) showed  $24.5 \pm 0.4282$  for the same. The percentage increase in survivals, it was found to be 11.01%, 11.94%, 16.51% respectively as compared to control group. The EAC bearing mice treated with the PEEAP showed excellent increase in life span when compared to control. Treatment with PEEAP at the doses of 250, 500 and 1000mg/kg reduced the body weight<sup>10</sup>, 11, PCV<sup>12</sup>, 13 and viable tumour cell count as compared to that of EAC control group and increased the haemoglobin content and RBC count towards normal level. Administration of PEEAP at the doses of 250, 500 and 1000mg/kg in EAC bearing mice reduced the WBC count as compared with the control. Treatment with PEEAP at different doses changed these altered parameters towards normal levels.<sup>9</sup> The PEEAP is rich in flavonoids, alkaloids and terpenoids. The cytotoxic and antitumour properties of the extract may be due to these compounds. The present study points to the potential anticancer activity of *Abrus precatorius*.

**Anti diabetic effect-**

The chloroform – methanol extract of *Abrus precatorious* seed showed a marked blood glucose reduction especially after 30 hours of oral administration compared to chlorpropamide a known sulfonylurea and a control group control. The peak percentage reduction of chloroform – methanol was 69.1% after 30 hours while that of chlorpropamide was 61.3% after 20 hours of administration. The blood glucose percentage reduction was 42.9, 58.7, 67.4, 69.1, 67.9, 56.6 and 51.8 after 05,10,20,30,40,50,60 and 168 hours respectively; while that of chlorpropamide was 13.8, 32.3, 61.3, 33.5,46.8, 46.5 and 46.2% respectively. There was a significant difference ( $P<0.001$ ) between the reduction pattern of chloroform – methanol to that of chlorpropamide. When chloroform – methanol was however compared to control, there was no significant difference after each time of blood collection except after 05 minutes which was significant at  $P<0.001$ . Also chlorpropamide did not show any significant difference when compared with control except after 05 ( $P<0.05$ ) and 40 hours ( $P<0.001$ ) of blood collection.

The chloroform – methanol extract of *Abrus precatorious* was able to reduce alloxan hyperglycaemic blood glucose levels. The extract was seen to be slightly more potent than chlorpropamide -a known antidiabetic drug in the class of sulfonylurea. The potency was measured in terms of longer time of action and higher percentage reduction in blood glucose levels. Many bioactive compounds have been isolated from plants and have been used as antidiabetic agents. The chloroform-methanol extract i.e. 50mg per kilogram body weight of *Abrus precatorious* was able to reduce blood glucose level by 69% after 30 hours of exposure which shows that, there are some antidiabetic substances in this extract. The chloroform – methanol extract comprised most of the lipid – soluble compounds in the seed. The mechanism of blood glucose reduction of this extract may be as a result of the ability of the fat soluble extract to bind to receptor sites especially the peroxisome proliferator – activated receptors. These receptors are the chief regulators of glucose metabolism. They have the ability of binding to lipid – soluble substances because they are steroid group of receptors i.e. they are lipophilic in nature. The binding of chloroform –methanol extract, to these receptors may activate the receptors. Which act on glucose metabolizing pathways and thus reduce or reverse the glucose circulation in dithizone induced diabetes. Activation of these receptors also can be used to regulate gene expression, since the active form of these receptors can bind to DNA and modulates gene expression, and thus tissue – specific expression. Diabetes mellitus having a genetic origin can be attacked at this molecular level. Also since these receptors are found in almost all the tissues, all other tissues diseases, associated with diabetes can also be checked. It is also interesting to note that insulin generates its intracellular effects by binding to a plasma membrane receptor, which is the same in all cells. The receptor is a disulfide – bonded glycoprotein, thus lipid –soluble chloroform – methanol extract can also easily bind to this receptor site at the plasma membrane, and this decreases glucose transport by decreasing the number of glucose transport molecules in the plasma membrane<sup>10</sup>. Membrane – associated signaling processes or alterations in membrane physical properties by chloroform – methanol extract may be another possible mechanism of glucose reduction in this study. Many membrane bound glycolytic enzymes may be also affected, for example, insulin induces the uptake of glucose by fusion of intracellular glucose transporter – containing vesicles to the plasma membrane, this facilitates the phosphorylation of membrane phosphoinositides by activation of phosphoinositide 3 – kinase<sup>11</sup> which mobilizes critical signaling enzymes and proteins. In conclusion therefore, chloroform – methanol extract of *Abrus precatorius* has shown to have some antidiabetic properties in alloxan diabetes in rabbit.<sup>12</sup>

**Anti-fertility activity –**

Testicular degeneration characterized by reduced number of cells in the epithelium along with reduction in the number of sperm cells was observed when the aqueous extract of *Abrus precatorious* was administered to male rats at doses of 400 mg, 800 mg and 1600 mg per kg body weight for 18 days.<sup>13</sup> The alcoholic seed extracts of *Abrus precatorious* at a dose of 100 mg per kg body weight for 60 days significantly lowered cauda epididymal sperm motility and brought about a decrease in the levels of succinate dehydrogenase and ATPase in the sperm of albino rats. Scanning electron microscopic studies on sperm morphology revealed decapitation, acrosomal damage and formation of bulges on the midpiece region of sperms following exposure to *Abrus precatorious* seed extracts.<sup>14</sup> Dose dependent reduction in testicular weight, sperm count and degeneration in later stages of spermatogenesis were found in the testis of rats treated with steroidal fraction of seeds.<sup>15</sup> Irreversible impairment of the motility of human spermatozoa at a concentration of 20 mg per mL of the methanol extract of *Abrus precatorious* seed extracts was reported, which may be due to the decline in cAMP and enhanced generation of reactive oxygen species.<sup>16</sup> According to Sinha steroidal fraction has been isolated from the seeds of *A. precatorius* and found to exhibit antifertility activity. it caused post-testicular antifertility effects and suppressed sperm motility in cauda epididymis.<sup>17</sup>

