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Research Paper

Hepatoprotective activity of Aerva Javanica Plant against Cyclophosphamide induced Hepatotoxicity

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Aerva Javanica Plant belong to Family: Amaranthaceae. In Western Australia it tends to Grow in sandy soils. This Plant Grow in Desert Aeria Mainly Rajasthan, Gujarat, Maharashtra In India. The extensive research carried out on Aerva Javanica in six decades reveals that it possess a wide variety of pharmacological activities.. In traditional medicine this plant has many uses. Aerva Javanica Plant are used in diuretic activity and inflammation and diabetes , Nephroprotective, anti-spasmodic, hypoglycemic, anti-parasitic, anti-microbial, anti-asthmatic, anti-fertility, hypolipidemic. A gargle is made from the plant to treat toothache.. It contains alkaloid, flavonoids, phenol, tannin, proteins, amino acids, steroids, saponins and carbohydrates, polyphenols, terpenoids, flavonoids, and alkaloids . The present review is aim plant, Aerva javanica possessing Hepatoprotective activity. This review article has made an attempt to compile all the information available through the extensive research that has been done so far on Aerva Javanica. The Main object of this review artical to introduce Aerva Javanica Plant used in hepatoprotective activity against cyclophosphamide induce hepatotoxicity.

Keywords: Amranthaceae, Secondary Metabolites, Bioactive Phytoconstituents.

INTRODUCTION

The Utilization of herbs as medicinal agents has a long history which is as old as human civilization. Around half of the population of higher flowering plants species possess high degree of medicinal importance that has been used by households since thousands of years in India. The increased demand of herbal drugs gives rise to the researchers to investigate the plants with unknown pharmacological activities.

Amaranthaceae is a tall and woolly undershrub found india Pakistan and Westren Australiya and Mainly found in Rajasthan and Guajrat Maharashtra.

1. Description of Plant(1)

The Plant Aerva Javanica belonging to the family

Division	Magnoliophyta
Class:	Dicotyledonae
Subclass	Monochlamydeae
Series	Curvembryeae
Family	Amaranthaceae
Genus	Aerva
Species	Javanica (Burm.f.)



Fig.-1 Aerva Javanica Plant

1.1-Common Name of Aerva Javanica Plant in India⁽²⁾

Indian Languages	Vernacular Names of Aerva Javanica
Sanskrit	Astrmabayda
Gujarati	Patharphod, Bur
English	Desert cotton, Javanese wool plant
Hindi	Patharphori

1.2-Geographical Source Distribution

India, Burma, Baluchistan, Sind, Deccan, Egypt, Arabia, Wildly distributed in Rajasthan , Saurashtra and kachchh in india⁽³⁾.

It has great nutritional and medicinal importance⁽⁴⁾. It has been used as stuff for pillows, medicinal remedies for the treatment of infectious diseases in human and veterinary⁽⁵⁾. It has been reported to constitute various biochemical, phytochemical and antioxidant

compounds such as carbohydrates, proteins, fiber, fats, steroids, triterpenes, flavonoids, tannins, saponins, alkaloids, sulphates and glycosides⁽⁶⁾. Leaves contain essential oils such as hentriacontane, pentacosane, nonacosane, heptacosane, octacosane, while stem contains , octacosane, heptacosane, hentriacontane, squalene and t⁽⁷⁾. This herb is deep rooted, and is used as soil binder in desert reclamation. In traditional medicine this plant has many uses. A gargle is made from the plant to treat toothache .^(7,8)

1.3-Medicinal Uses

This Herb is used in diabetic, diuretic activity and demulcent⁽⁹⁾. The decoctions of the A. javanica are used to remove swelling and powder of this plant is applied externally to ulcers in domestic animals⁽¹⁰⁾. The seeds are used to relieve headache. Paste made up of inflorescence and leaves is used externally to heal the wounds and inflammation of joints. Decoction of plant is used as a gargle for toothache⁽¹¹⁾. The whole A. javanica plant is used for the purpose of chest pain, ascaris and diarrhea with blood⁽¹²⁾ . The presence of carbohydrates, steroids, triterpenoids and flavonoids has been reported earlier in Aerva javanica⁽¹³⁾ .

