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Pharmacognostical, Phytochemical and Pharmacological Evaluation of Monocot Grass *Kyllinga Triceps* Rottb

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Abstratct – The aim of present study was pharmacognostical phytochemical and pharmacological evaluation of monocot grass kyllinga triceps rottb. In the present study hepatotoxicity was induced by using ccl_4, silymarin was takan as standard drug. Ethanolic and petroleum ether extracts were prepared for study. It was observed that among all the extracts of kyllinga triceps rottb, the petroleum ether extract significantly decreased (p>0.01) the SGOT, SGPT, ACP, ALP and DB levels.Petroleum ether extract (200 mg/kg) showed highest hepatoprotective activity almost comparable to the silymarin (25 mg/kg) treated group.It can be decided that the plant kyllinga triceps has revealedsubstantial hepatoprotective action when related to silymarin. In present study complete morphological and microscopical studies were performed with isolation and identification of chemical constituents of the plant, rhizome extract was evaluated for pharmacological afficacy, plant is found effective as hepatoprotective anti-oxidant and diuretic.

Keywords: Hepatoprotective Activity, Ethanolic Extract, Kyllinga Triceps, Petroleum Ether Extract, Silymarin

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INTRODUCTION

Drug discovery is identification of novel active constituents. One of the major tools in the drug discovery is the Pharmacophore approaches screening of compounds for biological activity and structure elucidation of chemical compounds by Mass, IR and NMR spectroscopy are the two approaches which help in finding of new chemical compounds from the natural sources. Medicinal plants are also rich in the secondary metabolites which have a potent physiological effect on the living system. These are called as active plant principles.

PLANT PROFILE

Scientific Classification of Research Plant.

Taxonomy (Matthew, 1983, Kirtikar & Basu, 1918, Kirtikar & Basu, 1991)

Kingdom	-	Plantae
Subkingdom	-	Tracheobionta
Superdivision	-	Spermatophyta
Division	-	Magnoliophyta
Class	-	Liliopsida
Subclass	-	Commelinidae
Order	-	Cyperales
Family	-	Cyperaceae
Genus	-	Kyllinga Rottb
Species	-	*Kyllinga Triceps* Rottb

Regional Names (Gamele, 1928, Pandey, 1989, Mukerjee, 1984).

Sanskrit	-	Svetanirvisa, Apavisha, Avisha,Vivisha, Musta
Tamil	-	Velutta Nirbasi
Malayalam	-	Palnirvasi, Pimuttanna
Telugu	-	Gandala

Hindi	-	Nirbishi, Svet Gottubi
Bengali	-	Nirbishi
Marathi	-	Mustu
Brizbhasa	-	Motha, Bhada
Bengali	-	Nirbishi
Marathi	-	Mustu
Brizbhasa	-	Motha, Bhada

Geographical Distribution (Shukla & Mishra, 2002, Singh, et. al., 2005, Vasishtha, 1984)

The plant is distributed throughout India, Ceylon hot and warm temperate regions of the Old World countries.Plant is a maintidy of enhancedfallows, but also happens in yields, grounds, farms and roadsides. It nurturesfinest in humidlushmud that is rarelyrefined and in filled sunshine. It is current in regions up to 7000 ft. elevation. The plant is naturalized primarily in gardens and lawns.

Traditional Uses (Swami & Rao, 1992, Longman, 1994, Anonymous)

The rhizomesof plant *Kyllinga triceps* rottb are fragrant, aromatic, sweet, astringent, bitter, refrigerant, febrifuge, antidiarrhoeal, diuretic, stomachic, anthelmintic, expectorant, demulcent and tonic. They are useful in vitiated conditions of pitta and vata, fever, cough, bronchitis, hepatopathy, splenopathy, diabetes, dermatitis, fistula and tumours.

LITERATURE REVIEW

Swaroopa et.al, (2011); announced impacts of root extricate divisions of Kyllinga triceps rottb. On streptozotacin initiated diabetic rats. The examination was intended to assess the root extricate divisions of Kyllingatriceps for their antidiabetic potential on streptozotocin incited diabetes in neonatal rats. Diabetes was incited by a solitary intraperitoneal infusion of Streptozotocin (90mg/kg) to 48±2h old neonatal rats. Impact of root remove parts (toluene, ethyl acetic acid derivation, 1-butanol at 50 &100 mg/kg.) were tried for their antihyperglycemic movement by estimating their fasting blood glucose level in diabetic rats at 0,2,4,6,8,12 and 24 h after the treatment [13].

