A PHYTO PHARMACOLOGICAL REVIEW ON VIGNA SPECIES

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ABSTRACT

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, with the available resources at the nearest. In the present review an attempt has been made to gather the information regarding taxanomial characters, various species, climatic conditions, various folklore usages, and some of phytochemical, pharmacological, antimicrobial studies conducted so far on these vigna genus plants which belongs to leguminosae family. This review reveals that legumes can be used as antioxidant in treating various ailments like liver diseases, cancer, diabetes, kidney disorders and for curing various microbial infections. These legumes acts as good nutritive as well as cures various ailments hence these legumes comes under nutraceuticals. With this review we conclude that there is a need of conducting further studies for isolation of individual constituents, to find our their pharmacognostic characters, and going for different formulations and screening of various activities on these genus plants.

Key words: vigna species, vigna mung, vigna radiate, phytochemical work

INTRODUCTION

Man and Animals depend on the plants for their very existence. Our environment is characterized by richly diversified plant life. Plant diversity is composed of more than 500,000 botanical species. The green scum and the duckweed on surface of some ponds, the lichens, fungi, liverworts, mosses, ferns, conifers and the flowering plants are the representatives of the plant diversity. Worldwide, drugs derived from various sources continue to be significant for the treatment and prevention of diseases. Plants constitute a vital component of the biodiversity as they play a key role in maintaining earth’s environmental equilibrium and ecosystem stability. They are also essential for the survival of not only the human beings but also animals at large. Wild plants have enormous endemic, cultural and aesthetic importance, and provide food, medicine, fuel, clothing and shelter to majority of people. With the emerging world wide interest in adopting and studying traditional systems and exploiting their potential based on different health care systems. In this regard one of those heritages is species belonging to vigna genus, Fabaceae family. Which is cultivated and used as a nutraceutical in all over world. In the traditional system of medicine this genus is mainly used in the treatment of liver disorders, ulcers, to decrease the weight, and also used in hormonal balancer¹. The aim of present review is to highlight the nutritional value, phytochemical and pharmacological investigation so far carried on the few species of this vigna genus. So that further research could be carried out on these genus plants.

Plant profile:
The genus is named after Dominico Vigna, an Italian botanist of the 17th century. They include some well-known and other less well-known beans formerly — and sometimes still, especially in non-scholarly sources — included in the genus Phaseolus. Common names in this genus reflect its mixed taxonomic history: some are referred to as “peas” and others as “beans.” The Urad Bean (V. mungo) is sometimes called a “lentil,” while germinating Mung Bean (V. radiate) are often sold as bean sprouts similar to those of the Soybean.

**TAXONOMICAL / SCIENTIFIC CLASSIFICATION** ²,³

- Kingdom : Plantae
- Division : Magnoliophyta
- Class : Magnoliopsida
- Order : Fabales
- Family : Fabaceae
- Genus : Vigna
- Parts : Seeds.

Different species of vigna are⁴
- Vigna aconitifolia — Moth Bean, Mat Bean, Turkish Gram
- Vigna angularis — Azuki Bean, “red bean”
- Vigna caracalla — Snail Bean, Corkscrew Vine, Snail Vine
- Vigna debilis Fourc.
- Vigna dinteri Harms
- Vigna lanceolata — Pencil Yam, merne arlatyeye (Arrernte)
  - o Vigna lanceolata var. filiformis
  - o Vigna lanceolata var. lanceolata
  - o Vigna lanceolata var. latifolia
Vigna luteola
Vigna marina (Burm.f.) Merr.
Vigna maritima
Vigna mungo — Urad Bean, Black Matpe Bean, Black Gram, White Lentil, “black lentil”
Vigna o-wahuensis Vogel — Hawaii Wild Bean
Vigna parkeri
Vigna radiata — Mung Bean, Green Gram, Golden Gram, Mash Bean, Green Soy
Vigna speciosa (Kunth) Verdc. — Wondering Cowpea
Vigna subterranea — Bambara Groundnut, J ugo Bean, njugumawe (Swahili) (sometimes separated in Voandzeia)
Vigna umbellata — Ricebean, “red bean”
Vigna unguiculata — Cowpea, Crowder Pea, Southern Pea
  o Vigna unguiculata ssp. cylindrica — Catjang
  o Vigna unguiculata ssp. dekindtiana — Wild Cowpea, African Cowpea, Ethiopian Cowpea
  o Vigna unguiculata ssp. sesquipedalis — Yardlong Bean, Long-podded Cowpea, Asparagus Bean, Snake Bean, Chinese Long Bean
  o Vigna unguiculata ssp. unguiculata — Black-eyed Pea, Black-eyed Bean
Vigna vexillata (L.) A.Rich. — Zombi Pea
  o Vigna vexillata var. angustifolia
  o Vigna vexillata var. youngiana

TRADITIONAL USES
This genus seeds are said to be a traditional source, cures for paralysis, rheumatism, coughs, fevers and liver ailments, for weight reduction.
Some other species individual traditional uses are

Vigna marina
This is used in fractured bone, remedy for food poisoning, to treat weakness after child birth, to treat head ache, to cure stomachache. this herb is used to treat mouth infections, abscesses

Vigna philosa
Uses: roots are bitter, sweet, aphrodisiac, germicidal, cooling. They are cured for consumption, cough, fever, diarrhea, hemoroids, ophthalmomopathy, burning sensation, dyspepsia, violated condition of vatta, pitta, and kapha.

Vigna radiata:
Uses: it is employed as light diet during fever, and is considered as cooling and astrigent affect, the pulse is prescribed for vertigo. A decoction of seeds is used an affective treatment for beri-beri. The mung extract is said to be protective and curative properties in polyneuritis granuloma

Vigna unguiculata
Uses: Roasted seeds are used to treat neuritis, insomnia, weakness of memory, indigestion, dyspepsia, sensation of pins and needles in limbs, periodic palpitation, congestive cardiac failure etc. it is an excellent medicine for stomatitis, corneal ulcers, colic diseases, kwasiorrak, marasmus. Decoction of leaves is used to treat hyperacidity, nausea and vomiting

Vigna vexillata
Uses: Seeds contain L-Dopa, a medicine for parkinsons disease.

Vigna mung
Uses: used in liver disorders, rheumatisim, infection of nervous system. root is said to narcotic and is used as remedy for aching bones, black gram is considered as diuretic and is used in dropsy and cephalgia. The mung bean is one of many species recently moved from the genus Phaseolus to Vigna and is still often seen cited as Phaseolus aureus or Phaseolus radiatus. These are all the same plant.

