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# RESEARCH ARTICLE

## XANTHIUM STRUMARIUM L. (COCKLEBUR): A REVIEW ETHNOMEDICINAL RELEVANCE, PHYTOCONSTITUENTS, AND PHARMACOLOGICAL PERSPECTIVES

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## ABSTRACT

*Xanthium strumarium L.*, commonly known as Cocklebur, is a widely distributed medicinal plant belonging to the Asteraceae family. Traditionally used across Asia, Europe, and the Americas, it has gained attention for its therapeutic potential in treating ailments such as rhinitis, headaches, fever, and skin conditions. This review comprehensively explores the plant's traditional uses, botanical characteristics, phytochemical constituents, pharmacological activities, and toxicological aspects. The plant contains a wide spectrum of bioactive compounds, including sesquiterpene lactones, flavonoids, phenolic acids, and alkaloids, which contribute to its reported antibacterial, antifungal, antiviral, anti-inflammatory, hypoglycemic, antitussive, and anticancer effects. Despite extensive in vitro and in vivo research, clinical validation remains limited. Furthermore, most studies have focused on the fruits, while other plant parts remain underexplored. This paper emphasizes the need for detailed pharmacokinetic studies, safety assessments, and clinical trials to validate traditional claims and fully realize the therapeutic potential of X. strumarium. The findings underscore its promise as a valuable natural resource for the development of plant-based pharmaceuticals.



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# INTRODUCTION

The common medicinal plant *Xanthium strumariumL.* is a member of the Asteraceae family. The plant is found in America, China, India, Pakistan, and Eurasia. Chota dhatura and Common Cocklebur are the local names for *Xanthium strumarium L*. Its 950 genera have 20,000 species that grow as climbers, trees, shrubs, and herbs all throughout the planet. In the tropical regions of India, it is frequently found as a weed along roadsides, in rice fields, and in hedges. The annual herb *Xanthium strumarium* can grow up to one meter in height. The robust stems of *Xanthium strumarium L*. are rough, hairy, and green, brownish, or reddish-brown in colour. They are frequently speckled with red.Fruits are glandular, cylindric to ovoid, two-chambered burs that are 1 to 4 cm long and covered in hooked prickles. Two longer, incurved prickles protrude from the bur's apex. (N. S. Chopra RN 1958). Furthermore, there is growing evidence that *X. strumarium* has a broad range of pharmacological activities, such as anti-inflammatory and analgesic properties, antioxidant properties, hypoglycemic properties, anti-cancer properties, antibacterial and antifungal properties, anti-trypanosomal properties, anti-tussive properties, effects on the digestive and neurological systems, and more (Kamboj and Saluja 2010). Chemical components include steroids; alkaloids, flavonoids, triterpenoids, terpenoids, tannins, saponins, quinone, coumarin, protein, sugar, and gum are responsible for these therapeutic effects.

### BOTANICAL DISCRIPTION

- **Botanical name:**Xanthium strumarium
- **Family name:**Asteraceae
- **Common name:**Common Cocklebur, Cockleburr, Rough Cocklebur
- **Part used:**The whole plant, especially root and fruit
- **Habitat:**India, Nepal, Pakistan, Bangladesh, Australia, South Africa, and America

In an effort to advance research into fully utilizing the medicinal properties of this plant, we have compiled in this study the traditional applications, botany, phytochemistry, pharmacology, pharmacokinetics, and safety aspects of *X. strumarium*. Furthermore, *Xanthium strumarium L.* is highlighted along with possible study avenues.

**Traditional usages**: *X. strumarium* has a long history for utilization as a medicinal plant in China due to its extensive biological and pharmacological activities. In particular, the fruit is the predominant medicinal part of *X. strumarium*, and is one of the most common used herbal medicines to treat rhinitis and headache for thousands of years [(Medicine 1986)The herb is used a reputed medicine in Europe, China, Indochina, Malaysia and America. The whole plant, especially root and fruit, is used as medicine. According to Ayurveda, the plant has