Pandey et.al, (2012); revealed Kyllinga triceps is an Indian restorative plant showed to apply different pharmacological impacts. In light of customary claim of the plant in treatment of diabetes [14].

Nishant et.al, (2013); examined the antidiabetic impact of methanolic concentrate of Kyllinga triceps (Family: Cyperacea) in typical and streptozotocin initiated diabetic rats, separately. The methanolic concentrate of Kyllinga triceps was directed orally at a measurement of 100 mg/kg, for 15 days to streptozotocin actuated diabetic rats. Fasting blood glucose level and change in body weight evaluated in methanolic remove treated diabetic rats, were contrasted and typical control, diabetic control and standard medication treated rats [15].

Somnath et.al,(2014); detailed assessment of anthelmintic action of Kyllinga triceps rottb.3 The present examination was pointed on the Phytochemical assessment and screening of root concentrate of Kyllinga nemoralis for its antihelmintic proficiency in creature demonstrate which has customary claims additionally [16].

Shiddamallayya et.al, (2015) detailed similar pharmaconosy of cyperus rottundus linn and kyllinga bulbosa. P. beauv.Cyperus rotundus Linn. is the affirmed wellspring of Musta is a critical Ayurvedic medicate utilized in India to fix number of ailments like fever, loose bowels, hack, retching, thirst, epilepsy, eye maladies, vatarakta and so on [17].

Nishant et.al, (2016) detailed pain relieving and antipyretic capability of methanolic concentrate of kyllinga triceps rottb.Kyllinga triceps is customarily used to treat excruciating and provocative conditions. In the present examination, pain relieving and antipyretic exercises of methanolic concentrate of Kyllinga triceps at various measurements was contemplated utilizing hot plate, acidic corrosive incited squirming and yeast prompted hyperthermia strategy. Kyllinga triceps indicated noteworthy pain relieving and antipyretic exercises in all models contemplated. Results bolster the customary utilization of the plant in the treatment of torment and fever [18].

Kirtikar and basu, announced that musta (Kyllinga/cyperus rotundus) is a vital home solution for acid reflux, sprue, loose bowels and other intestinal issues of youngsters. Root tuber is the part utilized in medication. It is light severe, sweet-smelling, astringent, carminative, diuretic, anthelmintic, galactagogue, emmenagogue and nervine tonic. It fixes kapha and pitta issue, dyspepsia, spewing, heartburn , thirst , worm inconveniences, hack, bronchitis, dysuria, fever and noxious, affections. The medication is additionally utilized in epilepsy, loss of memory, blood sicknesses and general debility. The glue is connected in skin infections and eye sickness. Mustaristam, ceriya rasnadi kasayam, carngeryadi ghrtam, vyaghryadi leham, and so on are a portion of the arrangements utilizing the medication [19].

Basu et.al,(1991); announced that the plant is diuretic stomachic and anthelmintic givin for fistula, pustules, tumors, stomach and intestinal

disorders.in Malaya it is utilized for the runs and in Celebes for measles, spikes are connected as poultices for assembled nails [20].

Gamele et.al, revealed the natural data of kyllinga triceps. Stem 3-calculated, verdant just at the base, ended by 1-3, infrequently more, sessile, capitate, ovoid or cylindric spikes, spikelets various, little, compacted; glumes 4-5, seldom more, distichous; rhachilla disarticulating and tumbling off entire over the 2 least, little, void glumes; third glume 2-sexual, fourth male or void, once in a while swinger fifth simple or althogether missing. Stamens 1-3. Ovary suborbicular; style not swollen at the base. Nut smooth, now and then apiculate by the persevering base of the style [21].

Mukerjee et.al,(1984), detailed about monetary significance of the plant family, basic oil is utilized as drug by kavirajes to fix looseness of the bowels. They revealed about botanical recipe, bloom chart of cyperaceae, divisions of cyperaceae, correlation of graminae and cyperaceae [22].

Mishra et.al, (2002); gave a nitty gritty data about family cyperaceae and about sweet-smelling properties of rhizomes Kyllinga species. Cyperus rotundus L. (Cyperaceae), is an enduring sedge disseminated all through India and different parts of the world. Its tubers are utilized as a starter, febrifuge and to treat dying, rankles, bubbles, hack, the runs, aggravation, lacteal issue, rheumatoid joint inflammation, stomach sicknesses, skin rashes, thirst, spewing, worm invasion and wounds [23].