As far as evaluation of DNA damage by *A. precatorius* is concerned, it has been demonstrated that isolated constituents from the seeds of *A. precatorius* that is, abrin and agglutinin induce apoptosis by causing DNA fragmentation in vitro.<sup>18</sup>

*A. precatorius* seed extract has genotoxic effects on DNA of spermatozoa in adult male mice. An intraperitoneal administration of ethanolic seed extract of *A. precatorius* causes a dose independent reduction in sperm production while spermatozoa DNA damage is dose dependent.

Present investigation shows a significant decrease in number of spermatids in testes after administration of seed extract of *A. precatorius*. Evaluation of DNA damage by seed extract of *A. precatorius* was made by comet assay. In contrast to sperm production there was a dose dependent increase in number of spermatozoa with damaged DNA. The low dose caused a significant increase ( $p < 0.05$ ) DNA damage compared to control while high dose induced a highly significant increase ( $p < 0.001$ ) in DNA damage compared to control.<sup>19</sup>

Parental *A. precatorius* extract treatment of 40 and 60 mg/kg/ by weight employed in the study causes impairment of testicular and epididymal structures. Significant decrease in spermatogenesis activity in seminiferous tubules and disorganized corpus epithelium accompanied by the reduction in the number of sperm in tubular lumen indicates that the action of seed extract is via action of its strong toxin, abrin which causes depletion of Leydig cells in tubular interstitial thus reducing serum testosterone level and testicular and epididymal dysfunction might be due to this androgen deprived effect. Hence sperm production and maturation process in both respective organs is affected by the extract administration leading to the loss of fertility in treated mice without toxic symptoms<sup>20</sup>

#### Anti-inflammatory activity -

Table 1 shows percent reduction of the inflammatory response following topical application to the right ear of the rat of the extract of the plant *A. precatorius* and acetylsalicylic acid in croton oil vehicles (inflammatory response measured as increased in weight of rat ear produced by croton oil taken as 100%).

Table 1. Percent reduction of inflammatory response following application of the extract of *A. precatorius* and acetylsalicylic acid to the right ear of rat.

Agent	Percentage Reduction of Inflammatory Response
<i>Abrus precatorius</i> extract	a67.10 + 2%
Acetylsalicylic acid	b71.1 + 2%

a Value is mean + S.E. of mean reduction of inflammatory response in 20 rats

b Value is mean + S.E. of mean reduction of inflammatory response in 20 rats

From table 1 the average of the inflammatory response induced by croton oil was taken as 100%. Percentage reduction was calculated as difference in weight of treated ear in the presence of the extract or ASA and the weight of the contra-lateral croton oil alone treated ear.

Acetylsalicylic acid is a very effective nonsteroidal anti-inflammatory agent. Decreases in weight of the croton oil treated ears of the rats provided an adequate index of anti-inflammatory response and thus allows for assessment of many substances for topical anti-inflammatory activity. The results of this present study shows that extract of the plant *A. precatorius* possesses anti-inflammatory property and produced significant reduction in the croton oil treated rat ear (67.10 + 2%) thus exhibiting potent anti-inflammatory activity though lesser than that produced by acetylsalicylic acid (71.1 + 2%). This finding therefore may justify the use of the plant in the treatment of inflammatory disease conditions by traditional healers.<sup>21</sup>

#### Anti-microbial activity –

The antibacterial activity of *A. precatorius* seed extracts was assayed *in vitro* by agar well diffusion method against ten bacterial species. Methanol extracts exhibited antibacterial activity towards almost all the bacterial microorganisms. The hexane and chloroform extracts of three plants showed less or no antibacterial activity. On the other hand, the methanolic crude extracts showed maximum antibacterial activity on *Klebsilla pneumonia*, followed by *Staphylococcus aureus*, *Streptococcus mitis* and *Micrococcus luteus*, respectively. The studied plants were most active against all the bacteria tested. The significant antibacterial activity of the active plant extracts was comparable to the standard antibiotic Streptomycin (10µg/disc). Therefore this study offer a scientific basis for traditional use of solvent extracts of *Abrus precatorius* could be a possible source to obtain new and effective herbal medicines to treat infections caused by multi-drug resistant strains of microorganisms.<sup>22</sup>

#### Anti-oxidant activity –

The raw, dry seeds powder was extracted with 99.9% of ethanol. Phytochemical test shows that extract contains higher level of total phenol and flavonoids. Total phenolic compound in ethanolic seeds extract of *Abrus precatorius* was found to be 95 mg/g of extract calculated as gallic acid equivalent ( $r^2=0.9976$ ) and total flavonoids compound was found to be 21 mg/g of extract calculated as rutin equivalent ( $r^2=0.9985$ ). The extract was screened for its potential antioxidant activities using tests such as hydroxyl radical-scavenging activity, reducing power activity, and hydrogen peroxide-scavenging activity. The in-vitro antioxidant assay showed ethanolic seeds extract of *Abrus Precatorius* ASET posses potent antioxidant activity when compared with reference compound butylated hydroxytoluene (BHT). ASET could be useful for preparation of nutraceuticals as potent antioxidant to treat various human diseases and its complications.<sup>23</sup>