Mung Bean is a traditional food source of our Indian people. Vitamins, calcium, irons, phosphorus ratio higher than crude rice. So it got good values both as food and as medicine, in the hot summer, mung bean soup are nice drinks for local folks to drive away heat.

Some of the folklore usage of these species

Anti-bacteria
Some contents of mung bean shows anti-bacteria effects directly. Bacteria inhibition experiment proved that mung bean skin extraction saps shows inhibition to staphylococci. According to related research, tannins from mung bean can solidify bioplasm of microorganisms, thus show bacteria inhibition activity. Flavonoids and phytosterols show certain degree of bacteria inhibition effects and anti-viral effects.

Mung beans contains active compositions such as coumarins, alkaloid, phytosterols, saponins boost the immune system, increase the amount of phagocytic cell.

Antiatherosclerosis:
Experiment proved 70% mung bean powder or sprout mung bean powder shared feed to rabbit, result showed that it works to lower blood fat of the experimental hyperlipemia rabbit, thus relieve coronary arterial lesions, further experiment find that phytosterols in mung beans has similar structure as cholesterol, phytosterols compete with cholesterol to get, lipid enzyme, thus make many cholesterol cannot be esterified
thus reduced the absorption of cholesterol in the intestine, also mung bean can reduce the serum cholesterol.

**Anti-Cancer and Antineoplastic**
Experiment proved mung bean shows prevention to lung cancer and liver cancer induced by morphine and sodium nitrite.

**Detoxification**
Mung bean rich in proteins, raw mung bean powder and liquid taken orally could protect mucosa of stomach and intestines. Mung bean protein, tannins and flavonoids combine with organophosphorus pesticide, mercury, arsenic, plumbum to form deposit, reduce its amount and toxins, can not be absorbed easily.

**Other Actions**
- The protein and phospholipid shows property to improve appetite and exciter nerve, necessary for many important organs
- Polysaccharides of mung bean can boost the activity of serum lipoprotein lipase, hydrolyze the glycerin trilaurate of lipoprotein, thus prevent coronary heart disease and angina cordis
- Globulin and polysaccharides in mung bean can boost cholesterin decomposed to cholic acid, boost the secretion of bile salt and lowering the absorption of cholesterin by small intestine
- Clinical reports proved the effective components from mung bean shows antianaphylaxis property, can be used to treat hives
- Mung bean shows inhibition on staphylococci and some virus, clear heat and detoxify.
- Mung bean rich in trypsin inhibitor, protect liver, reduce decomposition of proteins, thus protect liver.

O groups. They were stable between pH 3·5 and 7·5 for their agglutination requirement. The lectins did not show any metalion requirement. They were inactivated at 50°C. The lectin activity was inhibited by D-galactose (0·1 mM). The Scatchard plots of galactose

binding to these lectins are nonlinear and biphasic curves indicative of multiple binding sites. The data show that the monomeric lectins have both lectin and galactosidase activities suggestive of a bifunctional protein.

**Comparative phytochemistry of eleven species of Vigna (Fabaceae)**
Joseph C. Onyilagha et al has made a survey of the biochemical constituents of 11 species of Vigna indicates the absence of the non-protein amino acid canavanine in their seeds, and absence of proanthocyanidin (polyphenol) in their leaves. Proanthocyanidin was found in the seeds of all, except Vigna subterranea. The constitutive leaf flavonoids of four genotypes of the pantropic V. subterranea were also studied and compared with those from three other cultivated species. The flavonoid kaempferol seems to be most prevalent as it was found in all of the four cultivated species and genotypes. The glycoside kaempferol-3-O-rutinoside was found present in the four genotypes of V. subterranea and other cultivated Vigna species. However, the flavonoid kaempferol-3-O-glucoside-7-rhamnoside is restricted to V. subterranea. This study questions the inclusion of V. subterranea in the genus Vigna on account of absence of seed proanthocyanidin and restricted accumulation of kaempferol-3-O-glucoside-7-rhamnoside in the leaves.

**Accumulation of O-methyl-inositols in water-stressed Vigna species**
Clive W. Ford has made survey on Accumulation of O-methyl-scyllo-inositol and ononitol in leaves of several water-stressed Vigna species is described. It is suggested that the relevant species could be used as convenient sources of these relatively rare compounds.

**The use of hyphenated techniques in comparative phytochemical studies of legumes**
G. C. Kite et al has worked on The coupling of instruments performing chromatographic separations to those providing structural data has had an enormous impact in analytical chemistry. These ‘hyphenated techniques’ are enabling compounds to be detected in plant extracts more effectively than ever before. At the same time, the rapid development of DNA sequencing technology and classic data analysis have provided taxonomists with the means to produce testable systematic hypotheses. The application of GC-MS and LC-MS in comparative phytochemical studies in legumes is reviewed both from selected research in the literature and from the authors’ own experiences, with an emphasis on nitrogen-containing and phenolic compounds.

The use of GC-MS has provided an extensive data set on the occurrence of quinolizidine alkaloids in legumes GC-MS also provides the means to separate the numerous isomeric forms of polyhydroxyalkaloids and hydroxypipeolic acids as their volatile trimethylsilyl derivatives. LC-MS is enabling the metabolic profiles of intact flavonoid glycosides to be obtained from small fragments of material while recent methods to analyse non-protein amino acids by LC-MS without derivatisation hold much promise in surveys of these important taxonomic characters. Tandem mass spectrometry (MS/MS) provides a rapid means of sequencing peptides and so, as we enter the era of proteomics,

**Some of the chemical constituents were isolated from vigna radiate**

**Chemical Constituents**
Aliphatic compounds from the seed: O-acetylenolamine, 1-triaccontanol

**Flavonoids from the seed:** aureol, coumestrol, cyclokievitone, dalbergioidin, 2,3-dehydrokievitone, 5-
deoxykievitone, genistein, 2'-hydroxygenistein, isovitexin, kievitone, myrtillin, phaseol, phaseollidin, vitexin

Others from the seed: β-sitosterol, stigmasterol, soyasapogenol C, 1,4-butanediamine, 3-(carboxymethylamino) propanoic acid, 1H-imidazole, spermidine, spermine, amino acids and peptides

PHARMACOLOGICAL WORK

Estrogenic effect

Stephen M.Bovie et al has evaluated Estrogenic activity using an estrogen-dependent MCF-7 breast cancer cell proliferation assay in seven legume extracts containing phytoestrogens . Methanol extracts were prepared from soybean (Glycine max L.), green bean (Phaseolus vulgaris L.), alfalfa sprout (Medicago sativa L.), mung bean sprout (Vigna radiata L.), kudzu root (Pueraria lobata L.), and red clover blossom and red clover sprout (Trifolium pratense L.).