Pandey et.al,(2005); announced about foundational position dissemination vegetative characters in brilliance and bloom qualities, botanical equation and financial significance of family cypeaceae. Plants for the most part herbs with 3 calculated stem, strong culm; leaves with whole sheathing base not split on one side; blossoms in spikelets of cymes, subtended by a solitary glume, stripped or with perianth of scales or hairs; stamens 1 to 3; carpels 2 or 3, ovary unrivaled, unilocular with single basal ovule; organic product an achene or nut, seed endospermic [24].

Vasishtha et.al,(1984); detailed that the decoction of underlying foundations of kyllinga triceps is utilized to extinguish thirst in fever and roots yield an oil which is utilized to advance actionof liver.Kyllinga is variety of blossoming plants in the sedge family referred to ordinarily as spikesedges. They are local to tropical and warm calm regions of the world, particularly tropical Africa. These sedges fluctuate in morphology, developing to statures from 2 centimeters to a meter and some of the time lacking rhizomes, they are firmly identified with Cyperus species [25].

Narayan et.al,(1992); announced that blossoms of the plant family are indiscriminate or unisexual. Whenever unisexual, monoecious. Little and unnoticeable. The blossom is borne in the axil of a glume-the aglumes being orchestrated distichously or spirally. In carex, unisexual blossoms happen. The guys shape a straightforward spike, remain in the axils of their bracts and are spoken to just by the stamens; on the hand, the female blossoms frame a compound spike, each bloom spoke to just by the ovary that is situated upon an optional pivot: the bloom and additionally the auxiliary hub whereupon it is situated, are subtended by their own particular bracts. In any case, once in a while, a similar inflorescence may bear both male and female blossoms. Shizogenously delivered air sections normal in stems and takes off. Quickly beneath the epidermis is available the chlorophyll containing tissue and this chlorenchyma is hindered by plates of their vascular bundules are concentric, some of the time with xylem and once in a while with phloem at the inside [26].

Beatriz et.al; detailed unpredictable concoction creation and bio exercises from Colombian kyllinga pumil assential oil. the fundamental oil from the new leaves of Kyllinga pumila (Michx) was gotten by hydrodistillation and described by gas chromatography-mass spectrometry (GC-MS). Twenty-eight unstable mixes were recognized, real constituents of the oil were Methyl E,E-10,11-epoxyfarnesoate (43.8%), β-elemene (12.5%), Z-caryophyllene (11.3%), germacrene D (7.1%) and E-caryophyllene (5.6%). Repellent and fumigant exercises of the oil against Tribolium castaneum Herbst (Coleoptera: Tenebrionidae), were finished utilizing the region inclination strategy [27].

Ayganar et,al, (2009); announced about home grown prescriptions for twisted recuperating among inborn individuals in southern India, incorporates kyllinga as wound mending plant.Results of an ethnobotanical investigation of wound recuperating medicines among the ancestral individuals of Tirunelveli slopes in southern India are displayed [28].

Prajwal et.al, (2012); revealed leaf fundamental oil piece of kyllinga brevifolia rottb. From Nepal.The point of the investigation was to dissected substance constituents of the fundamental oil, gotten by hydro refining of the roots [29].

Shanmugam et.al,(2009); announced about plants utilized as pharmaceutical by paliyar clans of shenbagathope in virudhunagar locale of Tamil Nadu India, Decoction of kyllinga is utilized for fever and hack by tribals.The customary restorative employments of 58 angiospermic plant species having a place with 54 genera of 31 families for different illnesses and diseases like injuries, cuts, stomach torment, diabetes, fever, cool, noxious nibbles and so on., by the Paliyar clans of Shenbagathope in Virudhunagar area of Tamilnadu, India, are specified. By and large, new piece of the plant is utilized for the planning of

prescription. At the point when new plant parts are not accessible, dried parts are likewise utilized. Consideration ought to be made on appropriate misuse and usage of these ethnomedicinally critical plant species [30].

Rupa et.al, (2012); announced about pain relieving and calming plants including kyllinga as pain relieving plant utilized by tribals. The present correspondence comprises a refreshed audit on plants with pain relieving and mitigating action with unique accentuation on those plants found in various parts of the world. This article will be useful to the average citizens for their essential human services and the scientists for facilitate separation and portrayal of the dynamic substance constituents in charge of pain relieving calming potential [31].

Jitendra et.al, (2006); revealed plant kyllinga as against diabetic. Plants are characteristic enterprises, which give superb nourishment and crude material for pharmaceutical, corrective and perfumery ventures without causing ecological debasement [32].