#### **Nephroprotective activity –**

Alcohol is widely consumed. It is regarded as the most commonly abused drug in the world with profound consequences, both societal and medical<sup>24</sup>. In this study, alcohol administration induced severe renal injury evident as derangement of serum electrolyte, elevation of creatinine levels and structural alterations of tubules, glomeruli as well as parenchymal infiltration by chronic inflammatory cells. The attendant elevation of malondialdehyde level indicates that the damage is related to increased lipid peroxidation. This is consistent with the findings of previous studies which have implicated the generation of reactive oxygen species such as superoxide radicals, hydrogen peroxide and hydroxyl radicals in alcohol- induced tissue injury.<sup>25</sup> Alcohol may also produce tissue damage by causing depletion of glutathione, mitochondrial damage, dysregulation of growth factor signalling and the potentiation of cytokine- induced cellular injury [19]. Renal damage that occurs as a result of alcohol consumption may be reversible with abstinence;<sup>26</sup> as was also the case in this study. Rats administered with alcohol and *Abrus precatorius* seed extract exhibited significant attenuation of both structural and functional derangement with concomitant reduction in malondialdehyde level. This finding is supportive evidence that the seed extract of *Abrus precatorius* has protective effect against alcohol induced renal injury and that this effect may be related to a reduction in alcohol- induced lipid peroxidation. The active metabolites in the seed of *abrus precatorius* include abrin, abrus agglutinin, glycyrrhizin gallic acid, trigonelline, precatorine and lipolytic enzymes. Glucine, Coumestrans, resin asparagines and sterols, among others, have also been demonstrated.<sup>27</sup> Gallic acid, glycyrrhizin and trigonelline are potent antioxidants.<sup>28</sup> These metabolites may account for the ability of the seed extract of *abrus precatorius* to attenuate alcohol induced lipid peroxidation of renal cell membrane *vivo*.

Although *abrus precatorius* has been shown to be stable in the gastrointestinal tract, the presence of toxic lectins in its seed limits its pharmacologic utility. Abrin and Abrin agglutinin are type IV ribosome inactivating proteins that inhibit protein synthesis in eukaryotes and induce apoptosis.<sup>29</sup> Concurrent administration of vitamin E, a potent antioxidant, with alcohol and *abrus precatorius* seed extract did not produce enhanced antioxidant effect in this study. This can be explained by the diversity of the mechanisms by which antioxidants restrict lipid peroxidation by free radicals. Protective Effect of *Abrus Precatorius* Seed Extract Following Alcohol Induced Renal Damage 435 radicals. Denisov and Azatyam (2000) explained that the co-administration of two inhibitors of free radicals to an oxidized hydrocarbon or other substances may exhibit a net additive, synergistic or antagonistic effect. It is not unlikely therefore that a net antagonistic effect was the outcome following concurrent administration of the seed extract of *abrus precatorius*, alcohol and vitamin E. Therefore this study strongly indicate that the aqueous extract of the seed of *abrus precatorius* has protective effect on alcohol- induced renal injury and that this effect is related to the attenuation of alcohol-mediated lipid peroxidation of renal parenchymal cells.<sup>30</sup>

#### **Bronchodilator activity -**

Histamine induced broncho-constriction is the traditional immunological model of antigen induced airway obstruction. Histamine when inhaled causes hypoxia and leads to convulsion in the guinea pigs and causes very strong smooth muscle contraction, profound hypotension, and capillary dilation in the cardiovascular system. A prominent effect caused by histamine is severe bronchoconstriction in the guinea pigs that causes asphyxia and death.<sup>31</sup> Bronchodilators can delay the occurrence of these symptoms. In the *in vivo* assay, the extract of concentrations 30, 100 and 300 mg/kg body weight were given orally, 30 minutes before the histamine challenge and the pre-convulsive time (PCT) calculated. The present findings show that methanolic extract of *Abrus precatorius* leaves prolonged the PCT in the guinea pigs following histamine induced bronchospasm. Each dose of AP protected the animal to some extent from the histamine induced broncho-constriction. The range of degree of protection was between 7.74% (for a dose of 30 mg/kg) and 41.62 % (for a dose of 300 mg/kg). The maximum percentage protection calculated was 41.62% and was obtained at 300 mg/kg dose of the AP. The broncho-relaxation effect increased with increasing dose of the extract. The positive control drug, salbutamol gave the maximum protection of 47.52%.