Extracts of kudzu root and red clover blossom showed significant competitive binding to estrogen receptor (ER). All seven of the extracts exhibited preferential agonist activity toward ER. Using HPLC to collect fractions and MCF-7 cell proliferation, the active components in kudzu root extract were determined to be the isoflavonones, daidzein, and genistein. These results show that several legumes are a source of phytoestrogens with high levels of estrogenic activity.

Immunostimulatory activities of Vigna mungo L. extract in male Sprague-Dawley rats

Yogendrasinh B. Solanki has made a work to evaluate any immunostimulatory activities of the extract of V. mungo seeds in an animal model. The induction of any immunostimulatory effects were evaluated using measures of sheep red blood cells (SRBC)-induced humoral antibody titer, SRBC-induced delayed-type hypersensitivity (DTH), neutrophil adhesion, and in vivo phagocytosis (via the carbon clearance method) after host treatment with the extract. The results here indicated that primary and secondary antibody titers in the rats were significantly increased by treatment with the V. mungo extract as compared with those noted among rats in a control group. Increases in DTH response, the percentage (%) neutrophil adhesion, and in situ phagocytosis were also observed after treatment with the extract. The findings in these study suggest that V. mungo seed extract possesses profound immunostimulatory activities. These present study provides evidence that could help explain how the traditional use of V. mungo has been successful in the treatment of various disorders in humans.

Stimulation of phenolics, antioxidant and antimicrobial activities in dark germinated mung bean sprouts in response to peptide and phytochemical elicitors

Reena Randhir, Yuan has worked on The phenyl propanoid pathway (PPP) was stimulated in mung bean sprouts through the pentose phosphate and shikimate pathways, by natural elicitors such as fish protein hydrolysates (FPH), lactoferrin (LF) and oregano extract (OE). The higher antimicrobial activity was also observed with the higher stimulation of G6PDH and GPX activity during early stages of germination. This leads to the hypothesis that enhanced mobilization of carbohydrates (as indicated by G6PDH activity on days 2 and 4), enhanced polymerization of simple phenols (as indicated by GPX activity on day 3) contributed to high antioxidant activity producing intermediary metabolites.

The antioxidant and free radical scavenging activities of processed cowpea (Vigna unguiculata (L.) Walp.) seed extracts

Perumal Siddhuraju has worked on the antioxidative properties and total phenolic contents of two varieties of cowpea (Vigna unguiculata) were extracted with 70% acetone and the extracts were freeze-dried were examined. The unprocessed light brown seeds (LB) contained significantly higher level of total phenolics and tannins than the dark brown seeds (DB). The extracts were screened for their potential antioxidant activities using tests such as DPPH, OH, ±,±-diphenyl-²-picrylhydrazyl (DPPH), ABTS, 2,22-azinobis(3-(ethylbenzothiazoline-6-sulfonic acid) (ABTS+), Ferric reducing/antioxidant power (FRAP), linoleic acid emulsion and ²-carotene–linoleic acid in vitro model systems. At 800 µg of extract in the reaction mixture, the superoxide anion radical scavenging activity was found to be significantly higher in the raw and dry heated seed extracts than the hydrothermally processed seed samples of the respective varieties. The DPPH radical and ABTS cation radical scavenging activities were well proved and correlated with the ferric reducing antioxidant capacity of the extracts. Interestingly, among the various extracts, dry heated samples of LB and DB showed the highest hydroxy radical scavenging activity of 83.6% and 68.2%, respectively. All extracts exhibited good antioxidant activity (74.3–84.6%) against the linoleic acid emulsion system.

The antioxidant activity and free radical-scavenging capacity of phenolics of raw and dry heated moth bean (Vigna aconitifolia) (Jacq.) Marechal seed extracts

The antioxidative properties and total phenolic contents of V. aconitifolia were examined. The raw and dry heated samples were extracted with 70% acetone and the extracts were freeze-dried. The raw seeds contained higher levels of total phenolics (6.54%) and tannins (1.91%) than the dry heated samples of LB and DB showed the highest hydroxy radical scavenging activity of 83.6% and 68.2%, respectively. All extracts exhibited good antioxidant activity (74.3–84.6%) against the linoleic acid emulsion system.
was found to be similar in raw and dry heated seed extracts. The DPPH radical and ABTS cation radical scavenging activities were well proved and correlated with the ferric reducing antioxidant capacity of the extracts. Interestingly, both raw and dry heated seed extracts showed the highest hydroxyl radical scavenging activity of 67.3% and 68.5%, respectively, at concentration of 1 mg/g extract. In addition, both extracts exhibited good peroxidation inhibiting activity (54.2% and 58.2%, respectively) against the linoleic acid emulsion system and the values were lower than BHA and Trolox. Fe³⁺ chelating activity was also detected in both raw and dry heated seed with EDTA equivalent of 0.61 mg and 0.45 mg/g extracts, respectively.

Mung beans processed by solid-state bioconversion improves phenolic content and functionality relevant for diabetes and ulcer management²⁷

References and further reading may be available for this article. To view references and further reading you must purchase this article.

Industrial relevance
Solid State Bioconversion (SSB) of mung bean by R. oligosporus is a good strategy to enhance ingredient functionality due to mobilization of phenolic antioxidants. Such enhanced phenolic antioxidant activity potentially contributes to health-relevant functionality such as amylase inhibition for diabetes management and H. pylori inhibition for peptic ulcer management. Optimization of such SSB systems at industrial scale can help large-scale low cost production of such health-relevant ingredients.

Minor components of pulses and their potential impact on human health²⁸

Rocio Campos-Vega, and co workers has made a review on pulses contain a number of bioactive substances including enzyme inhibitors, lectins, phytochemicals, oligosaccharides, and phenolic compounds. Enzyme inhibitors can diminish protein digestibility, and lectins can reduce nutrient absorption, but both have. Some phenolic compounds can reduce protein digestibility and mineral bioavailability, and galacto oligosaccharides may cause flatulence. On the other hand, these same compounds may have protective effects and prebiotic activity. Phytic acid exhibits antioxidant activity and protects DNA damage, phenolic compounds have antioxidant and other important physiological and biological properties. These compounds can have complementary and overlapping mechanisms of action, including modulation of detoxifying enzymes, stimulation of the immune system, regulation of lipid and hormone metabolism, antioxidant, antimutagen, and antiangiogenic effects, reduction of tumor initiation, and promotion and induction of apoptosis. Secondary metabolites are considered antinutrients, simultaneously conferring health benefits, so these secondary metabolites are currently marketed as functional foods and nutraceuticals ingredients.