Karthikeyan et.al, (2009); went for assessing the hepatoprotective action of the rhizomes of K. nemoralis against carbon tetrachloride (CCl(4))-instigated hepatotoxicity in rats.Hepatotoxicity was incited in male Wistar rats via carbon tetrachloride and olive oil (half, v/v). i.p. ethanolic and oil ether concentrates of K. nemoralis rhizomes were controlled to the exploratory rats (100 and 200mg/kg, p.o. for seven days). The hepatoprotective impact of these concentrates was assessed by the test of liver capacity biochemical parameters and histopathological investigations of the liver contrasted and silymarin.Both removes indicated critical hepatoprotection when contrasted with control, like standard silymarin. Histology of liver segments likewise uncovered that the concentrates shielded liver from injury.The examine distinguished a plant with potential hepatoprotective constituents which will be confined and portrayed in future [33].

Arvind et.al, (2014); evaluate the vascular divider verdure of the Varanasi city, India, situated on the bank of consecrated Ganges Stream. An aggregate of 173 plant species were recorded which incorporates Kyllinga triceps rottb, from the dividers of Varanasi city, of which 171 species were spoken to by angiosperms while just two species were spoken to by the pteridophytes. The angiosperms were spoken to by 131 genera dispersed among 47 families. The Poaceae, Asteraceae and Amaranthaceae were the overwhelming groups of the divider verdure of Varanasi city. Investigation of vegetation regarding living things showed the predominance of therophytes over the other living things. The vascular divider greenery of the city is ruled by the intriguing species. Lindenbergia indica, Ficus religiosa,Ficus benghalensis, Ficus infectoria, Pteris vittata and Tridax procumbens were the most widely recognized greenery obvious on the dividers of the Varanasi city [34].

Padmavathy et.al,(2013); revealed about ethno science of unconcerned greeneries in natural and inorganic horticultural fields-Bahour, Pondicherry India they detailed that kyllinga triceps is febrifuge, hostile to dermatosis and against diabetic [35].

Pulak et.al, (2013); revealed about anthelmintic action of a disregarded plant kyllinga nemoralis. The examination was pointed on the Phytochemical assessment and screening of root concentrate of Kyllinga nemoralis for its antihelmintic proficiency in creature demonstrate which has conventional claims too. The phytochemical tests uncovered the nearness of restricted phytoconstituents like starches, alkaloids and unstable oils in ethanolic tuber remove. The anthelmintic action of ethanolic remove was examined by utilizing creature display [36].

Sindhu et.al, (2014);evaluated the cell reinforcement and antibacterial movement of methanol concentrate of Kyllinga nemoralis. Six distinctive in vitro cell reinforcement examines including 2,2-diphenyl-1-picrylhydrazyl, hydroxyl radical, superoxide anion radical, hydrogen peroxide radical, ferric diminishing cancer prevention agent control test and lessening power were completed to guarantee the rummaging impact of the plant on free radicals. Furthermore, add up to cell reinforcement limit measure, add up to phenolic substance, tannins, flavonoids and flavonol substance of the plant were additionally examined by the standard conventions [37].

Rajagopal et.al, (2016), detailed about phytochemical and cancer prevention agent screening of the flying parts of kyllinga nemoralis. In examine, an endeavor has been made to assess the cell reinforcement action of the aeronautical parts of the plant and results demonstrated that the alcoholic concentrate of the plant were found to lessen ferric particles in a focus subordinate way indicating intense cancer prevention agent action of the plant [38].

Mondal et.al,(2013), detailed about home grown pharmaceuticals helpful for the treatment of diabetes in upper east India, kyllinga triceps was incorporated as antidiabetic natural medicine.Diabetes mellitus (DM) is a gathering of metabolic issue described by hyperglycemia, which is related with irregularities in sugar, fat and protein digestion result in perpetual confusions. The primary goal of the investigation to introducing the restorative plants utilized in North-East India for hostile to diabetic purposes. This investigation stresses potential hotspots for the improvement of new enemy of diabetic medications from

indigenous restorative plants found in North-East India [39].

Dhivya et.al, (2016), revealed about ethno restorative learning of plants utilized by irula clans, nellithurai beat, the nilgiris. Tamil Nadu, they announced that the juice of the plant kyllinga triceps is utilized by tribals as hostile to diabetic drug [40].

