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Phytochemical and Pharmacological Analysis of *Cyamopsis tetragonoloba*(L): A Review

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ABSTRACT

Guar (Cyamopsis tetragonoloba(L)) is an annual Herbaceous legume upto 3m in height, abundant in Tropical region of Africa and Asia. The plant has many indigenous system of Medications like Ayurveda, siddha and has been a part of many Traditional literatures. It is drought resistant and sustainable to wide range of soil types. In north Indian states it is cultivated for guar gum production and for use as forage. Plant is well known for its disease protective properties due to the presence of many bioactive components. Various parts such as leaves, seeds and pods are used in asthma, diabetes, inflammation, as Laxative, antibilious, anticholesteric, appetite depressor and hypolipidemic agent. Researchers have reported the presence of many essential Phytochemicals in plant responsible for the antioxidant activity of plant. Present review is an effort to describe the traditional uses, phytochemical identification, pharmacological activities and Bioactive components of plant.

Keywords: *Cyamopsis tetragonoloba(L)*, Antioxidant, Phytochemical.

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INTRODUCTION

India has great diversity in terms of Traditional heritage of Medicine, many drugs have been recognized by evaluating its Phytochemical, Pharmacological activities and made use for mankind. One of which is *Cymopsis Tetragonoloba (L)* Taub commonly called Guar “Cluster bean”.¹ It’s an annual crop of India and Pakistan, and parts of Tropical Africa. It contains about 24% Protein, 60% carbohydrate, 2% Fat and its rich in Vitamins and Phosphorus.² It is 2-9 feet in height, saw-toothed trifoliolate leaves, they have deep blue color flowers which are self pollinated.³ The pods are used as vegetables and fodder. Their cultivation varies from tropic to subtropic areas and are drought resistant.² Being a legume it has significant part to play in Protein and dietary fiber. It has many health benefits and nutritive values containing amino acid, fiber, trace elements, vitamins.⁴ Saponin and Flavonoids are the well known Phytochemicals of this plants, Saponin have Anti cancer, Antibacterial, Antiprotozoal effect. Flavonoids have many Beneficial effects such as Anti oxidant, Anti fungal, Antibacterial, Anticardiovascular, Anti inflammatory, Anticancer and Anti ageing.⁵ Pulses play a major role in restoring soil fertility through nitrogen fixation and sustain agricultural land.^{2,6} Seeds of Guar specifically Endosperm is rich source of Gum or Mucilage, Guar gum has wide application as Gelling agent used in plant tissue culture media. It is also a convenient adhesive applied in paint formulation.⁷ Recently Guar gum –galactomannan have shown to have property of potent hypocholesterolemic agent.⁸ Cluster bean (guar) is a cash crop used in textile, paper, petroleum, mining, Pharmaceuticals, explosives and food industry.⁹ Dietary tender cluster bean (*cymopsis tetragonoloba*) have found to have Gastroprotective effect and help reducing Oxidative stress by enhancing concentration of antioxidant enzymes (superoxide dismutase, catalase, glutathione reductase, glutathione-S-transferase, and GPX) and antioxidant molecules.¹⁰ various researches are carrying on to prove its potent Neutraceutical activity.

Taxonomy

Kingdom Plantae – Plants

Subkingdom Tracheobionta – Vascular Plants

Super division Spermatophyta – Seed plants

Division Magnoliophyta- Dicotyledons

Subclass- Rosidae

Order – Fabales

Family –Fabaceae-Pea family

Genus – *Cyamopsis* DC – *cyamopsis* P

Species- *Cyamopsis tetragonoloba* (L) Taubert – guar P

Traditional Uses

Cymopsis Tetragonoloba(L) is well known Traditional plant known used in folklore medicine.⁵ Leaves are rich in calcium and Protein, leaves are used to cure Asthama and night blindness.¹ Leaves contain Galactomannan. seeds and pod is used as antioxidant, laxative, anti inflammatory, antibilious. Folic acid and Ascorbic acid found in high amounts in Pods. Seeds are found to have tripsin inhibitory activity.¹¹ The plant is recognized as having Ayurvedic property useful in constipation, dyspepsia, anorexia, agalatia, hyetalopia and as digestive tonic.¹ Plant also posses virus inhibitory activity.¹² Guar seeds are used in pharmaceuticals and industries. Leaves are used boiled or stir-fried; green pods used boiled, stir-fried, or dried for storage; dry seeds processed for gum as thickener.¹