**Fig.1. Fruit of*X. strumarium L***

**Fig. 2. Plant of*X. strumarium L.***

cooling, laxative, fattening, anthelmintic, alexiteric, tonic, digestive, antipyretic activities and improves appetite, voice, complexion and memory. It cures leucoderma, biliousness, poisonous bites of insects, epilepsy, salivation and fever. The plant has been reported as fatal to cattle and pigs.(Masvingwe C 1998)The leaves and roots are used for their anodyne, antirheumatic, antisyphilitic, appetiser, diaphoretic, diuretic, emollient, laxative and sedative activities. An infusion of the plant has been used in the treatment of rheumatism, diseased kidneys and tuberculosis. It has also been used as a liniment on the armpits to reduce perspiration (N. S. Chopra RN 1958) (N. S. Chopra RN, Glossary of Indian Medicinal Plants. New Delhi 1986).Cocklebur was cultivated as a leafy vegetable in China. Young floral tops and the two leaves below are boiled in water and eaten as a pot-herb in Assam. The herb as such is suspected to be poisonous but the toxic substances are removed by washing and cooking(N. S. Chopra RN, Glossary of Indian MedicinalPlants. New Delhi: 1945)] Xanthium is classified in modern Materia Medicas as either a herb for dispelling wind chill or a herb for dispelling wind damp. Its modern uses are mainly for allergy-type disorders, specifically allergic rhinitis, atopic dermatitis (urticaria), chronic paranasal sinusitis and chronic eczema.(S 2003).

## CHEMICAL CONSTITUENT:

The plant's aerial parts are thought to contain a variety of unknown alkaloids that are harmful. In addition to alkaloids, the plant's aerial parts contain sesquiterpene lactones, such as xanthinin, its stereoisomer, xanthumin**,** and xanthatin (deacetylxanthinin); phytosterols, xanthanol**,** isoxanthanol**,** xanthinosin, 4-oxo-bedfordia acid, hydroquinone, xanthanolides, and a toxic principle, a sulphated glycoside (Malik MS 1992)(Marco JA 1993)(Winters TE 1969)(Minato H 1965) caffeoylquinic acids; α and γ-tocopherol thiazinedione,(Qin L 2006)2.11,(13)-xanthatriene-12, 4-oxo-1(5),Linoleic acid and 8-olide, also referred to as "deacetyl xanthumin," are antifungal substances**.** Carboxyatractyloside, a kaurene glycoside formerly known as xanthostrumarium**,** has been discovered as the primary poisonous chemical extracted from the plant(Macleod JK 1990). In addition to carboxyatractyloside CAT, potentially toxic ingredients include several sesquiterpene lactones (e.g. guaianolides, germacranolides, and elemanolides).