Shikha et.al,(2013) revealed about commitment of indigenous therapeutic plant in treatment of diabetes, they announced kyllinga triceps as subterranean insect diabetic prescription. Plants have dependably been a wellspring of medications for people since time immemorial. The Indian conventional arrangement of pharmaceutical is loaded with the utilization of plants for the administration of diabetic conditions. As per the World Wellbeing Association, up to 90% of populace in creating nations utilize plants and its items as customary medication for essential medicinal services [41].

K M Matthew (1983) announced about plant profile of Kyllinga triceps.stem thickly tufted,4-12 cm, to 0.5 mm wide, slim, triquetrous, incrassate at base, leaves level or collapsed, 13×0.2 mm, flabby, scabrid; sheaths pale or yellow. Inflorescence capitate, regularly of 3, seldom 1-or 5-lobed spikes; focal one subglobose or oblong,to 6 mm; parallel ones globose, 2 mm; involucral bracts 3, unequal, overtopping, to 5 cm. spikelets oval, to 2 mm, suberect or 1-bloomed. Glumes 4, hyaline; bring down 2 barely direct, to 1 mm; third one praise, to 1.5 mm, 7-nerved; upper one tight straight, to 1 mm, 5-nerved; bottom solid, smooth, stamens 2; anthers to 1 mm. nut biconvex, oval, to 1.5 mm, along the side packed, apiculate, stipitate. It is appropriated fields from the drift ; less on hils. Across the board in old world tropics from Africa to north Australia [42].

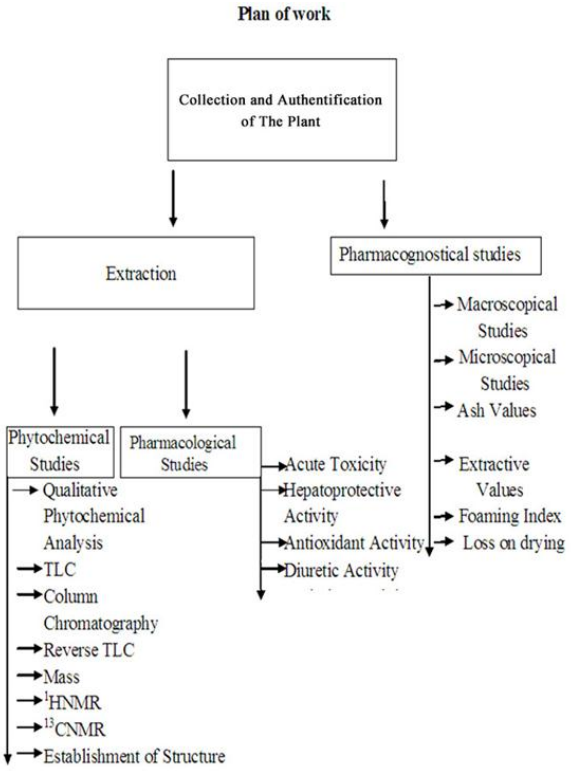
P. Gopalkrishna Bhat et. al. revealed about the 22 tubers and 9 beats screened for inhibitors of enterokinase movement, the accompanying 12 tubers, Curcuma amada, Kyllinga monocephala, Solanum tuberosum, Canna indica, Helianthus tuberosus, Coleus parviformis, Mirabilis jalapa, Colocasia antiquorum (red assortment), Alium cepa, Arnorphophalus companulatus, Maranta arundinacea, Daucus carota [43].

Yaya Mahmout et. al. revealed about piece of the fundamental oil from Kyllinga erecta S. was broke down and found to contain a lot of manoyl oxide, with lesser measure of 13-epimanoyl oxide of oxo and of hydroxymanoyl oxide subsidiaries. The major sesquiterpene hydrocarbon was indentified as cyperene, alongside sativene, cyperotundone, and spatulenol [44].

AIM AND SCOPE OF THE STUDY

Aim of the Study

Kyllinga triceps rottb is distributed throughout India, Except few ethno medicinal studies not much work has been reported on this plant. Hence we are interested to submit this plant for detailed pharmacognostical, preliminary phytochemical and pharmacological investigations which may help in future research in field of hepatoprotective, Antioxidant and diuretic medication.



MATERIAL AND METHODS

Plant Collection and Identification

Collection of Specimen

The species for the proposed study that is *Kyllinga triceps* rottb were collected from Bhoora Khon area of Shivpuri District of Gwalior Division (M.P.) with the help of Mr. N.K. Pandey (R.O.) National Research institute for ayurvedic-siddha (CCRAS) Amkho, Gwalior.