Salbutamol is a well known  $\beta$ -2-receptor agonist with bronchodilator activity and is routinely used in the management of conditions of broncho-constriction as occurs in asthma. The results suggest that the *Abrus precatorius* leaf extract may have bronchodilator activity justifying the traditional uses of the plant in the management of asthma. Hence a decrease or inhibition of the contractions induced by histamine and or acetylcholine in the presence of the leaf extract of *Abrus precatorius*, is suggestive of possible anti-histaminic or anti-cholinergic activity. The guinea pig ileum was used for screening of antihistaminic and anti-cholinergic activities. This is because the presence of histamine H1 sensitive excitatory receptors and acetylcholine muscarinic receptors in the airway smooth muscle of man and animals have been established<sup>32</sup>. The stimulation of H1 receptors produced graded dose related contractions, and from the result, it was observed that the extract of *Abrus precatorius* (100mg/ml) significantly inhibited the histamine induced contractions on the guinea pig ileum preparation indicating its H1 receptor antagonistic activity and supports the bronchodilator properties of the plant. The stimulation of the vagus nerve releases acetylcholine, which binds to specific receptors on the smooth muscle within the bronchial walls and thus constricts the airways. Cholinergic stimulation causes broncho-constriction through airway smooth muscle contraction<sup>27</sup>. Thus stimulation of cholinergic receptors produced graded dose related contractions and in this case, the extract of *Abrus precatorius* (100 mg/ml) significantly inhibited the acetylcholine induced contractions on the guinea pig ileum preparation, indicating its cholinergic receptor antagonist activity and supports the anti-asthmatic properties of the plant. Asthma is an inflammatory disease of the lungs characterized by increased infiltration of leukocytes, especially eosinophils, into the airways, and reduced respiratory function and that the inflammation induces broncho-constriction, increase airways hypersensitivity and mucus production. It is important to emphasize that the mechanism involved in asthma condition is more complex than the model used in our assay. Nevertheless, the bioassay models used in these experiments give a good insight into the justification of the traditional use of the plant for the management of asthma.

It is instructive that the neuromuscular effects of the crude extracts of the leaves of *Abrus precatorius* have been investigated using isolated toad rectus abdominis and rat phrenic nerve-diaphragm muscle preparations as well as young chicks<sup>13</sup>. In their study, the ethanol extract of the leaves inhibited acetylcholine-induced contractions of both toad rectus abdominis and rat phrenic nerve-diaphragm muscle preparations. The extract also caused flaccid paralysis when injected intravenously into young chicks. Their findings in a way confirm the adrenergic activities of the plant as observed in our study even when different animals and tissues were used. Therefore, it can be deduced that the methanolic extract of the leaves of *Abrus precatorius* has broncho-dilatory effect and its use traditionally in the management of asthma is justified.<sup>33</sup>

#### **Anti-arthritic activity –**

The effect of APW and APR seed extracts on FCA induced arthritis model in rats, selected to evaluate their efficacy against the proliferative phase of inflammation is shown. Freund's adjuvant – induced arthritis is widely used chronic model for inflammation. After FCA injection on the rat hind paw, a pronounced swelling and hyperalgesia appeared with no involvement of the contralateral paw. This response is usually considered as a primary reaction. There is also a delayed hypersensitive response which is considered as latent secondary systemic response known to induce arthritis occurs after few days on the contra lateral paw and characterized by tibiotarsal joint swelling and nodule formation in the tail. Hyperalgesia is one of the major phenomenon of arthritis and it is more evident during the acute phase of arthritis. This reduced pain threshold in FCA animals thus reveals in the arthritis control group. FCA induced arthritis rat model also served as a model in several studies for the evaluation of chronic pain in different ways using thermal or mechanical stimuli. Evaluation of pain threshold in arthritis animals by nociceptive thermal stimuli such as hot plate, which serves as a model for quantitative estimation of hyperalgesia related behaviors According to result and investigation more pronounced and reliable anti-inflammatory activity was observed in APW (250 mg/kg), which significantly ( $p < 0.001$ ) inhibited the development phase of chronic joint swelling induced by FCA on both the paws. The anti nociceptive effect of both extracts on arthritis rats were also evaluated by hot plate method in which the result shows delayed withdrawal latency for APW (250 mg/kg) at  $p < 0.001$  level significance from thermal nociceptive threshold and proved its potency as an anti inflammatory and analgesic agent in FCA induced chronic model in dose dependent manner than the APR extract. Adjuvant arthritis is characterized by reduced weight loss and the body weight loss is associated with increased production of pro-inflammatory cytokines such as TNF- $\alpha$  and interleukin – 1. Treatment with APW extract shows significant ( $p < 0.05$ ) increase in body weight as that of vehicle control group. The radiographic analysis of the tibiotarsal joint in arthritis and drug treated animals further supported and confirms the potent antiarthritic effect of APW in a dose dependent manner which suppress the pathological changes, such as pannus formation and bone destruction. In case of APR treatment, reveals only a mild antiarthritic effect when compared with APW. NSAIDs, glucocorticoids or so called disease-modifying drugs such as gold or methotrexate are prescribed for the treatment of rheumatoid arthritis. The limitations of these therapies are their well-known toxicity and variation in clinical efficacy. Conventional NSAIDs that exhibit their activity by inhibiting cyclooxygenase