(Roussakis H 1994).Three xanthanolide and xanthane-type sesquiterpenoids are found in the aerial parts: 11α,13-dihydroxanthatin, 4β,5 βepoxyxanthatin-1α,4α-endoperoxide, and 1β,4β,4α,5α-diepoxy xanth-11(13)-en-12-oic acid(AA 1998 ). a dimeric xanthanolide, sesquiterpene lactones(Ahmed A 1999)] 8-epixanthatin, 2-epixanthumin and 8-epi-xanthatin-5β-epoxide. Caffeic acid, potassium 3-O-caffeoylquinate, 1-O-caffeoyl quinic acid, chlorogenic acid, 4-O-caffeoylquinic acid, 1,4-di-O-caffeoylquinic acid, 1,5-di-O-caffeoylquinic acid, 3,5-di-O-caffeoylquinicacid, 4,5-di-O-caffeoylquinic acid, 1,3,5-tri-O-caffeoylquinic acid, 3,4,5-tri-O-caffeoylquinic acid, and cynarin are the phenols that were isolated(Ma Y 1998)(I 2004). Choline, hydroquinone, and a third, unnamed, poisonous chemical are the seeds' main hazardous ingredients. In addition to this, the seeds have a significant amount of iodine(N. S. Chopra RN, Glossary of Indian Medicinal Plants 1945) (N. S. Chopra RN, Glossary of Indian Medicinal Plants 1986). The fruits are rich in vitamin C**.** Thiazinediones isolated from the fruits are 7-hydroxy methyl-8,8-dimethyl4,8-dihydrobenzol [1,4] thiazine-3,5-dione-11-O-β-dglucopyranoside (Han T 2006)] 2-hydroxy-7-hydroxymethyl-8,8- dimethyl-4,8-dihydrobenzol [1,4] thiazine-3,5- dione-11-Oβ-d-glucopyranoside, 7-hydroxymethyl-8,8- dimethyl-4,8-dihydrobenzo[1,4] thiazine-3,5-dione, 7-hydroxymethyl-8,8-dimethyl- 4,8-dihydrobenzol[1,4] thiazine-3,5-dione-(2-Ocaffeoyl)- β-d-glucopyranoside, ferulic acid, formononetin and ononin.(Han T 2006)The powdered shell of fruit can be used for making activated carbon. The shells contain 15.9% pentosans and can be used as a raw material for the synthesis of furfural.(Srivastava RC 1950) The young fruit contains glucose, fructose, sucrose, organic acids, phosphatides, potassium nitrate, β-sitosterol, γ-sitosterol, β-d-glucoside of β-sitosterol called strumaroside.(Bhakuni DS 1971)(CriagJr JC 1976)(S. R. Bisht NPS, Chemical Investigation of the leaves Xanthium Strumarium L 1977)] The total free amino acid content is 1.65%. It includes amino-n-butyric acid, arginine, aspartic acid, cystine, glutamic acid, methionine, proline, tryptophan in micromoles per milligram dry weight.(S. R. Bisht NPS, Chemical Investigation of the leaves of Xanthium Strumarium L 1978)(Mondal AK 1998)The stem oil is characterised by large amounts of monoterpenes (49.4%) and sesquiterpenes (29.1%); the leaf oil is also characterised by higher amounts of monoterpenes (55.8%) than sesquiterpenes (26.4%). The oil is light yellow, odourless and has the same taste as other vegetable oils. Oil contains d-limonene (35.0%), d-carveol (25.0%), α-ionone (10.5%), terpinolene (7.0%), β-caryophyllene (6.0%) and p-cymene (5.0%)(Habibi Z 2004)(Cole RJ 1980)The essential oil obtained by hydrodistillation of the stems and leaves was analysed by gas chromatography (GC) and GC/mass spectrometry (MS). Twenty-two compounds representing 86.4% of the stem oil were identified, among which bornyl acetate (19.5%),