CONCLUSION:
India can benefit enormously if we can build a Golden Triangle among Modern Science, Modern Medicine and Traditional Medicine²⁹ Indeed, triangles are a popular concept in complementary medicine³⁰, but for AYUSH, the Golden Triangle presents a golden opportunity to bring these different systems together. Numerous drugs have entered the international market through exploration of ethnopharmacological and traditional medicine. Although scientist studies have been carried out by the scientists on many of the Indian botanicals, considerably small number of marketable drugs or phytochemical entities has entered the evidence-based therapeutics. Efforts are therefore needed to establish and validate safety and practice of herbal medicines³¹. 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. With the present review we can conclude that vigna species has proved to be antioxidant which can able to treat disorders associated with free radical generation in humans, still then there is a need of conducting further phytochemical, pharmacogonostical, and pharmacological studies on vigna species.

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Hepatoprotective Activity of Whole Plant Extract of *Vigna radiata* Linn Against Carbon Tetrachloride Induced Liver Damage Model

T Satyanarayana¹, B Gangarao¹, K V I S N Anjana Male¹*, G Surendra¹

Abstracts: Whole plant parts of *Vigna radiata* were extracted using petroleum ether, chloroform, ethanol consecutively and the obtained extracts were screened for hepatoprotective activity using ccl₄ induced liver damage model. The activity was assessed by comparing the serum enzyme levels of plant extracts treated group with carbon tetrachloride treated animals and results showed dose dependent activity, ethanolic extract treated group showed highly significant activity, where as chloroform extract treated group has shown the significant action but less compare ethanolic extract, petroleum ether treated group showed moderate action. The results were further supported by histopathological studies.

INTRODUCTION

*Vigna radiata* is commonly called as green gram which belongs to leguminosae family, in telugu it is called as pessalu, in hindi it is called as mung which is widely used as diet in the day to day life. It has comprised of many proteins and enzymes which has got the folklore Usage as light diet during fever ¹, and is considered as cooling and astringent affect, the pulse is prescribed for vertigo. A decoction of seeds is used an effective treatment for beriberi. The mung extract is said to be protective and curative properties in polyneuritis granuloma ². Mung Bean is a traditional food source of our Indian people. Vitamins, calcium, iron, phosphorus ratio higher than crude rice. So it got good values both as food and as medicine, in the hot summer, mung bean soup are nice drinks for local folks to drive away heat. Urd is much valued in medicine, used in rheumatism, infections of nervous system & disease of liver and reported to be used by sandals as remedy for aching bones ³.

Acute Toxicity Studies

Adult swiss albino mice 20-25gm were taken for acute toxicity tests. The mice were divided into control and test groups containing 6 animals each. The control group received vehicle (5% of normal saline) and the test group receive graded doses of extracts. The animals were observed carefully up to 4 hours then occasionally up to 48 hours for sign of any behavioural changes and motility and LD₅₀ values were calculated ⁵.

Determination of Hepato Protective Activity

The experimental protocol was approved by the animal ethical committee of Andhra university, Visakhapatnam, which was registered with the committee for the purpose of control and supervision of experiments on animals (CPCSEA), govt of india (registration no 516/ 01/ A/ CPCSEA)

Selection of Animals

Wistarb-albino rats weighing 150-200gm of either sex were used. The animals were fed with balanced diet and tap water ad libitum. The animals were maintained at room temperature and 40-70% RH with 12hr light period (6:00-18:00). The animals were divided into control group I received vehicle 5% aqueous gum acacia, group II to group IX received CCl₄ for 7 days at a dose of 0.25 ml/100gm, Group II serves as toxic group receives only CCl₄, group III serves as standard recieves silymarin 50mg/kg b.w and group IV to group IX serves as V.R.P.E 50mg/kg, V.R.P.E 100mg/kg, V.R.C.E 50MG/kg, V.R.C.E 100mg/kg, V.R.C.E 50mg/kg, V.R.E.E 100mg/kg respectively. Each group consisting of 6 animals. The vehicle and the test samples were administered orally for 7 days and the liver damage was induced in rats on the 7th day after 6 hrs of administration of drug, by giving a single oral dose of CCl₄ in olive oil (1:1 ratio). On the 8th day, the blood samples were withdrawn by puncturing retro-orbital plexus ⁶. The blood samples were allowed to clot for 30 min, and serum was separated by centrifuging at 2500rpm for 10 min.

Assessment of Liver Function

Assessment of liver function was done by studying changes in biochemical parameters. Viz Serum glutamic oxaloacetate transaminase (SGOT)/ (AST) and serum glutamic pyruvic transminase (SGPT)/ (ALT) were

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**Table 1: Results of Preliminary Phytochemical Tests of the Extracts**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Chemical Constituents</th>
<th>Pet Ether Extract</th>
<th>Chloroform Extract</th>
<th>Ethanolic Extract</th>
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<tbody>
<tr>
<td>1</td>
<td>Alkaloids</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Amino acids</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Carbohydrates</td>
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<td>+</td>
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<td>4</td>
<td>Flavonoids</td>
<td>-</td>
<td>-</td>
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<td>5</td>
<td>Mucilage</td>
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<td>+</td>
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<td>6</td>
<td>Proteins</td>
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<td>7</td>
<td>Starch</td>
<td>-</td>
<td>+</td>
<td>+</td>
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<tr>
<td>8</td>
<td>Steroids and triterpenoids</td>
<td>+</td>
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<tr>
<td>9</td>
<td>Glycosides</td>
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</table>