(COX), which catalyzes the prostaglandin biosynthesis, may induce gastric ulceration and kidney failure (Awouetrs et al., 1978) due to COX-1 inhibition. COX-1 is necessary for the maintenance of stomach lining, interfering with its activity causes gastrointestinal disturbances such as bleeding ulcers. Whereas inhibition of COX- 2 shown to have a lower rate of gastro intestinal bleeding (Silverstein et al., 2000) hence COX-2 is responsible to exert normal cell physiology including regulation of vascular homeostasis, renal blood flow (Brater et al., 2001) and inflammatory process (Masferrer et al., 1994). Macroscopic examination of the gastric mucosa of the APW and APR treated rats did not reveal any treatment related tissue damage. The mechanism of anti-inflammatory effect of both the seed extracts of *A. precatorius* without any gastric lesions led us to believe that they did not interfere with prostanoid production. They might also act by selective inhibition of either COX-2 or LOX pathway, which produces leukotrienes from arachidonic acid. When only COX-2 is blocked, the LOX pathway still produces the potent mediator of inflammation. Hence in the development of new drugs for anti inflammation dual inhibition of LOX/COX has been suggested to be a desirable approach (Florucci et al., 2001)

Both the extract exerts similar significance ( $p < 0.001$ ) in reducing the hyperpyrexia induced by Brewer's Yeast. The lower dose of APW and APR 250 mg/kg more or less shows similar significance ( $p < 0.05$ ). It is interesting to note that APW treatment was found to be more effective and exhibited significant ( $p < 0.001$ ) anti arthritic activity against adjuvant-induced arthritis experimentally with less toxicity (no ulcerogenic), compared to APR treatment. From these investigated results strongly suggest that APW alone have strong anti-inflammatory property and alleviated the extent of inflammatory reaction, which proved itself to be more effective, and an active drug of choice for the long treatment of chronic inflammatory conditions like RA with gastric ulcer, which is common.<sup>34</sup>

### Antiserotonergic Activity-

#### Effect of crude extracts on frog fundus strip

Different concentrations of crude extracts such as Ethyl acetate were tested in presence of sumatriptan. The sumatriptan, ethyl acetate extract, was showed the graded dose response on frog fundus strip hence ethyl acetate extract mediated through serotonergic system

#### Effect of crude extract *Abrus Precatorius* on frog fundus strip (with Sumatriptan) -

Standard Drug/Crude extract	Concentration (mg)			Response
	1	2	3	
Sumatriptan	0.3 mg	0.6 mg	1.2 mg	Contraction of smooth muscle (Graded dose response)
Ethyl acetate extract	4.25 mg	8.5 mg	-	Contraction of smooth muscle

The plant of *Abrus precatorius* was collected from the localise area of Akkalkuwa Dist. Nandurbar. The fresh leaves of plant washed with water then it extracted in Soxhlet apparatus for 48 hrs using ethyl acetate as solvent. The extract obtained after extraction was dried in dessicator then this extract undergoes for Phytochemical screening and shown presence of the compounds like Alkaloids, Carbohydrate, Proteins, Tannins, Amino acids and Pharmacological screenings of extract of *Abrus precatorius* leaves was carried out on a frog fundus strip and shows smooth muscle contracting property(Graded dose response) on comparison with a sumatriptan as a standard this graded dose response segested that ethyl acetate extract possesses antiserotonergic activity.<sup>35</sup>

### Cytotoxic property-

Phytochemical screening was carried out for both the extracts, Chloroform extract contains alkaloids, steroids, flavonoids, and triterpenoids. Ethanol extract contains flavonoids, triterpenoids, glycosides, saponins, reducing sugars and phenolic compounds. The active constituents are present predominantly in ethanolic extract due to high polarity. Hence ethanol extract was subjected to HPTLC studies. In HPTLC, with ethanol extract 9 peaks were obtained from the solvent system Hexane: ethylacetate: acetic acid (7: 3: 0.5). *Abrus precatorius* leaves contain oleanane type triterpenoids (Abruslactone A). As per the literature survey, in TLC densitometry method, the oleanane type triterpenoids was isolated using the same solvent system mentioned above and occurs at Rf value 0.15 - 0.2 [9, 10]. Hence the 1st peak with a Rf value 0.10 - 0.21 assumed to be oleanane type triterpenoids. In cytotoxic study, both the extract exhibits cytotoxic activity, but ethanol extract has better cytotoxic effect than chloroform extract. Ethanol extract exhibits greater cytotoxic effect against hepG2 (liver cancer cell) with a GI50 value of 18.6  $\mu$ g/ml. Chloroform extract exhibits greater cytotoxic effect against HeLA (Cervical Cancer) with a GI50 value of 29.2  $\mu$ g/ml. Doxorubicin

shows extremely low GI50 values against the above mentioned cancer cells. The cytotoxic activity may be due to the presence of triterpenoids and flavonoids.

Today with a spectrum of antibiotic resistance emerging infectious diseases and cancers, phytochemicals continue to provide new structural leads for chemotherapeutic industry. A number of triterpenoids are known to possess antineoplastic activity. Members of cycloartane, lupane, cursane, oleanane and friedelane (especially quinone methides) dammarane and limonoid triterpenoids have demonstrated antiproliferative activity on various cancer cells.<sup>36</sup>