limonene (15.0%) and β-selinene (10.1%) were the major ones. The leaf oil of the plant is characterised by higher amount of limonene (24.7%) and borneol (10.6%) among the 28 components comprising 85.2% of the total oil detected. Steam distillation of the essential oil of *X. strumarium* under pressure gave in decreasing amounts: limonene, carveol, terpineolene, β-caryophyllene, p-cymene, sabinene, bornyl acetate, β-cubebene and a trace of α-pinene.g Sesquiterpenes (germacrene D) constituted the major part of the volatiles in Iran.(Singh G 1976)(Esmaeili A 2006) Fatty acid composition of oil includes unsaturated fatty acids like oleic, linoleic, palmitic, stearic, behenic acid and saturated fatty acids include capric, lauric, myristic and palmitic acid .(Bhargava PP 1960)

**Pharmacology activity:** Antibacterial and Antifungal Effects In 1983, Mehta et al. reported that the WEXFT possessed antimicrobial properties against Vibrio cholera. Later, a study in 1997 revealed that the xanthatin isolated from the leaves of *X. strumarium* had notable potent activities against Staphylococus epidermidis, Bacillus cereus, Klebsiella pneumoniae, Pseudomonas aeruginosa and Salmonella fyphi with minimum inhibitory concentration (MIC) values of 31.3, 62.5, 31.3, 125 and 125 μg/mL, respectively (Mehta P. 1983). In addition, it is reported that MEXL (500 and 100 mg/mL) exhibited strong activity against K. pneumoniae, Proteus vulgaris, P. aeruginosa, Pseudomonas putida, Salmonella typhimurium, B. cereus, Bacillus subtilis and S. epidermidis(Sato Y. 1997). In 2015, Chen et al. also reported that β-sitosterol and β-daucosterol isolated from the *X. strumarium* have significant inhibitory effects against Escherichia coli, with MIC values of 0.17 and 0.35 mg/mL, respectively(Srinivas P. 2011)By using the disc diffusion method, Devkota et al. determined the antibacterial activity of MEXL and WEXL, and results showed that the two extracts inhibited growth towards K. pneumoniae, Proteus mirabilis, E. coli, B. subtilis, Enterococcus faecalis and Staphylococcus aureus at concentrations of 50, 100, 150, 200 and 250 mg/mL(Chen W.H. 2015)Moreover, Sharifi-Rad et al. revealed that EOXL can significantly suppress the growth of S. aureus, B. subtilis, K. pneumoniae and P. aeruginosa with MIC values of 0.5, 1.3, 4.8 and 20.5 μg/mL, respectively; additionally, EOXL (30, 60 and 120 mg/mL) also exhibited obvious antibacterial activity against Shiga toxin-producing Escherichia coli [(Devkota A. 2015)(Sharifi-Rad J 2015)Furthermore, Wang et al. revealed that WEX possessed antibacterial potentials against S. aureus and E. coli with MIC values of 31.25 and 7.81 mg/mL, respectively [68]. Using the disk diffusion, the antibacterial activity of EOXF on Rathayibactertoxicus and Pyricularia oryzae was evaluated, and the MIC values were 25 and 12.5 μg/mL, respectively (Ghahari S., Biochemical Composition,Antioxidant and Biological Activities of the Essential Oil and Fruit Extract of Xanthium strumarium Linn 2017)Similar to the antibacterial potentials, the antifungal activities of *X. strumarium* were also deeply investigated. In the year of 2002, Kim et al. found an antifungal constituent from *X. strumarium,* which was named deacetylxanthumin. It can inhibit mycelial growth and zoospore germination of Phytophthora drechsleri with a MIC value of 12.5 μg/mL.(Sharifi-Rad J. 2016). In 2011, Yanar et al. used radial growth technique to test the antifungal activities of MEX against Phytophthora infestans, and the MEX showed the lowest MIC value of 2.0% w/v which was lower than the standard fungicide (Metalaxyl 4% + Mancuzeb 64%, MIC value was 2.5%, w/v)(Wang W. 2016)Later, in 2015, Sharifi-Rad et al. investigated the antifungal ability of EOXL on Candida albicans and Aspergillus niger, and the MIC values were 55.2 and 34.3 μg/mL, respectively. In vitro, using the disk diffusion method, the EOXL exhibited strong inhibition against Pyricularia oryzae and Fusarium oxysporum with MIC values of 12.5 and 50 μg/mL, respectively(Ghahari S. 2017)Furthermore, the EOXL showed remarkable growth inhibition of a wide spectrum of fungal strains, such as A. niger, Aspergillus flavus, F. oxysporum, Fusarium solani, Alternaria alternata and Penicillium digitatum with both MIC and MBC (minimum bactericidal concentration) values of 8 μg/mL(Yanar Y. 2011)

**Antiviral Activity**

In 2009, it was reported that the WEX (0.01, 0.1 and 1.0 g/kg, i.g., for 10 days) possessed antiviral activity against duck hepatitis B virus, and it can delay pathological changes [(Li X.M. 2016)Inaddition, five compounds were isolated from the fruits of *X. strumarium*, and their antiviral abilities were also evaluated. The results indicated that norxanthantolide F, 2-desoxy-6-epi-parthemollin, xanthatin, threoguaiacylglycerol-8′-vanillic acid ether and caffeic acid ethyl ester exhibited notable activity against influenza A virus with IC50 values of 6.4, 8.6, 8.4, 8.4 and 3.7 μM, respectively by a cytopathic effect (CPE) inhibition method(Li T.X. 2017)(Liu Y. 2009)