*+ indicates presence of constituents, - indicate*

**Table 2: Effect of Vigna radiata Whole Plant Extracts on Serum Biological Parameters in ccl4 Induced Liver Damage Model**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Groups</th>
<th>SGOT U/L (mean±s.e.m)</th>
<th>SGPT U/L (mean±s.e.m)</th>
<th>Alkaline Phosphatase (mean±s.e.m)</th>
<th>Total Bilirubin (mg/dl) (Mean±s.e.m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control group -I</td>
<td>120.17±05.77</td>
<td>106.76±03.78</td>
<td>190.84±06.99</td>
<td>1.58±0.20</td>
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<td>2</td>
<td>Toxic control GROUP-II</td>
<td>350.49±22.16**</td>
<td>394.02±16.54**</td>
<td>440.50±13.76**</td>
<td>4.71±0.51**</td>
</tr>
<tr>
<td>3</td>
<td>Standard GROUP-III</td>
<td>124.23±05.28*</td>
<td>122.24±05.17*</td>
<td>186.18±10.12*</td>
<td>2.05±0.19**</td>
</tr>
<tr>
<td>4</td>
<td>V.R.P.E GROUP-IV (50mg/kg)</td>
<td>359.47±02.02</td>
<td>396.21±05.22</td>
<td>418.67±21.61</td>
<td>3.26±0.05</td>
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<tr>
<td>5</td>
<td>V.R.P.E GROUP-V (100mg/kg)</td>
<td>320.50±10.26</td>
<td>336.83±05.71</td>
<td>394.16±10.14</td>
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<tr>
<td>6</td>
<td>V.R.C.E Group-VI (50MG/KG)</td>
<td>297.50±08.30*</td>
<td>246.57±14.57*</td>
<td>396.22±0.54*</td>
<td>2.84±0.05**</td>
</tr>
<tr>
<td>7</td>
<td>V.R.C.E Group-VII (100mg/kg)</td>
<td>270.33±10.26*</td>
<td>242.17±09.29*</td>
<td>273.50±19.56*</td>
<td>2.56±0.46**</td>
</tr>
<tr>
<td>8</td>
<td>V.R.EE Group-VIII (50mg/kg)</td>
<td>194.0±08.85*</td>
<td>196.32±07.18*</td>
<td>198.28±19.26</td>
<td>2.64±0.16*</td>
</tr>
<tr>
<td>9</td>
<td>V.R.EE Group-IX (100mg/kg)</td>
<td>144.13±14.14*</td>
<td>162.12±08.29*</td>
<td>189.27±24.15*</td>
<td>2.24±0.26*</td>
</tr>
</tbody>
</table>

Values are mean±SEM, n=6, **P<0.01, when compared with control Group ,* P<0.01, when compared with Toxic Group

**Table 3: Percentage Decrease in Biochemical Parameters Due to Treatment with Plant Extracts of, Vigna radiata**

<table>
<thead>
<tr>
<th>Groups</th>
<th>SGOT</th>
<th>% Decrease In Levels Of</th>
<th>AKLP</th>
<th>Total Bilirubin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Silimarin</td>
<td>98.42%</td>
<td>94.68%</td>
<td>102.04%</td>
<td>85.02%</td>
</tr>
<tr>
<td>V.R.P.E (50mg/kg)</td>
<td>3.92%</td>
<td>0.69%</td>
<td>8.93%</td>
<td>46.34%</td>
</tr>
<tr>
<td>V.R.P.E (100mg/kg)</td>
<td>13.08%</td>
<td>20.19%</td>
<td>18.48%</td>
<td>51.78%</td>
</tr>
<tr>
<td>V.R.C.E (50mg/kg)</td>
<td>23.12%</td>
<td>51.52%</td>
<td>17.67%</td>
<td>59.77%</td>
</tr>
<tr>
<td>V.R.C.E (100mg/kg)</td>
<td>34.90%</td>
<td>52.91%</td>
<td>67.09%</td>
<td>68.72%</td>
</tr>
<tr>
<td>V.R.E.E (50mg/kg)</td>
<td>68.06%</td>
<td>68.92%</td>
<td>97.22%</td>
<td>66.16%</td>
</tr>
<tr>
<td>V.R.E.E (100MG/KG)</td>
<td>89.87%</td>
<td>80.76%</td>
<td>100.84%</td>
<td>78.95%</td>
</tr>
</tbody>
</table>

estimated by Reitman and Frankel method. Total bilirubin. Alkaline phosphatase were also estimated.

**Statistical Analysis**

The results are expressed as mean ± s.e.m and the statistically significance of difference between groups was analyzed by one-way ANOVA followed by Dunnett’s multiple comparison test. P<0.05 was considered as significant. The percentage reduction was calculated by considering the difference between mean values of toxicant and control as 100% reduction.

**Histological Study**

For histopathological study, liver from each animal was removed after dissection and preserved in 10% formalin. Then representative blocks of liver tissues from each lobe were taken and possessed for paraffin embedding using the standard microtechnique. Sections (5 μm) of livers stained with hemotoxylin and eosin, were observed microscopically for histopathological studies.

**RESULTS AND DISCUSSION**

This work is an attempt made for the validation of rational usage of Vigna radiata Linn as a heptoprotective agent in liver infections. In acute toxicity study no mortality was found up to 1000mg/kg p.o of Vigna radiata plant extracts treated animal group. The LD<sub>50</sub> was not determined and 1/10<sup>th</sup> of the tested proven safe concentration is taken as our experimental dose.
CCl₄ is a hepatotoxin commonly used for the production of experimental liver toxicity. The serum transaminase level is most widely used as a measure of hepatic injury, due to its ease of measurement and high degree of sensitivity. It is useful for the detection of early damage of hepatic tissue and requires less effort than that required for a histological analysis, moreover without sacrifice of animal. From the results, it was observed that there is a significant increase in the levels of SGOT, SGPT & total bilirubin in the toxicant group. Pretreatment with plant extracts and silymarin in test groups and standard group respectively daily for seven days showed significant (p<0.01) protective effect against CCL₄ induced hepatotoxicity when compared to toxicant group. From the results, it was observed that the percentage reduction in silymarin pretreated group in the biochemical parameters, SGOT, SGPT, ALKP, TB were found to be 98.42, 94.68, 102.04 and 85.02% respectively, where as in the Vigna radiata ethanolic extract, chloroform extract pretreated group showed highly significant reduction in biochemical parameters, where as petroleum ether extract showed moderate action when compared to other extracts.

Shown in the figure 7 the ethanolic extract, chloroform extract of V.radiata at the dose of 100mg/kg and 50mg/kg were found to have significant hepatoprotective activity.
The hepato protective activity of \textit{V. radiata} could be due to the presence of alkaloids, proteins, and mucilage in case of chloroform extract. Whereas ethanolic extract possess proteins and mucilage which are reported to have hepato protective and antioxidant properties. Petroleum ether extract of \textit{Vigna radiata} possess moderate hepatoprotective activity at the dose of 100mg/kg.