Taxonomical Identification

The species for the proposed study was identified as *Kyllinga triceps* by Dr. (Smt.) M.D. Gupta (Asst Director) and Mr. N.K. Pandey (R.O.) National Reseach Institute for Ayurveda and siddha (C.C.R.A.S.) under Ministry for Health and Family Welfare, Govt. of India, Amkho Gwalior (M.P.)

Pharmacognostical Studies

Morphological and microscopically studies were performed.

Phytochemical Studies

Extraction, separation of phytoconstituent by TLC column, reverse TLC, mass ^{13}CNMR ^{1}HNMR spectral studies was performed with structure elucidation of isolated component.

PHARMACOLOGICAL STUDIES

Acute oral toxicity study

Study was performed by using OECD guidelines - 423 (Organization of Economic Co-Operation Development)-Fixed dose procedure (FDP).The Static Dose Process (FDP) is a technique for measuringsevere oral poisonousness that includes the identification of an amount level that reasonsindication of non-lethal toxicity which labelspure signs of toxicity following supervision of test material, such that an upsurge to the followingmaximum fixed dose would effect in the development of severe toxic signs and probably mortality (Venkatesh, et. al., 2015), (Aneela, et. al., 2011).

HEPATOPROTECTIVE AND ANTIOXIDANT STUDIES

Chemicals

All the solvents and chemicals used were of analytical grade. Standard kits for SGOT, SGPT (Ranbaxy Diagnostic Ltd, Baddi, H.P.) Bilirubin ,Total Protein, Globulin,Albumin(Span Diagnostic Ltd,Surat.) and cholesterol, Triglycerides,Urea,Creatinine (Excel Diagnostics Pvt, Ltd., Hyderabad), Standard drug silymarin (Unicure India Private Limited, Noida), were used in the present study. Silymarin is natural product obtained from seeds and fruits of silybum Marianun (milk thistle). It was melted in olive oil for oral management to micethroughresearch, at the amountequal 25 mg/kg body massper day.

Planning of excerpts and normal drug for animal quantity.

Vehicle of Optimal, Drugs Disbanding and Capacity Selection Basis

Rendering to the OECD's plans, quantity of drug (mg) should be created in an suitable volume not usually beyond 10 ml/kg (1 ml/100g) body mass of experimental animals (mice) for non-aqueous solvent in oral way of management. However in the situation of aqueous thinners, 20 ml/kg (2 ml/100g) body mass can be measured (OECD, 2000). Huge dose volumes (40 ml/kg body weight) can cause redundantpressure to animals and can also excess the abdominalvolume and permitclosely into the slight bowel or can consequence in sluggish reflux in the abdominal, ambition pneumonia, pharyngeal, oesophageal, and intestinalannoyance or damage with criticism formation, oesophageal and intestinal rupture and stress. Inferiorcapacity (5 ml/kg) can be measured to melt highly solvable solute drugs. Such squat volume would ease the administration of medication in solution. However, extremelyviscid drug solution should be watery, whenever likely, for ease of administration. However, concludingreduction volume should not exceed 20 ml/kg. Based on 10 ml/kg volume selection, obligatory dose volume for a 100 g rat can be intended as follows; (Erhirhie, et. al., 2014).

100 g / 1000 g × 10 ml = 1 ml

NB: 1kg = 1000 g

Based on 20 ml/kg volume assortment, essential dose volume for a 100 g mice can be intended as follows;

100 g / 1000 g × 20 ml = 2 ml

Dosage Calculation and Preparation of Stock Solution of Crude Plant Extract for Experimental Animals

Standard solutions and quantities of a plant excerpt

(With designated doses, 100 mg/kg and 200 mg/kg)

for a mice weighing 120 g be calculated as follows;**.**

Step 1: **Dosage calculation**

Body weight of animal =120 g

Dosage in mg = **Body weight in animal (g) / 1000 g** × dose (mg)

Dosage in mg **= 120 g/ 1000 g ×200** (**mg**) = 24 mg.

Step 2: **Dissolution of dose in a suitable vehicle for oral administration**

From the OECD's guidelines, **120 g** rat requires **24 mg** of the crude plant extract which should be constituted in not more than **1.2 ml** of normal saline according to the OECD guidline.

In a nut shell, **120 g ≡ 24 mg ≡ 1.2 ml** of normal saline.