Phytochemistry

Phytochemical testings were done on different parts of *cymopsis tetragonoloba*(L), many phytochemicals were found in leaves, seed and pod of the plant. Many researches been carried out on the plant so far. Carbohydrates, proteins, fibers, galactomannans, ascorbic acid and condensed tannins together with, **Caffeic acid**, gallic acid, p-coumaricacid, astragalin, P-hydroxycinamyl and gentisic acid, and coniferyl alcohol found in leaves and pod of the plant.¹ Saponin and Flavonoid are the beneficial contents of plant found in abundance, both are responsible for providing many advantageous effect in human health, as they govern many properties like antioxidant, antibacterial, anticancer, anti-inflammatory, antifungal, antiprotozoan.⁵ seeds of plant shows the presence of Saponin, Quinone, Phenol, Steroids, Flavonoids and Terpenoids.⁶ Polyphenolic content of guar seed varies with different maturity age as 1.26 to 0.69% total phenols, 0.13 to 0.23% Favanol, 0.24 to 0.12% Gallic acid, 0.5 to 0.21% Gallatannins(all as percentage dry matter). The polyphenolic content of guar leaves varied from 0.74 to 1.24% total phenols; 0.18 to 0.84% flavonols; and 0.05 to 0.24% hydroxycinnamic acids as percentage of dry matter of guar leaves.¹³

Antioxidant activity of the plant was measured and found the presence of a component Tocopherol important for Antioxidant activity.¹⁴

Table 1: Chemical Composition of Guar Seed[20]

Composition	based on dry weight
Ash	4.53
Fat	3.32
Fibre	11.06
Moisture	10.00

Protein	33.25
Mineral	(ppm)
Fe ⁺²	465.90
Zn ⁺²	73.31
Cu ⁺²	11.17

Table 2: Phytochemicals of *Cyamopsis tetragonoloba* (L)^{8,13}

Part of the plants	Chemical Constituents
Seed	Gallotannins, gallic acid, gallic acid derivatives, myricetin-7-glucoside-3-glycoside, kaempferol-7-glucoside-3-glycoside, kaempferol-3-rutinoside, kaempferol-3-glucoside, chlorogenic acid, caffeic acid and ellagic acid (identified by chromatographic and spectral analysis)
Leaf	Myricetin-7-glucoside-3-glycoside, kaempferol-7-glucoside-3-glycoside, kaempferol-3-rutinoside, kaempferol-3-glucoside, quercetin-3-rutinoside, 2,3,4-trihydroxybenzoic acid, texasin-7-O-glucoside, daidzein-7-O-glucoside, chlorogenic acid and <i>p</i> -coumaryl quinic acid (identified by chromatographic and spectral analysis)
Fruit	1,2-Cyclopentanedione, Isopentyl acetate (3,5-Dihydroxy-6-methyl-2,3-dihydro-4H-pyran-4-one), 2,3-Dihydro-benzofuran Acetyl monoglyceride, 1-(<i>p</i> -methoxyphenyl)propene, Ethyl alpha-d-glycopyranoside, Mome inositol, n-(2-heptynyl)-n-hexylamine, Palmitic acid, Ethyl hexadecanoate, Phytol, ethyl (9Z,12Z)-9,12-octadecadienoate, Nonacosane, Aletamine, Alpha Monostearin, Alpha Beta Tocopherol, Tetracontane, dl-alpha-Tocopherol, ergost-5-en-3-ol, Stigmasterol, gamma-sitosterol, Alpha-amyrin, Lupeol (GS-MS analysis)

Table 3: Phenolics, Flavonoids, Saponin, Sterols of *Cyamopsis tetragonoloba* (L)^{1,21}

Phenolics	gallotannins, gallic acid and gallic acid derivatives, myricetin-7-glucoside-3-glycoside, chlorogenic acid, ellagic acid, 2,4,3-trihydroxy benzoic acid, texasin-7-O-glucoside and <i>p</i> -coumaryl, quinic acid Quercetin, Kaempferol, Caffeic acid, Genistein
Saponins	3-epikatic acid (3 β -hydroxyolean-12-en-29-oic acid), a triterpenoidal Some Structure elucidated as 3-O- $\{[\alpha$ -L-rhamnopyranosyl(1 \rightarrow 2)]- $[\alpha$ -L-rhamnopyranosyl(1 \rightarrow 4)]- β -D-glucopyranosyl(1 \rightarrow 2)- β -D-glucuronopyranosyl(1 \rightarrow)}-29-O- $[\alpha$ -D-glucopyranosyl (1 \rightarrow 2)-D-glucopyranosyl(1 \rightarrow)]-3 β -hydroxyolean-12-en-29-oate
Sterols	campesterol, Avenasterol, Stigmasterol, Sitosterol and traces of Delta-7-avenasterol, stigmasterol-7-enol, brassicasterol and cholesterol
Galactomannan	<i>Guran</i>