Results of histopathological studies provided supportive evidence for biochemical analysis. Histology of liver section of normal control animal exhibited normal hepatic cells each with well defined cytoplasm, prominent nucleus, and nucleolus and well brought out central vein whereas that of CCl\textsubscript{4} intoxicated group animal showed total loss of hepatic architecture with centrilobular hepatic necrosis, fatty changes, vacuolization and congestion of sinusoids, kupffer cell hyperplasia, crowding of central vein and apoptosis. Treatment with petroleum extract of \textit{V. radiata} at a dose of 100 mg/kg b.w. showed moderate to weak activity in protecting the liver cells from CCl\textsubscript{4}-injury. Among the plant extract, treatment with chloroform extract returned the injured liver to quite normal. And in case of animal treated with ethanolic extract almost it is equivalent with the standard group liver. Now, it could be decided that the hepatoprotective activity was dose and time dependent. Out of three plant extracts, the ethanol extract of \textit{V. radiata} had shown very high significant potential heptoprotective activity at a dose of 100 mg/kg, b.w. Even chloroform extract had shown significant protection, where as petroleum extract has shown least significant activity against ccl\textsubscript{4} induced liver toxicity.

**Histopathological Sections of Liver in Rats**

Histopathological section of liver in Animals treated as Toxic group, treated with carbon tetrachloride shows high amount of necrosis. CCl\textsubscript{4} has eaten up the hepatocytes and produced lot of fatty infiltration.

Histopathological section of liver inGroup II animals treated as Toxic group, treated with carbon tetrachloride + Silymarin at a dose (100mg/kg b.w). regaining of cellular structure almost equal to hepatocytes of control group.

Histopathological section of liver inGroup V animals treated as standard group, treated with carbon tetrachloride + pet ether extract of \textit{V. radiata} at a dose (100mg/kg b.w). showing large necrosis in hepatic cells and damage of normal cellular structure and kupffer cells presence.

Histopathological section of liver in Group VII animals treated as standard group, treated with carbon tetrachloride + chloroform extract of \textit{V. radiata} at a dose (100mg/kg b.w). Showing little necrosis in the hepatocytes and fatty infiltration.

Histopathological section of liver in Group IX animals treated as standrad group, treated with carbon tetrachloride + ethanolic extract of \textit{V. radiata} at a dose (100mg/kg b.w).showing regain of the damaged cells equal to that of standard drug treated group.

**CONCLUSION**

From this work we can conclude that the folklore usage of \textit{Vigna radiata} in treating liver diseases has been validated, it is useful in treating different liver infections and diseases.

**REFERENCES AND NOTES**


HEPATOPROTECTIVE ACTIVITY OF WHOLE PLANT EXTRACT OF VIGNA MUNG LINN AGAINST CARBON TETRACHLORIDE INDUCED LIVER DAMAGE MODEL

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²Department of chemistry, Krishna Teja college of pharmacy, Tirupathy, Andhra pradesh
*Corresponding Author Email: anjana.male@gmail.com

ABSTRACT

Whole plant part of Vigna mung linn were extracted using petroleum ether, chloroform, ethanol consecutively and the obtained extracts were screened for hepatoprotective activity using ccl₄ induced liver damage model . The activity was assessed by comparing the serum enzyme levels such as serum glutamate pyruvate transaminase, serum glutamate oxalate transaminase, total bilirubin, alkaline phosphatase of plant extracts treated group with carbon tetrachloride treated animals and results showed dose dependent activity, ethanolic extract treated group showed highly significant activity, where as chloroform extract treated group has shown the significant action but less compare ethanolic extract, petroleum ether treated group showed moderate action and petroleum ether extract at a dose of 50 mg/kg b.w showed least significant action. The results were further supported by histopathological studies.

KEYWORDS

Vigna mung, serum glutamate oxalo acetate, serum glutamate pyruvate transaminase, total bilirubin, alkaline phosphatase

INTRODUCTION

The liver is the largest organ of the body. It is located between the portal and the general circulation, between the organs of the gastrointestinal tract and the heart. The main function of the liver is to take up nutrients, to store them, and to provide nutrients to the other organs¹. The liver is not only an important power and sewage treatment plant of the body. In fact, the liver is probably the best example for a cheap recycling system. The function of the liver as clearance organ, however, harbors the danger that the substances that should be degraded and/or eliminated lead to tissue damage. Thus, effective defense mechanisms are necessary. During the process of elimination there is chance of accumulation different kinds of toxic materials inside the hepatocytes and there is chance of liver infection, and hepatic disorders such as hepatitis. Even though different kind of allopathic molecules are available in market all of them are suffer with some are the other toxic effect, so an urgent need of developing a herbal medicine which has got both liver protecting and nutritional value is require hence an attempt has been made to screen the hepato protective activity of whole plant extracts of vigna mung Linn. It is commonly called as black gram which belongs to leguminosae family, in telugu it is called as minnumulu which is widely used as diet in the day to day life. It has comprised of many proteins and enzymes which has got the folklore usage in liver disorders, rheumatism, curing infections of nervous system². Roots are said to be narcotic and are used as remedy for aching bones, black gram is considered as diuretic and is used in dropsy and cephalgia³. So it got good values both as food and as medicine, in the hot
summer, mung bean soup are nice drinks for local folks to drive away heat.

MATERIALS AND METHODS:
Collection of specimens: The whole plant of Vigna mung Linn were collected from the nearby area of Guntur district fields in February 2011 and was authenticated by prof. D. Ramakanth raju retire botanist and a voucher specimen (T.S.N-001, 13/12/2011) has been deposited in pharmacognosy department Andhra university.

Preparation of plant extracts:
Collected plant material has been dried under shade and made into coarse powder passed through sieve # 20 and has been successively soxhelted using solvents like petroleum ether, chloroform and ethanol for 72 hrs. Obtained extracts were made solvent free using rota evaporator and stored in vacuum dessicator. Yield was found to be 7%, 9.5% and 13.5% respectively. Obtained extracts were tested for preliminary phytochemical screening. Oral suspensions of the extracts were prepared at a dose of 50mg/ml and 100mg/ml using 5% aqueous gum acacia.

Acute toxicity studies:
Adult swiss albino mice 20-25gm were taken for acute toxicity tests. The mice were divided into control and test groups containing 6 animals each. The control group receive vehicle (5%of normal saline) and the test group receive graded doses of extracts. The animals were observed carefully up to 4 hours then occasionally up to 48 hours for sign of any behavioural changes and motility and LD 50 values were calculated.