**Antifungal Activity**

The plant has potent antifungal activity against pathogenic as well as non-pathogenic fungi due to the presence of terpenes, d-limonene and d-carveol.(S. R. Bisht NPS 1978)The antifungal compound from plant was identified as 4-oxo-1(5),2,11,(13)- xanthatriene-12, 8-olide, known as "deacetyl xanthumin." Fresh sap from *X. strumarium* at 50-fold dilution was highly effective in controlling the disease incidence in pot and field trials. Crude extracts of the plant inhibited mycelial growth and zoospore germination of Phytophthora drechsleri, the causal agent of Atractylis rot, in vitro at a concentration of 12.5 and 15.6 μg/ml, respectively.(C. K.-S. Dong KK 2002) The leaf extract of plant may be used as a potent fungitoxicant against the mycelial growth of Fusarium moniliforme. (Kishore N 1982)Amerjothy et al. studied the hexane, ethylacetate and alcoholic extracts of the leaves for their antimicrobial (antifungal, antibacterial) activities by disc diffusion assay. The antifungal activity was compared with that of fluconazole and nystatin as standards. Hexane extract showed marked inhibition against C. albicans, Aspergillus niger, P. aeruginosa and S. aureus at a concentration of 200 μg/disc. Ethylacetate extract showed an inhibition against A. niger, S. aureus and E. coli at a concentration of 200 μg/disc. Alcoholic extract showed an inhibition only against S. aureus at a concentration of 200 μg/disc.(Amerjothy S 2007)The plant possesses significant potency against C. neoformans and Candida species with low toxicity to brine shrimps. The 4,5-dihydroxyl groups in the quinic acid moiety were necessary for the activity and introduction of a free amino group increased the inhibitory activity against Aspergillus fumigatus.(Ma C 2007)

**Hypoglycaemic Activity:** The plant exhibited potent hypoglycaemic activity in the rat.(M. A. Favier LS 2005)(Kupiecki FP 1974) The antihyperglycaemic effect of caffeic acid and phenolic compounds present in the fruit of *X. strumarium* was investigated. After an intravenous injection of caffeic acid into diabetic rats of both streptozotocin-induced

and insulin-resistant models, a dose-dependent decrease of plasma glucose was observed. However, a similar effect was not produced in normal rats. An insulin-independent action of caffeic acid can thus be considered. Otherwise, this compound reduced the elevation of plasma glucose level in insulin-resistant rats receiving a glucose challenge test. Also, glucose uptake into the isolated adipocytes was raised by caffeic acid in a concentration-dependent manner. Increase of glucose utilisation by caffeic acid seems to be responsible for the lowering of plasma glucose.(Hsu FL 2000)Carboxyatractyloside also possesses hypoglycaemic activity.[59](C. G. Fouche G 2008)

**Antimitotic activity:** X. strumarium may possess antimitotic components. In a study, the plant was screened for its antimitotic activity using the microtubule-tubulin system isolated from mammalian tissue. The separated fractions obtained were identified and used for in vitro polymerisation studies. The whole as well as partially separated chemical constituents showed effective inhibition of tubulin polymerisation (Menon GS 2001).

**Antitussive Activity:** Mandal et al. showed that the extract possesses significant antitussive activity in a dose-dependent manner in mice. The antitussive potential of extract was comparable to that of codeine phosphate (10 mg/kg), a standard drug. The extract at a dose level of 100, 200 mg/kg (p.o.) showed significant inhibition of cough reflex by 39.75 and 65.58%, respectively, during 2 hours of the experiment.(C. K.-S. Dong KK 2002),(Mandal SC 2005).