PHARMACOLOGY

Antidiabetic

Diabetes is caused by increased blood sugar level or insulin deficiency in body. There is an increasing demand of Natural Medication with anti diabetic activity. Hyperglycemic activity found in *Cyamopsis tetragonoloba* (L) along with insulin is administered for its treatment. The pod contain many bioactive components like Tannins, caffeic, gallic, quercetin play a major role for various activities. For the investigation of properties alloxan induced diabetic rat is and a normal

is compared with gliclazide, a reference drug. It was found that the Aqueous extract of bean at 250/mg body wt significantly able to lowered the blood glucose level in diabetic rat in 3 hrs of administration. The plant is reported in Traditional literature for its diabetic treatment. the antiglycemic effect of the bean is not due to potentiation of insulin release from pancreatic cell but it was found that the drug may be effective in insulin independent diabetes. It was suggested that the hyperglycemic effect of *Cyamopsis tetragonoloba* (L) was due to the presence of Flavonoids, tannins, coumarins found in the plant.¹⁵ High-performance liquid chromatography (HPLC) analysis of CTme showed the polyphenols present in it such as gallic acid and caffeic acid in the concentrations of 2.46% (W/W) and 0.32% (W/W). Ctme which is significantly reverted the altered biochemical parameters to near normal levels in diabetic rats.¹⁶

Anticholesteric

Increased blood cholesterol level can cause heart disease. Soluble dietary fibres have the potential to reduce the cholesterol concentration. Guar gum – Galactomannans from mature *Cyamopsis tetragonoloba* (L) have a potent hypocholesterolamic activity. The plant posses rich soluble fibre have therapeutic application in hypercholesterolaemia.¹⁷ Aqueous, alcoholic and pet ether extract when fed to hypercholesterolemic albino rats for 3 months it was found that pet ether extract exerted significant impact. Cluster bran reported reduction in serum cholesterol in 7 weeks in albino rats. Guar gum when given to overweight person with normal diet for 6 weeks shows reduction in plasma LDL-C,TC:HDL-C ratio.¹⁸ Hypercholesterolmic of Guar gum may sustain for 6-7 months.¹⁷

Antioxidant Activity

Cyamopsis tetragonoloba (L) posses many Phytochemicals which are responsible for the effective Antioxidant Activity of plant. The leaves and the pods contains carbohydrates, proteins, fibers, ascorbic acid and condensed tannins Caffeic acid, together with, Caffeic acid, gallic acid governing the antioxidant Potential to plant.¹ Total phenolic and Flavonoid content of different extracts of plant were tested for antioxidant activity, maximum activity was reported in methanol extract of plant, total phenolic content 14.51 and Flavonoid 17.34 (Mg of catechin equivalent/200mg dried extract).³ Lupeol present in plant is one of the important Antioxidant identified. The plant has many traditional value.

The major phytochemical compounds were mime inositol, ethyl alpha-d-glucopyranosidend, stigmasterol. The ethanolic extract of *cyamopsis tetragonoloba* fruit showed the presence of thirty four phytochemical constituents. Major constituents involve as potent Antioxidant are Alpha Monostearin, Alpha Beta Tocopherol, Tetracontane, dl-alpha-Tocopherol, Stigmasterol, gamma-

sitosterol, Alpha-amyrin, Lupeol found in Fruit of plant.⁸ Antioxidant activity of 1.0 and 0.2 mg of methanol extract from *cyamopsis tetragonoloba (L)* as measured by Thiocynate method is found to be very strong. Tocopherol is a strong antioxidant of the plant having values as alpha tocopheol(1.4), beta tocopherol(trace), gamma (4.0), delta(0.3), Total(5.7).¹⁴

Anti-ulcer, Cytoprotective and Anticholinergic effect

The pod of the plant identified for its ability to inhibit the gastric secretion and to protect mucosa against injury caused by pylorus ligation, restraint stress, hypothermic, indomethacin and various necrotizing agents.¹⁹ The intensity of gastric lesions induced by hypothermic restraint stress and indomethacin was significantly reduced by Guar extract representing the cytoprotective effect. The extract inhibits acetycholine induced contraction, suggesting anticholinergic activity.¹

Anti-inflammatory Activity

It was found that Anti-inflammatory activity is associated with rich Flavonoid and saponin content of plant. Aqueous and Alcoholic extract of seed (50&100mg/kg) assessed in Neurological inflammation against *carageenan* induced paw edema, formaldehyde induced paw edema, xylene induced ear edema. Ethanolic extract of plant showed significant inhibitory effect on inflammation caused by various phelogestic agents with the maximum percentage inhibition of 85.29% against carrageenan induced paw edema, 82.10% against formaldehyde induced paw edema and 60.20 % against xylene induced ear edema when compared to positive control.¹

CONCLUSION

Plant *cyamopsis tetragonoloba (L)* studied for various Phytochemical constituents and therapeutic applications and found to posses potential as a source of useful drug to treat many diseases. Chemicals found in plant helps to improve the health status and coming from natural source are associated with less side effects. Antioxidants found in plants reduces the oxidative stress condition in our body which is very useful to treat lethal diseases.

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