Determination of hepato protective activity:
The experimental protocol was approved by the animal ethical committee of Andhra university, Visakhapatnam, which was registered with the committee for the purpose of control and supervision of experiments on animals (CPCSEA), Govt of India (registration no 516/01/A/CPCSEA)

Selection of animals:
Wistar albino rats weighing 150-200gm of either sex were used. The animals were fed with balanced diet and tap water ad libitum. The animals were maintained at room temperature and 40-70% RH with 12hr light period (6:00-18:00). The animals were divided into control Group I received vehicle 5% aqueous gum acacia, Group II to Group IX received CCl₄ for 7 days at a dose of 0.25 ml/100gm³, Group II serves as toxic group receives only CCl₄, Group III serves as standard receives silymarin 50mg/kg b.w and group IV received Vigna mung petroleum ether extract (V.M.P.E) at a dose of 50 mg/kg b.w, group V received Vigna mung petroleum ether extract (V.M.P.E) at a dose of 100mg/kg b.w, Group VI received Vigna mung chloroform (V.M.C.E)at a dose of 50mg/kg b.w, Group VII received Vigna mung chloroform extract (V.M.C.E) at a dose of 100mg/kg b.w, Group VIII received ethanolic extract (V.M.E.E) at a dose of 50mg/kg b.w, and group IX received Vigna mung ethanolic extract (V.M.E.E) at a dose of 100mg/kg b.w. Each group consisting of 6 animals. The vehicle and the test samples were administered orally for 7 days and the liver damage was induced in rats on the 7th day after 6 hrs of administration of drug, by giving a single oral dose of CCl₄ in olive oil (1:1 ratio). On the 8th day, the blood samples were with drawn by puncturing retro-orbital plexus. The blood samples were allowed to clot for 30 min, and serum was separated by centrifuging at 2500rpm for 10 min.

Assessment of liver function:
Assessment of liver function was done by studying changes in biochemical parameters. Viz Serum glutamic oxaloacetate transaminase (SGOT)/ (AST) and serum glutamic pyruvic transaminase (SGPT)/ (ALT) were estimated by
Reitman and Frankel method\(^9\). Total bilirubin\(^10\), Alkaline phosphatase were also estimated\(^11\).

**Statistical analysis\(^12\):**

The results are expressed as mean ± s.e.m and the statistical significance of difference between groups was analyzed by one-way ANOVA followed by Dunnett's multiple comparison test. \(P<0.05\) was considered as significant. The percentage reduction was calculated by considering the difference between mean values of toxicant and control as 100% reduction.

**Histological study:**

For histopathological study, liver from each animal was removed after dissection and preserved in 10% formalin. Then representative blocks of liver tissues from each lobe were taken and possessed for paraffin embedding using the standard microtechnique\(^13\). Sections (5 \(\mu\)m) of livers stained with hematoxylin and eosin were observed microscopically for histopathological studies.

<table>
<thead>
<tr>
<th>S.no</th>
<th>Chemical constituents</th>
<th>Pet ether extract</th>
<th>Chloroform extract</th>
<th>Ethanol extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkaloids</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Amino acids</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Carbohydrates</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Flavonoids</td>
<td>-</td>
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<td>-</td>
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<td>5</td>
<td>Mucilage</td>
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<td>+</td>
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<td>6</td>
<td>Proteins</td>
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</tr>
<tr>
<td>7</td>
<td>Starch</td>
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<td>-</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>Steroids and triterpenoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>Glycosides</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

+ indicates presence of constituents, - indicate
Table: 2 Effect of vigna mung whole plant extracts on serum biological parameters in ccl₄ induced liver damage model

<table>
<thead>
<tr>
<th>S.No</th>
<th>Groups</th>
<th>SGOT U/L(mean±S.E.M)</th>
<th>SGPT U/L(mean±S.E.M)</th>
<th>Alkaline phosphatase (mean±S.E.M)</th>
<th>Total bilirubin (mg/dl)(mean±S.E.M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control group -I</td>
<td>120.17±05.77</td>
<td>106.76±03.78</td>
<td>190.84±06.99</td>
<td>1.58±0.20</td>
</tr>
<tr>
<td>2</td>
<td>Toxic control GROUP-II</td>
<td>350.49±22.16**</td>
<td>394.02±16.54**</td>
<td>440.50±13.76**</td>
<td>4.71±0.51**</td>
</tr>
<tr>
<td>3</td>
<td>Standard GROUP-III</td>
<td>124.23± 05.28*</td>
<td>122.24±05.17*</td>
<td>186.18±10.12*</td>
<td>2.05±0.19*</td>
</tr>
<tr>
<td>4</td>
<td>V.M.P.E GROUP-IV (50mg/kg)</td>
<td>361.74±12.02</td>
<td>391.11±05.22</td>
<td>426.22±14.22</td>
<td>3.94±0.06</td>
</tr>
<tr>
<td>5</td>
<td>V.M.P.E GROUP-V (100mg/kg)</td>
<td>340.12±07.01</td>
<td>356.21±16.11</td>
<td>407.14±04.12</td>
<td>3.16±0.23</td>
</tr>
<tr>
<td>6</td>
<td>V.M.C.E Group-VI (50MG/KG)</td>
<td>305.43±10.26*</td>
<td>311.83±10.14*</td>
<td>399.26±07.21*</td>
<td>3.01±0.44*</td>
</tr>
<tr>
<td>7</td>
<td>V.M.C.E group-VII (100mg/kg)</td>
<td>291.50±18.03*</td>
<td>260.57±05.71*</td>
<td>284.16±08.99*</td>
<td>2.76±0.64*</td>
</tr>
<tr>
<td>8</td>
<td>V.M.E.E group-VIII(50mg/kg)</td>
<td>204.50±07.21*</td>
<td>201.14±09.29*</td>
<td>209.17±14.57*</td>
<td>2.43±0.23*</td>
</tr>
<tr>
<td>9</td>
<td>V.M.E.E group-IX(100mg/kg)</td>
<td>150.21±06.18*</td>
<td>136.24±17.22*</td>
<td>197.19±11.21</td>
<td>2.31±0.62*</td>
</tr>
</tbody>
</table>

Values are mean ± SEM, n=6

**P<0.01, when compared with control Group,* P<0.01, when compared with Toxic Group
Table-3 Percentage decrease in biochemical parameters due to treatment with plant extracts of *Vigna mung*