Bulk volume of the stock solution required for large number of animals can be calculated by multiplying both sides by a constant value as follows;

24 mg = 1.2 ml

40 x 24 mg = 40 x 1.2 ml

960 mg of crude plant extract will be dissolved in 48 ml of normal saline =960 mg / 48ml = 20 mg/ml.

Thus 1 ml of dissolved plant extract from a given stock solution

(960 mg/48 ml = 20 mg/ml)

is the required dose (from selected dose of 200 mg/kg) for a rat weighing 100 g.

However, 1.2 ml from the same stock solution is the required volume for a rat weighing 120 g (which is meant to receive 24 mg of the plant extract).

Dosage calculation and preparation of stock solution of a reference drug.

The required dose of silymarin (70 mg per tablet) for a rat weighing 130 g at a standard dose 25 mg/kg can be calculated as follows;

Dosage calculation

Required dose for 130 g rat = **Weight of animal (g) / 1000 g** x Standard dose (mg) =**130 g / 1000 g** x 25 mg = 3.25 mg.

Dissolution of sylimarin in a suitable volume of vehicle for oral administration.

From the above calculation, 130 g rat requires 3.25 mg of sylimarin and this dosage (3.25 mg) should be constituted in not more than 1.3 ml of normal saline according to the OECD's guideline (see table 1 above).

In a nut shell, **130 g ≡ 3.25 mg ≡ 1.3 ml** of normal saline. If **3.25 mg** would be constituted in **1.3 ml** of normal saline,

Then, one tablet of sylimarin (**70 mg**) would be constituted in

1.3 ml / 3.25 mg x 70 mg = **28 ml** of normal saline.

That is **70 mg / 28 ml** = **2.5 mg/ml.**

Assessment of Hepatoprotective activity (Shankar, et. al., 2005, Sengottuvelu, et. al., 2017, Dash, et. al., Jaiprakash, et. al., 2003, Singhal & Gupta, 2012, Huo, et. al., 2011, Lin, et. al., 2014, Balne, et. al., 2013, Refaey, et. al., 2015, Rajangam & Christina, 2013).

Ethical Aspects

The study was approved by the institutional ethical committee (protocol No. 891/Po/ac/05/CPCSEA).

Induction of Hepatotoxicity using CCl4 and Grouping of Animal.

The rats were randomly divided into seven groups, comprising of six animals in each group (Singh, et. al., 2014).

Group-I Rats of this group received normal saline (10ml/kg) for 60 days. This group served as a normal control.

Group-II Rats of this group were intoxicated with carbon tetrachloride (CCl_4) with the dose of 0.3 ml/kg body weight/twice in a week, i.p. along with olive oil (50% v/v). This group served as a negative control.

Group-III Rats of this group received Silymarin (25 mg/kg orally) daily once for 60 days with CCl_4 as given to group-II for 60 days. This group served as a positive control.

Group-IV Rats of this group received petroleum ether extract of rhizome of kyllinga triceps rottb with the dose of 100 mg/kg orally daily once for 60 days with CCl_4 as given to group-II for 60 days.

Group-V Rats of this group received petroleum ether extract of rhizome of Kyllinga triceps rottb 200mg/kg orally daily once for 60 days with CCl_4 as given to group-II for 60 days.

Group-VI Rats of this group received ethanol extract of rhizome of Kyllinga triceps rottb 100mg/kg orally daily once for 60 days with CCl_4 as given to group-II for 60 days.

Group-VII Rats of this group received ethanol extract of rhizome of Kyllinga triceps rottb 200 mg/kg orally daily once for 60 days with CCl_4.

Assortment of blood

The blood models were composed from the period detour plexus on 8th day. Later serum was separated by centrifugation of blood at a speed of 2000 rpm for 10 minutes. The serum was collected and quantitatively analyzed for SGOT, SGPT and ALP, direct bilirubin, total cholesterol and triglycerides by using micro plate spectrophotometer using chemicaltoolsgotten from Ranbaxy Diagnostic ltd, Baddi, HP, India. The blood collected with anticoagulant containing EDTA (1 mg/ml) was used for estimation of Lipid profile, total protein, albumin, globulins, urea, creatinine (Singh, et. al., 2014).

Biochemical parameter estimation

- **Determination of Glutamate Pyruvate Transaminase (SGPT) (Kihara, et. al., 1984).**

Serum GPT assayed by using SGPT kit obtained from, Ranbaxy Diagnostic ltd, Baddi, H.P.