### **Immunostimulatory properties -**

The discovery and identification of new antitumor drugs, which can potentiate the immune function has become an important goal of research in immunopharmacology and oncology. Apart from its chemotherapeutic nature, the study investigated in vitro immunostimulatory properties of these peptide fractions in tumor bearing mice. The peptide fractions showed a characteristic mitogenic action and caused a high level of proliferation of thymocytes as compared to splenocytes in tumor bearing mice. Further, the mitogenic response of splenocytes to peptide fractions was supported by estimating expression of [CD3.sup.+] (T cell) and [CD19.sup.+] (B cell) markers on the cell surface in flow cytometric assay. Activated proliferating lymphocytes express [CD25.sup.+], [CD69.sup.+], [CD71.sup.+], and HLA-DR on their surface which are expressed minimally or even absent on resting cells and thus termed as "activation antigens". The activation markers ([CD25.sup.+],[CD71.sup.+]) of splenocytes were found to increase significantly as compared to control in presence of AGP and ABP as evaluated in flow cytometric analysis (Caruso et al. 1997). This study demonstrated that the nature of mitogenic stimulus of Abrus derived peptide fractions not only influenced proliferation property but also the activation status of splenocytes. Phenotypic analysis of the lymphocyte subpopulations clearly showed an increase of [CD4.sup.+] cells without any significant alternation in [CD8.sup.+] cells on peptide treatment. Consequently, peptide fractions increased the [CD4.sup.+]/[CD8.sup.+] ratio which is a major indicator for assessing the function of T cell mediated immunity. The antigen presenting cells in splenocytes expressed [CD80.sup.+] (B7-1) and [CD86.sup.+] (B7-2), which might provide co-stimulatory signals for optimal T-cell activation through the CD28 pathway. The AGP and ABP was able to activate tumor derived murine splenocytes and release of different cytokines which had role in antitumor response. The IL-2 has many immunopotentiating effects, such as proliferation of T cells, B cells, NK cells and monocytes, augmentation of cytotoxicity of T cells and NK cells which exhibit high cytolytic activities against tumor cells. The cytokines like TNF-[alpha] and IFN-[gamma] has been recognized as an important host defense cytokine that affects tumor cells. The IL-12 exerts its biological activity in T and NK cells, inducing the production of IFN-[gamma], enhancing the generation of cytotoxic cells, and stimulating antigen-activated lymphocytes. The IL-10 shows its antitumor property by enhancement of the function of natural killer cells and macrophages (Mocellin et al. 2003). The cytokine profile of treated splenocytes had a skew towards Th 1 type of immune response with negative IL-4 and IL-5 detection which supports our previous finding (Tripathi et al. 2004). The ability of these peptide fractions to stimulate Th 1 cytokines along with IL-10 by splenocytes can be exploited as an adjuvant effect. The in vitro IL-10 production associated with increased Th1 cytokines explained the immunostimulatory nature of the peptide fractions which might involve in indirect tumor regression in DL bearing mice (Bhutia et al. 2008c, d) TAM is characterized as a skewed M2 macrophage population with impaired expression of NF-kB-dependent inflammatory functions (expression of cytotoxic mediators, NO) and cytokines (TNF-[alpha], IL-1, IL-12). TAM also expresses high levels of both the scavenger receptor-A and the mannose receptor accompanied with predominant production of ornithine and polyamines by arginase pathway. TAMs generally are not tumoricidal, but upon activation they can exert toxicity towards tumor cells. The results revealed that activated TAM showed an enhanced phagocytosis, decreased in expression of MMR with enhanced amount of IL-1, which is a co-stimulatory signal for lymphocyte proliferation indeed due to antigen presentation of macrophage. Additionally, treatment of TAM by peptide fractions resulted in enhanced RNI production without having any effect on arginase activity which indicate tumor growth interfere might associated "switching on" of the arginase pathway. A strong positive NK cell activation was also observed by peptide fractions which explain the TNF-[gamma] and IL-10 release. This observation suggested that the AGP and ABP were able to stimulate tumor associated macrophage, proliferate splenocytes leading to Th 1 response and NK cell activation in tumor bearing mice in vitro. Many small peptides have been identified from natural sources for their nonspecific immunostimulatory responses against tumor suppressed condition (Bhutia and Maiti 2008). This study warrants Abrus lectins derived peptide fractions are possible sources of similar small immunostimulatory peptides which might involve in tumor regression.<sup>37</sup>

### **larvicidal activity-**

This study shows the larvicidal susceptibility of the *Abrus precatorius* plant extracts. Among the plant extracts tested for mosquito larvicidal activity, 17 plants were found effective by showing LC50 within 100 mg.l-1.

Among the plant species, *Cymbopogon citrates* and *Abrus precatorius* showed maximum larvicidal activity against *Culex quinquefasciatus* with the LC50 value 24 and 30 mg.l<sup>-1</sup>, respectively than the other plant extracts.<sup>38</sup>

**Conclusion** – In recent past there is a resurgence of interest in the study and use of medicinal plants. Many traditional plant based remedies are back in use and find increasing applications as- source of direct therapeutic agents, as raw material base for the elaboration of more complex semi synthetic compounds, as models for new synthetic compounds and as taxonomic markers for the discovery of new compounds. A critical analysis of literatures have shown the interesting fact that organic and aqueous extracts of *Abrus precatorius* possesses an array of multidimensional pharmacological activities viz anti-bacterial, anti-cancer, anti-diabetic, anti-fertility, antimicrobial, anti-oxidant activity, anti-inflammatory, anti- arthritic, antiseratonegic, nephroprotective activity etc. A detailed and systematic study is required for identification, cataloguing and documentation of plants, which may provide a meaningful way for the promotion of the traditional knowledge of the herbal medicinal plants. In view of the nature of the plant, more research work can be done on humans so that a drug with multifarious effects will be available in the future market.