**Antibacterial, Antitumour and Anticancer Activities:** The plant extract exhibited antimicrobial activity against Proteus vulgaris, Staphylococcus aureus, Bacillus subtilis, Candida albicans and Candida pseudotropicalis. The activity is due to presence of xanthol.(Jawad AL 1988) The xanthinin contained in plant acts as a plant growth regulator and has antibacterial activity. Seed yields semi-dry edible oil (30–35%) which resembles sunflower oil and is used in bladder infection, herpes, and erysipelas.(Oudhia P 1998),(Sastry TC 1990) Two xanthanolide sesquiterpene lactones, 8-epi-xanthatin and 8-epi-xanthatin-5β-epoxide,[1,2] isolated from the leaves demonstrated significant inhibition on the proliferation of cultured human tumour cells, i.e. A549 (non-small cell lung), SK-OV-3 (ovary), SK-MEL-2 (melanoma), XF498 (CNS) and HCT-15 (colon) in vitro. They were also found to inhibit the farnesylation process of human lamin-B by farnesyltransferase, in a dose-dependent manner in vitro. [(Rodriguez TE 1976),(L. T. Kim HS 2003),(Kupchan SM 1971) Alcoholic solution of xanthinin in concentration of 0.01–0.1% showed strong antibacterial activity against gram-negative bacteria and fungi.(Little JE 1950)] In a study, the antibacterial activity of each extract (ether or ethylacetate under neutral, acidic and alkali conditions) was tested against 16 strains of bacteria, 2 strains of yeast and 2 strains of fungus. The ether neutral extract exhibited the strongest growth inhibition upon the eight strains of gram-positive bacteria, six strains of gramnegative bacteria and Cryptococcus neoformans. Fluorescein diacetate (FDA) testing of XE-N and XEA-N showed growth inhibition of the three strains of Escherichia coli, S. aureus and C. albicans even at 30 ng/ml and with the exception of Pseudomonas aeruginosa. The results of antitumour activities of the crude extract and of its purified compounds showed that XE-N-S1 had the best antitumour activity against HeLa cells. In terms of antitumour activity against HepG2 cells, XE-N-S1 and XE-N-S3 were superior; against HT29 cells, XE-N and XE-N-Sl had a good activity; against Saos2, NCI H522, NCI H1703 and Clone M3 cells, XE-N-51 was very active; against LN CAP cells, XE-N-S3 was the best. Comparing the cellular toxicities of various extracts and purified compounds with the existing antitumour agents, XE-A and XEA-A and XEA-B were found to have the lowest toxicity and XE-B had a lower toxicity than etoposide. XE-N-S1 and XE-N-S3 showed higher toxicities than etoposide and the toxicity of XE-A-S3 was higher than that of etoposide and lower than that of cisplatin.(L. T. Kim HS 2003)] Xanthatin showed the strongest gastric protective activity. In a study, the inhibitory action exerted by this molecule on the lesions induced by 0.6 N HCl and 0.2 N NaOH was highly significant, reducing ulceration in the range of 58–96% at a dose from 12.5 to 100 mg/kg in rats. These results appear to confirm that the presence of a non-hindered 4,5-unsaturated carbonyl group seems to be an essential structural requirement for the gastric cytoprotective activity of these compounds. In order to explore this possibility, a theoretical conformational analysis was performed. The mechanism of protection would involve, at least in part, a nucleophilic attack of the sulfhydryl group from the biological molecules present in the gastric mucosa to electrophilic carbons accessible in suitable Michael acceptors.(M. A. Favier LS 2005)Gautam et al. tested the plant extract for in vitro antimycobacterium activity and found that the ethylacetate extract and MeOH-petroleum ether extract possess significant in vitro antimycobacterium activities against Mycobacterium tuberculosis and Mycobacterium smegmatis. Ethyl acetate extract exhibited 4 mm zones of inhibition at 20 mg/ml in agar-well diffusion assay using streptomycin sulphate (1 mg/ml) as positive control showing 20 mm zones of inhibition.(McChesney JD 1985) The petroleum ether and methanol extracts exhibited 70 and 12% inhibition, respectively, at 1 mg/ml in radiorespirometry assay using BACTEC system with rifampin (2 μg/ml) and clarithromycin (32 μg/ml) as positive controls.(Gautam R 2007) The plant also possesses anticancer activity. Fouche et al. screened the plant extract for in vitro anticancer activity against a panel of three human cell lines (breast MCF7, renal TK10 and melanoma UACC62) at the CSIR. The plant extract that exhibited anticancer activity against these three human cell lines was screened by NCI against 60 human cancer cell lines organised into sub-panels representing leukaemia, melanoma, cancer of the lung, colon, kidney, ovary, CNS, breast and prostate.[(C. G. Fouche G 2008)