<table>
<thead>
<tr>
<th>Groups</th>
<th>% Decrease In Levels Of</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SGOT</td>
<td>SGPT</td>
<td>AKLP</td>
<td>Total Bilirubin</td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Silymarin</td>
<td>98.42%</td>
<td>94.68%</td>
<td>102.04%</td>
<td>85.02%</td>
<td></td>
</tr>
<tr>
<td>V.M.P.E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(50mg/kg)</td>
<td>4.58%</td>
<td>1.04%</td>
<td>5.62%</td>
<td>24.61%</td>
<td></td>
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<tr>
<td>V.M.P.E</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(100mg/kg)</td>
<td>4.86%</td>
<td>13.22%</td>
<td>13.25%</td>
<td>49.54%</td>
<td></td>
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<tr>
<td>V.M.C.E</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(50mg/kg)</td>
<td>19.6%</td>
<td>28.89%</td>
<td>16.47%</td>
<td>54.34%</td>
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<tr>
<td>V.M.C.E</td>
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<tr>
<td>(100mg/kg)</td>
<td>25.74%</td>
<td>46.64%</td>
<td>62.67%</td>
<td>62.33%</td>
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<td>V.M.E.E</td>
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<tr>
<td>(50mg/kg)</td>
<td>63.69%</td>
<td>67.18%</td>
<td>92.80%</td>
<td>72.88%</td>
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<tr>
<td>(100MG/KG)</td>
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<td>89.81%</td>
<td>97.62%</td>
<td>76.71%</td>
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</tr>
</tbody>
</table>

RESULTS AND DISCUSSION:

This work is an attempt made for the validation of rational usage of *Vigna mung* Linn as a heptoprotective agent in liver infections. In acute toxicity study no mortality was found up to 1000mg/kg p.o of *Vigna mung* plant extracts treated animal group. The LD50 was not determined and 1/10th of the tested proven safe concentration is taken as our experimental dose. 

CCl4 is a hepatoxin commonly used for the production of experimental liver toxicity14. The serum transaminase level is most widely used as a measure of hepatic injury, due to its ease of measurement and high degree of sensitivity. It is useful for the detection of early damage of hepatic tissue and requires less effort than that required for a histological analysis, moreover without sacrifice of animal. From the results, it was observed that there is a significant increase in the levels of SGOT, SGPT & total bilirubin in the toxicant group. Pretreatment with plant extracts and silymarin in test groups and standard group respectively daily for seven days showed significant(p<0.01) protective effect against CCl4 induced hepatotoxicity when compared to toxicant group. From the results, it was observed that the percentage reduction in silymarin pretreated group in the biochemical parameters, SGOT, SGPT, AKLP, TB were found to be 98.42, 94.68,102.04 and 85.02% respectively , where as in the *Vigna mung* ethanolic extract at a dose of 100mg/ kgb.w has shown highly significant action as 87.2%, 89.81%, 97.62% and 76.71% respectively. Chloroform extract pretreated group showed significant reduction in biochemical parameters, where as petroleum ether extract showed moderately significant action when compared to other extracts.
Hence the ethanolic extract, chloroform extract of *V. mung* at the dose of 100mg/kg and 50mg/kg were found to have significant hepatoprotective activity. The hepatoprotective activity of *V. mung* could be due to the presence of alkaloids\textsuperscript{15}, proteins, and mucilage in case of chloroform extract. Whereas ethanolic extract possess proteins and mucilage\textsuperscript{16} which also are reported to have hepatoprotective and antioxidant properties.

**HISTOPATHOLOGICAL SECTIONS OF LIVER IN RATS**

Fig: 1 Histopathological section of liver in Animals treated as Control Group-I shows normal cellular structure.

Fig: 2: Histopathological section of liver in Group II animals treated as Toxic group, treated with carbon tetrachloride showing central lobular vein with high amount of necrosis.
Results of histopathological studies provided supportive evidence for biochemical analysis. Histology of liver section of normal control animal exhibited normal hepatic cells each with well defined cytoplasm, prominent nucleus, and nucleolus and well brought out central vein whereas that of CCl₄ intoxicated group animal showed total loss of hepatic architecture with centrilobular hepatic necrosis, fatty changes, vacuolization and congestion of sinusoids, kupffer cell hyperplasia, crowding of central vein and apoptosis. Treatment with petroleum extract of V. mung at a dose of 100 mg/kg b.w. showed moderate to weak activity in protecting the liver cells from CCl₄ injury. Among the plant extract, treatment with chloroform extract returned the injured liver to quite normal. And in case of animal treated with ethanolic extract almost it is equivalent with the standard group liver. Now, it could be decided that the hepatoprotective activity was dose and time dependent. Out of three plant extracts, the ethanol extract of V. mung had shown very high significant potential heptoprotective activity at a dose of 100 mg/kg b.w. Even chloroform extract had shown significant protection against CCl₄ induced liver toxicity.
CONCLUSION:
From this work we can conclude that the folklore usage of Vigna mung as a hepatoprotective drug has been validated, it is useful in treating different liver infections and diseases

REFERENCES:
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Welcome to Photon. We have received a Detailed Peer Reviewed Report on your Manuscript ID: D-4988

Entitled as: PHARMACOGNOSTIC STUDY ON WHOLE PLANT OF VIGNA MUNG L.IINN

Authored by: Ch.k.v.I.s.n.Anjana Male1*, Dr.T.satyanarayana1, Dr.B.G.Gangarao, Rajesh K

from panel of eight international reviewers from USA, Canada, Germany, France, UK,Venezuela, Japan and Australia. The said manuscript has been placed in the meeting of Board of Editors held on 15 March, 2013. It is decided that Manuscript ID: D-4988 can be published on International Journal of Pharmacy.

Manuscript ID: D-4988 has been transferred to Publication Cell, Photon. You are required to acknowledge us the payment as below so that we can receive the Galley Proof of Manuscript ID: D-4988 along with Reviewer’s Recommendations.

Best Regards,

[Signature]

[Name]

[Position]

Photon Journals
Dear Ms Male,

We have the pleasure of informing you that the above abstract has been accepted for POSTER presentation during the FIP World Congress 2013, which will be held in Dublin, Ireland, from 31 August - September 5, 2013. Please read the instructions below.

Congress registration required
Abstracts can only be presented and will only be published if the presenting author has registered and paid for the Congress before 15 May 2013.
To register please visit the website: http://www.fip.org/dublin2013/Dublin/2001/Register_here/

Guidelines for poster presenters
In due time the Guidelines for Poster Presenters (including the size of the poster board) will be published on the website <http://www.fip.org/dublin2013/files/static/abstracts/Guidelines_for_Poster_Presenters.pdf> (under Abstracts).

More detailed information
The following information will be sent by e-mail and published on the congress website after 1 August
- Your poster board number
- Your day(s) of presentation
- Time slots for hanging up and taking down your poster

With kind regards,
On behalf of the Organizing Committee,

Kind regards,
Sophie Hamburger
FIP Congress Secretariat
c.o. MCI Amsterdam