### **References -**

- <sup>1</sup> Dr.K.M.NADKARNI'S Indian Materia Medica- volume 1 Second Reprint of third Revised and Enlarged Edition. 1982, page. No. 5-7.
- <sup>2</sup> P.V.Sharma, Classical uses of medicinal plants, chaukhambha visvabharati; reprint 2004.
- <sup>3</sup> Kirtikar and Basu's illustrated Indian Medicinal Plants, Edited by K.S.MHASKAR, E.BLATTER, J.F. CALUS – Third revised and enlarged edition, Page. No. – 1072-1073.
- <sup>4</sup> Ghatak,N. and kaul, R., chemical examination of the seeds of *Abrus precatorius* Linn. Part I. J.Indian Chem. Soc 1932; 9, 383-387.
- <sup>5</sup> Maiti,P.C. Mukherjee, S. and Chatterjee, A. Chemical examination of seeds of *Abrus precatorius*, J.Indian Acad. Forensic Sci 9, 1970; 64-68.
- <sup>6</sup> Niranjana, G.S., Agrawal, R. and Srivastava, A. Chemical examination of some wild leguminous seeds. J. Indian chem. Soc 1985; 62:693-694.
- <sup>7</sup> Holetz, F.B., Pessini, G.L., Sanches, N.R., Cortez, D.A.G., Nakamura, C.V. and Filho, B.P.D., Screening of Some Plants Used in the Brazilian Folk Medicine for the Treatment of Infectious Diseases. Mem. Inst. Oswaldo Cruz 2002; 97(7).
- <sup>8</sup> Kalpesh Mistry, Mansi Mehta, Nehal Mendpara, Sharmila Gamit and Gaurav Shah, Determination of Antibacterial Activity and MIC of Crude Extract of *Abrus precatorius* L. Advanced Biotech, 2010 August 1, 10 (02).
- <sup>9</sup> J. Anbu, v. Ravichandiran, m. Sumithra, b. Sudheer Chowdary, k. Swaroop kumar.s.v.v.s.n, r. Kannadhasan And r. Satheesh kumar ,Anticancer activity of petroleum ether extract of *abrus Precatorius* on ehrlich ascitis carcinoma in mice., International Journal of Pharma and Bio Sciences, 2011; 2 (3).
- <sup>10</sup> McCallum, CD; Epan, RM. Insulin receptor autophosphorylation and signalling is altered by modulation of membrane physical properties. Biochemistry 1995; 34: 1815 – 1824.
- <sup>11</sup> Carpenter, CL; Cantley, LC. Phosphoinositide kinases. Curr. Opin Cell Biol 1996; 8:153 - 158
- <sup>12</sup> MONAGO, C C; ALUMANAH, E O, Antidiabetic Effect of Chloroform -Methanol Extract of *Abrus Precatorius* Linn Seed in Alloxan Diabetic Rabbit, J. Appl. Sci. Environ. Mgt. 2005; 9 (1) 85 – 88, Available Online at <http://www.bioline.org.br/ja>
- <sup>13</sup> Adedapo AA, Omoloye OA, Ohore OG. Studies on the toxicity of an aqueous extract of the leaves of *Abrus precatorius* in rats. Onderstepoort. J Vet Res 2007; 74: 31-36.
- <sup>14</sup> Rao MV. Antifertility effects of alcoholic seed extract of *Abrus precatorius* Linn. in male albino rats. Acta Eur Fertil 1987; 18: 217-220.
- <sup>15</sup> Kulshreshtha SS and Mathur RS, Effect of steroidal fraction of seeds of *Abrus precatorius* Linn. On rat testis, Indian J Exp Biol, 1990; 28:752-756.
- <sup>16</sup> Ratnasooriys WD, Amarasekera AS, Perera NSD and Premakumara GAS, Sperm antimotility properties of a seed extract of *Abrus precatorius*, J Ethnopharmacol, 1991, may-june 33(1-2).85-90.