1.4-Chemical Constituents

Aerva javanica leaves was found to be rich in hentriacontane , nonacosane , heptacosane ,



pentacosane , octacosane , triacontane and hexacosane , whereas the essential oil of stems was determined to be rich in nonacosane , heptacosane , hentriacontane , octacosane , triacontane and squalene .Phytochemical analysis and revealed the presence of three compounds, 3-hydroxy-4 methoxybenzaldehyde, ursolic acid and (E)-N-(4-hydroxy-3-methoxyphenethyl)-3-(4-hydroxy-3-ethoxyphenyl) acryl amide. isolation of new flavonol, isorhamnetin 3-O- [4'''-p-coumaroyl-a-rhamnosyl (1 6) galactoside]⁽¹⁴⁾, has been isolated from *Aerva javanica* along with it's an acylated derivative, its kaempferol analogue and various common kaempferol, quercetin and isorhamnetin glycosides. *Aerva persica* burm.f. contains kaempferol, sterol, triterpenes, flavonoids, β -sitosterol, -amyrin, palmitic acid, stearic acid, linoleic acid, myristic, oleic acid, palmitic acid, aervanone, alkaloids, Chrysin-7-Ogalactosidem. Various chemical constituents including steroids, triterpenes, lipids, flavonoids, tannins, saponins, alkaloids, sulphates, carbohydrates and glycosides have been isolated from this plant. Lupeol, mixture of myristic, palmitic, stearic and oleic acid esters, -amyrin, -sitosterol, betulinic acid, phytol, quercetin, quercetin-3-O-rutinoside, quercetin-3-O-xylosyl(1 2) rhamnoside and shikimic acid were isolated from the *Aerva javanica*⁽¹⁵⁾. There are approximately 28 species

of *Aerva* genus, but only a few species are medicinal of which *A. persica*, *A. lanata* and *A. javanica* are of great value. Roots and flowers are reported to possess hypoglycemic, antioxidant, anthelmintic, analgesic,antimalarial, antivenin activities and medicinal properties against rheumatism and kidney troubles. Chromatographic purification of ethyl acetate soluble⁽¹⁶⁾ fraction of the methanolic extract of the flowers of *Aerva javanica* yielded three new acylated flavone glycosides: kaempferol – 3-O- –D-[4'''-E-pcoumaroyl- –L- rhamnosyl (1 6)] - galactoside, kaempferol-3-O- -D-[4'''-E-p-coumaroyl- -Lrhamnosyl(1 6)]-(3''-E-p-coumaroyl) galactoside and kaempferol-3-O- -D-[4'''-E-pcoumaroyl- Lrhamnosyl(1 6)]-(4''-E-p-coumaroyl) galactoside. The Ethyl acetate extract of the fresh leaves of *A. javanica* yielded a compound which was identified as -sitosterol glucoside. Hentriacontane, nonacosane, nonacosanol, tritriacontane, tetratriacontane, sitosterol, and oleanolic acid were isolated from the ethyl acetate extract of fresh leaves of *A. javanica*⁽¹⁷⁾

1.5-Pharmacological Activity

Aerva Javanica Plant Show many pharmacological activity.these are many type.

- **Anti Bacterial Activity**⁽¹⁸⁾ – The crude extracts of different parts of *Aerva javanica* with hexane, chloroform and methanol. Methanolic extract of



flower and leaf have shown a wide range of phytochemicals and more anti-bacterial activity. HPTLC separation of extract coupled with bioautography studies revealed that apigenin followed by rutin and kaempferol has shown anti-bacterial activity against more number of bacteria. Farees ud din mufti has evaluated various extracts by using methanol, n-hexane, chloroform, ethyl acetate and aqueous fraction of *Aerva javanica* and *Paeonia emodi* for antibacterial activity against *Escherichia coli* (NCTC 10418), *Klebsiella pneumoniae* (ATCC 700603), *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Salmonella typhi*, *Staphylococcus epidermidis* (NCTC 11047) and Methicillin Resistant *Staphylococcus Aureus*.

- **Anti Ulcer Activity⁽¹⁹⁾**- phytochemical analysis and Enzyme Inhibition Assay of *Aerva javanica*. Inhibition of urease activity of various fractions revealed that ethyl acetate fraction showed significant activity ($P < 0.05$) as compared to other fractions. (E)-N-(4-hydroxy-3-methoxyphenethyl)-3-(4-hydroxy-3-ethoxyphenyl) acryl amide showed marked anti ulcer activity .