**Toxicity and unwanted effect:** Despite its potential clinical use, *Xanthium strumarium* caused manyside effects, such as depression, vomiting, abdominal pain, weakness, recumbency, paddling convulsions terminating in death between 6 and 96 h after ingestion have been reported in farm animals [7-10. Microscopically, acute hepatic congestion and haemorrhage, centrilobular hepatocyte necrosis, with occasional binucleation together with discoid lysis of skeletal and cardiac muscle fibresare the changes which have been observed auto toxicity induced by XSF has also been reported in humans and the clinic signs are similar to those observed in animals Another toxicological study on male rats revealed that metabolism of CAT may have a role in its cytotoxic and lethal effects. Clinical signs of toxicosis, duration of illness, lethality, gross lesions and hepatic and renal histopathological lesions were recorded. The CAT toxicosis has independent lethal and cytotoxic components, which could be partly due to an active metabolite formed by de novosynthesised P450–P448-

independent haemoprotein, while CATdetoxification may occur partly through haemoproteinindependent, (phenyl butazone) PBZ-inducible enzyme, and partly through a P448-dependent (BNF-inducible) enzyme; and CAT detoxification apparently is not P450- or GSH-dependent .[90,91] Atractyloside poisoning is an infrequent, but often fatal, form of herbal poisoning, which occurs worldwide, especially in Africa and the Mediterranean regions. The primary mechanism of atractyloside poisoning is known to be inhibition of the mitochondrial ADP transporter. Atractyloside in large amounts gives rise to massive necrosis, but in vitro studies have shown that at lower doses the cells progress to apoptosis.Symptoms of poisoning appear in several hours. Gait, gloom, muscle contraction, the spasm, lying down, breath and heart rate it increases, with critical example 12-24 dies being hour reach(Anjoo Kamboj 2010)

**Future Perspectives and Conclusions:** In summary, *X. strumarium*, which possesses anti-AR effects, anti-inflammatory and analgesic effects and anti-tumor effects, has been widely applied to clinical practice in many countries. In the meantime, many modern studies on *X. strumarium* were also carried out, and its pharmacological activities and chemical compositions have been preliminarily investigated. Nevertheless, how to find out the mechanism of pharmacological activities and its related compounds, develop clinical efficacy of *X. strumarium* and ensure medication safety are still extremely crucial now. First, the chemical compounds and pharmacological activity studies of *X. strumarium* mainly focused on its fruits, but there are few investigations on the roots, leaves, stems and other parts of *X.strumarium*. In order to enlarge the source domain of the active compounds and maximize the plant utilization rate, it is very critical for researchers to conduct a comprehensive evaluation of other parts of this plant. The pharmacological studies so far have mostly been performed in vitro and in vivo with animals. Therefore, clinical studies are urgently needed in order to confirm traditional wisdom in the light of a rational phytotherapy. Even today, plants are the almost exclusive source of drugs for a majority of the world's population. Therefore, it remains a challenge for scientists to provide efficient, safe and cheap medications, especially for rural areas. The plant is widely distributed in North America, Brazil, china, Malaysia and hotter parts of India. Their quantification of individual phytoconstituents as well as pharmacological profile based on in vitro, in vivo studies and on clinical trials should be further investigated. *Xanthium strumarium L.,* a member of the Asteraceae family, has emerged as a pharmacologically rich medicinal plant with a diverse array of bioactive constituents including sesquiterpene lactones, flavonoids, alkaloids, and phenolic compounds. Traditionally used in various cultures for ailments such as rhinitis, fever, and skin disorders, modern scientific investigations have validated its antibacterial, antifungal, antiviral, anti-inflammatory, hypoglycemic, and anticancer potentials. However, most of the pharmacological studies to date are preclinical and focus predominantly on the fruits, leaving other plant parts relatively unexplored. In addition, while the plant shows promising activity in vitro and in animal models, rigorous clinical trials are required to establish its safety and efficacy in human subjects. Future research should aim to isolate and quantify the key bioactive compounds from all plant parts, elucidate their mechanisms of action, and conduct well-designed clinical studies. A comprehensive pharmacokinetic and toxicological profile is also essential to ensure safe therapeutic applications. Given its wide availability and ethnomedicinal relevance*, X. strumarium* holds substantial promise for the development of affordable, plant-based therapeutics, particularly in resource-limited settings.

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