- <sup>17</sup> Sinha R, Post-testicular antifertility effects of *Abrus precatorius* seed extract in albino rats, *J Ethnopharmacol*, 1990, 28(2), 173-181.
- <sup>18</sup> Bhaskar ASB, Deb U, kumar O, Rao PVL. Abrin induced oxidative stress mediated DNA damage in human leukemic cells and its reversal by N-acetylcysteine. *Toxicol. In Vitro* 2008; 22: 1902-1908.
- <sup>19</sup> Sarwat Jahan<sup>1</sup>, Salma Rasool<sup>1</sup>, Mir Ajab Khan<sup>2</sup>, Mushtaq Ahmad<sup>2</sup>, Muhammad Zafar<sup>2\*</sup>, Muhammad Arshad<sup>3</sup> and Arshad Mehmood Abbasi<sup>2</sup> Antifertility effects of ethanolic seed extract of *Abrus precatorius* L. on sperm production and DNA integrity in adult male mice; *Journal of Medicinal Plants Research* Vol. 3(10), pp. 809-814, October, 2009 Available online at <http://www.academicjournals.org/JMPR>
- <sup>20</sup> Sarwat Jahan, Naima Saeed, Fasihunnisa Ijlal, Mir Ajab Khan, Mushtaq Ahmad, Muhammad Zafar and Arshad Mehmood Abbasi Histomorphological study to evaluate anti-fertility effect of *Abrus precatorius* L. in adult male mice; *Journal of Medicinal Plants Research* Vol. 3(12), pp. 1021-1028, December, 2009 Available online at <http://www.academicjournals.org/JMPR>.
- <sup>21</sup> Owunari A. Georgewill, Udem O. Georgewill, Evaluation of the anti-inflammatory activity of extract of *Abrus precatorius*, *Eastern Journal of Medicine* 14 (2009) 23-25.
- <sup>22</sup> Varaprasad Bobbarala and Varahalarao Vadlapudi, ABRUS PRECATORIUS L. SEED EXTRACTS ANTIMICROBIAL PROPERTIES AGAINST CLINICALLY IMPORTANT BACTERIA, *International Journal of Pharm Tech Research*, Vol.1, No.4, pp 1115-1118, Oct-Dec 2009.
- <sup>23</sup> ranju s. Pal, g. Ariharasivakumar, kundlik girhepunje, ashutosh upadhyay, *in -vitro* ant oxidative activity of phenolic and flavonoid compounds extracted from seeds of *abrus precatorius*, *international journal of pharmacy and pharmaceutical sciences*, oct-dec 2009. 1( 2).
- <sup>24</sup> Masters SB(2007). The Alcohols. In Katzung BG. *Basic and Clinical Pharmacology*. 19<sup>th</sup> edition. Appleton and Lange. Boston. Pg363 – 373
- <sup>25</sup> Kera Y, Komura S. Ohbora Y, Kiriyama T, Inoue K(1985). Ethanol induced changes in lipid peroxidation and nonprotein sulphhydryl content. Different sensitivities in rat liver and kidney. *Res. Com. Chem. Pathol. Pharmacol* 47: pp203-209.
- <sup>26</sup> Cecchin E, De Marchi S. Alcohol misuse and renal damage, *Addict Biol*. 1996; 1:pp 7-17.
- <sup>27</sup> Rajaram N, Janardhanam K(1992). The chemical composition and nutritional potential tribal pulse, *Abrus precatorius*. *Plant food. Hum Nutr.* 42(4): pp285-290.
- <sup>28</sup> Lakshmi P, Tajdar H, Jehangir T, Sultana S. The effect of gallic acid on renal biochemical alterations in male rats. *Hum Toxicol*. 2006; 25:pp 523 – 529
- <sup>29</sup> Bagaria A, Surendranath K, Ramagopal UA, Rmakumar S, Karade AA. Structure Function analysis and Insight into the reduced toxicity of *Abrus precatorius* Agglutinin I in relation to Abrin. *J Biol Chem*. 2006; 281; 45: pp34465 – 34474
- <sup>30</sup> Ligha Ae , Jaja Bnr<sup>1</sup> , Numbere Nf; Protective Effect of *Abrus Precatorius* Seed Extract following Alcohol Induced Renal Damage, *European Journal of Scientific Research*, 2009; 25 (3), pp.428-436, <http://www.eurojournals.com/ejsr.htm>.
- <sup>31</sup> Goodman LS, Gilman A, *Pharmaceutical Basis of Therapeutics*, 10th ed., Macmillan Press London, 2001.
- <sup>32</sup> Busse, WW, Calhoun WJ, Sedgwick JD, Mechanisms of airway inflammation in asthma. *American Revised Respiratory Disease* 1993, 147, S20-S24.
- <sup>33</sup> Abraham Yeboah Mensah, Audrey Serwah Bonsu, Theophilus Christian Fleischer ,investigation of the bronchodilator activity of *abrus precatorius* *international journal of Pharmaceutical Sciences Review and Research*, January – February 2011; 6 (2), Article-003 Available online at [www.globalresearchonline.net](http://www.globalresearchonline.net)
- <sup>34</sup> M. Sudaroli and T. K. Chatterjee, Evaluation of red and white seed extracts of *Abrus precatorius* Linn. against Freund's complete adjuvant induced arthritis in rats., *Journal of Medicinal Plants Research*, November 2007; 1(4), pp. 086-094, Available online at <http://www.academicjournals.org/JMPR>.

- <sup>35</sup> Amol B. Choudhari, Sayyed Nazim, Ashish S. Khairnar, Pravin V. Gomase, Shaikh Afsar., Evaluation of Antiserotonergic Activity of Ethyl Acetate Extract of *Abrus precatorius* Leaves, *Journal of Pharmacy Research* 2011,4(3),570-572 ,Available online through [www.jpronline.info](http://www.jpronline.info)
- <sup>36</sup> Manoharan Sathish \*, Ramachandran Balaji, Ajithadas Aruna, Vedhaiyan Niraimathi, Ganesan Manikandan, Murugesu Bose Venkatesh Babu, Pachamuthu Vijayan, preliminary phytochemical and cytotoxic property on leaves of *abrus precatorius* linn, *journal of Herbal Medicine and Toxicology* 4 (1) 21-24 (2010).
- <sup>37</sup> Bhutia, Sujit K.; Mallick, Sanjaya K.; Maiti, Tapas K., In vitro immunostimulatory properties of Abrus lectins derived peptides in tumor bearing mice., *Phytomedicine: International Journal of Phytotherapy & Phytopharmacology*.
- <sup>38</sup> S. Nazar , S. Ravikumar\* , G. Prakash Williams1, M. Syed Ali and P. Suganthi, Screening of Indian coastal plant extracts for larvicidal activity of *Culex quinquefasciatus*, *Indian Journal of Science and Technology*, Vol.2 No 3 (Mar. 2009) ISSN: 0974- 6846.