- **Anti Oxidant⁽²⁰⁾**- Various Antioxidants are the substances which prevent the oxidative damage to biomolecules by trapping endogenous free radical species; Levels of these species are controlled by antioxidant

defense system. The components of this system commonly include vitamins, phyto-derivatives of plants and minerals¹⁵. Disease protective function of phytochemicals is mostly due to their antioxidant activity against oxidative damage. A significant amount of phytochemicals may be extracted from desert cotton using these solvents. The results also favor the preferable use of water extract and methanol extract of desert cotton as a source of antioxidant in pharmaceutical formulations particularly for the prevention of oxidative stress caused by free radicals.

- **Anti Fungal Activity⁽²¹⁾** –*aerva javanica* plant show the antifungal activity against *Aspergillus flavus*, *Aspergillus fumigatus*, *Aspergillus niger* and *Fusarium solani*.

- **Anti-Diarrheic Activity⁽²²⁾**-to evaluated that dichloromethane and methanol extracts from the *Brucea javanica* seed and a methanol extract from *Quercus infectoria* nut gall showed the highest anti-diarrheic activity. *Aerva* species, *Aerva lanata* and *Aerva javanica* were screened separately for their anti-diarrhoeal activity. The results illustrate that the ethanolic and aqueous extracts of *A. lanata* and the ethanolic and aqueous extracts of *A. javanica* have significant anti-diarrhoeal activity and the activity may be attributed to its effect on intestinal transit.

- **Asignificant Antispasmodic Activity⁽²³⁾**

Phytochemical screening of the aerial parts of *Aerva javanica* Spring, (Amaranthaceae) growing in Egypt revealed the presence of carbohydrates and/or glycosides, tannins, saponins, alkaloids and/or nitrogenous bases, unsaturated sterols and/or triterpenes and flavonoids in both species. The aqueous extracts of the two species exhibited smooth muscle relaxant effect in a dose dependent manner as well as a significant antispasmodic activity.

- **Nephro Protective**⁽²⁴⁾. The alcoholic and aqueous extract of root of *Aerva javanica*

checked for its nephro-protective activity. The hexane fraction of alcoholic extract of root of *Aerva javanica* showed significant effect compared to other fractions as well as negative control.

- **Anti Microbial Activity**⁽²⁵⁾. Six natural products were isolated from the whole plant of *Aerva javanica* and were tested for their antimicrobial activity along with different crude extracts (n-hexane, chloroform, ethyl acetate, methanol and water) which displayed moderate to weak inhibitory activity. different plants including *Aerva javanica* to determine

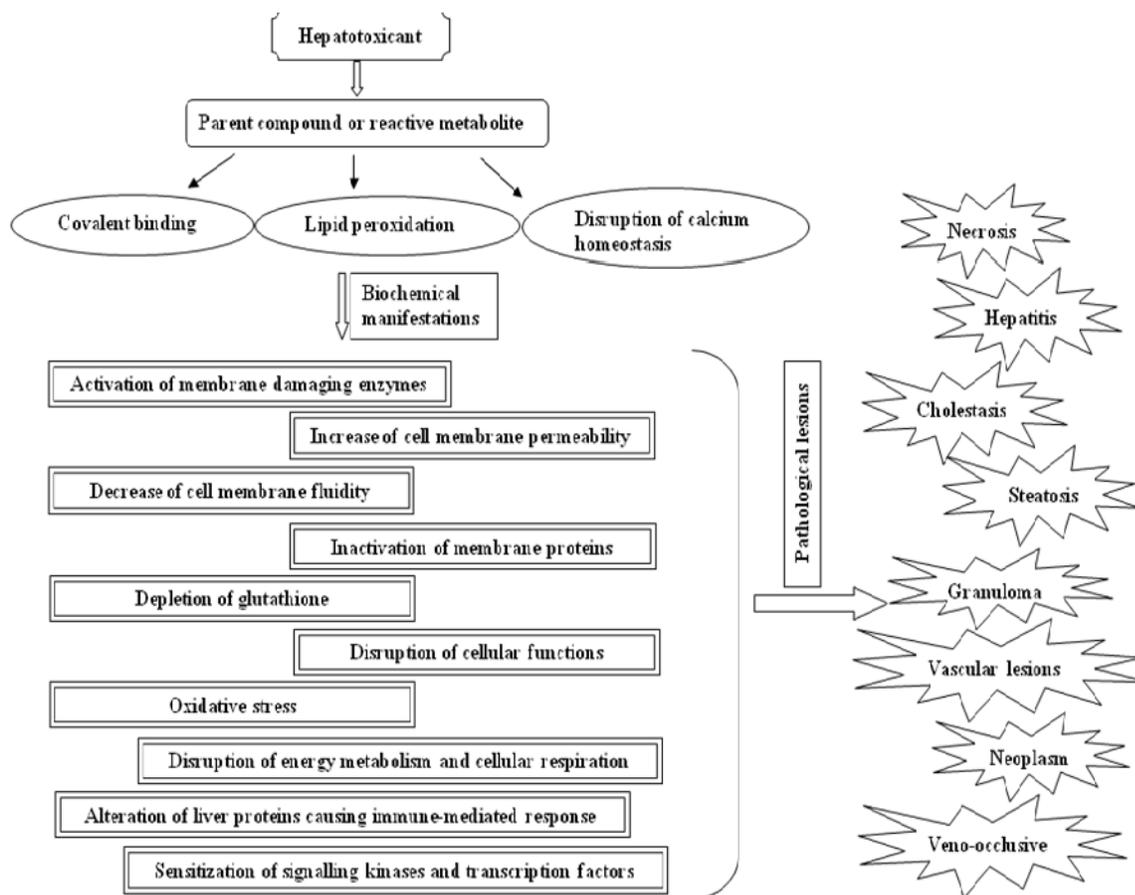


Fig. 2 Biochemical and Pathological Mechanism of Hepatotoxicity⁽³¹⁾



the ethno veterinary medicinal (EVM) practices for the treatment of different parasitic diseases of livestock in Cholistan desert, Pakistan.

• **As a Moderate To Weak Inhibitory Activity**⁽²⁵⁾. Six natural products were isolated from the whole plant of *Aerva javanica* and were tested for their antimicrobial activity along with different crude extracts (n-hexane, chloroform, ethyl acetate, methanol and water) which displayed moderate to weak inhibitory activity. *javanica* also showed antiviral, antiplasmodial and antidiabetic activities.

Hepatotoxicity

Hepatotoxicity Refers to Liver Dysfunction or liver Damage that is Associated with an overload of drugs or xenobiotics. The chemicals that cause liver injury are called hepatotoxins or hepatotoxicants. Hepatotoxicants are exogenous compounds of clinical relevance and may include overdoses of certain medicinal drugs, industrial chemicals, natural chemicals like microcystins, herbal remedies and dietary supplements⁽³⁰⁾. Certain drugs may cause liver injury when introduced even within the therapeutic ranges.

3- DRUG PROFILE

3.1-Cyclophosphamide- Cyclophosphamide is an antineoplastic compound that is chemically related to nitrogen mustard. Cyclophosphamide

is an odorless, fine white to off-white crystalline powder that is soluble in water and ethanol. Cyclophosphamide is an immunosuppressive and cytotoxic drug used in various medical problems as neoplasia, tissue transplantation. In human serum the half-life of cyclophosphamide is about 6.5 hours⁽³²⁾.

3.1.1-Metabolism of Cyclophosphamide -

Metabolism of CPH takes place in the liver and undergoes metabolic activation by cytochrome P450 isoenzyme 2B. Cyclophosphamide enzymatically metabolized into 4-hydroxycyclophosphamide, which exists in equilibrium with aldophosphamide. By the help of aldehyde dehydrogenase enzyme, most of the aldophosphamide oxidized and changes into carboxyphosphamide. A small fraction of aldophosphamide converts into toxic species like acrolein and phosphoramidate mustard. This acrolein is toxic for the epithelium of bladder⁽³³⁾.

3.1.2-Mechanism of Action

Cyclophosphamide is an alkylating agent of the nitrogen mustard type⁽³⁴⁾. An activated form of cyclophosphamide, phosphoramidate mustard, alkylates, or binds, to DNA. Its cytotoxic effect is mainly due to cross-linking of strands of DNA and RNA, and to inhibition of protein synthesis⁽³⁵⁾. These actions do not appear to be cell-cycle specific.



3.1.3-Side Effect of Cyclophosphamide

Cyclophosphamide-induced nucleic acid damage may lead to DNA mutations that result in cytotoxicity, carcinogenicity, teratogenicity, and reproductive toxicity following chronic exposure to CPH⁽³⁶⁾

4. CONCLUSION

From this review article it can be conclude that aerva javanica shows a versatile range of pharmacological properties such as anti-microbial, antifungal, anti-inflammatory and anti spasmolic anti daihrric activity anti bacterial . aerva javanica can be used for various therapeutic purposes. It provides a strong base for research work due to the presence of. alkaloid, flavonoids, phenol, tannin, proteins, amino acids, steroids, saponins and carbohydrates. Still, a lot of research work has to be done on aerva javanica to explore some more physiological actions of this plant.

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