- **Determination of Glutamate Pyruvate Transaminase (SGOT) (Amador, et. al., 1966).**

Serum GPT assayed by using SGOT kit obtained from, Ranbaxy Diagnostic ltd, Baddi, H.P.

- **Determination of Alkaline Phosphatase (ALP) (Ellis, 1976).**

Serum ALP assayed by using ALP kit obtained from Roche Diagnostics India Pvt. Ltd. Mumbai, India.

- **Determination of Acid Phosphatase (Ellis, 1976).**

Serum ACP assayed by using ACP kit obtained from Roche Diagnostics India Pvt. Ltd. Mumbai, India.

- **Determination of direct bilirubin (Westwood, 1991).**

Bilirubin test kit Jendrassik and Grof, Span Diagnostic Ltd. (Liquid Gold), Surat.

- **Determination of Total Cholesterol (Cabre and Patemain, 2000, Röschlau, et. al., 1974).**

Plasma total cholesterol estimated by using kit obtained from M/s Excel Diagnostics Pvt. Ltd, Hyderabad.

- **Determination of Triglycerides (Cabre and Patemain, 2000, Comporti, 1985).**

Plasma triglycerides estimated by using kit obtained from M/s Excel Diagnostics Pvt. Ltd, Hyderabad.

- **Determination of Total Proteins (Boll, et. al., 2001).**

Plasma total protein estimated by using kit obtained from Span Diagnostics Ltd, Surat.

- **Determination of Albumin (Boll, et. al., 2001).**

Plasma albumin estimated by using kit obtained from Span Diagnostics Ltd, Surat.

- **Determination of globulin (Boll, et. al., 2001).**

Plasma globulin estimated by using kit obtained from Span Diagnostics Ltd, Surat.

- **Determination of Urea (Chinnapa, et. al., 2012)**

Plasma urea estimated by using kit obtained from M/s Excel Diagnostics Pvt. Ltd, Hyderabad.

- **Determination of Creatinine (Chinnapa, et. al., 2012)**

Plasma creatinineestimated by using kit obtained from M/s Excel Diagnostics Pvt. Ltd, Hyderabad.

Body weight (Anith, et. al., 2012)

Mean body weights of 7 experimental groups at 0 days (initial) and 60 days (final) were noted

Liver weight (Anith, et. al., 2012)

Relative tissue weights per l00 gms body weight of liver were measured in all groups.

Autopsy Schedule (Singh, et. al., 2014)

After the last dose given to rats of each group they were kept on starvation for 24 hrs and after that they were anesthetized with the help of ether. Blood samples were collected from all groups of rats by puncturing the retro-orbital plexus. The blood samples of each animal were taken and allowed to clot at 37^0C after that serum was separated by centrifugation at 4000 rpm at 4ºC for 15 min and analyzed for various biochemical parameters. After the collection of blood the liver was immediately excised and washed with the help of cold normal saline and used for histological studies.

Histopathological Studies of the Liver (Jaiprakash, et. al., 2003, Singhal & Gupta, 2012)

Assessment of Antioxidant activity (Rajagopal, et. al., 2016, Kumar, 2014)

Studies on Antioxidant and Oxidative stress

Preparation of tissue extracts for glutathione and lipid peroxidation

Immediately after separation of liver, 10% tissue homogenate was equipped in 0.15 M potassium chloride using homogenizer at 0° C. The total homogenate was used for approximation of lipid peroxidation and glutathione

Lipid peroxidation

Procedure: To 1.0 ml of the liver homogenate, 2.0 ml of TCA and 4.0 ml of TBA were additional, intense in water wash for 30 minutes. After chilling and centrifugation, the absorbance of the supernatant was recite at 535 nm. A substancecomplete was equipped using water in its place of tissue homogenate.

Assay of Antioxidants enzyme levels

Sample preparation

Ten percent of the liver tissue homogenate in 0.15 M potassium chloride wasprepared at 0°C and centrifuged in cold (0-4°C) at 12,000 rpm for 45 min**,** in Remi **(**SL-**)** cooling centrifuge. The supernatant thus obtained into eppendorf tubes, labelled and stored at -20° C and all the antioxidant enzymes were assayed at the earliest.

Assay of superoxide dismutase (SOD) (Kuthan, et. al., 1986, Kakkar, et. al., 1984)

Procedure*:* The examine framework contained 2.1 ml of cradle, 0.02 ml of chemical source (35 gm protein) and 0.86 ml of refined water. The response was started with 0.02 ml of pyrogallol and change in absorbance was observed at 420 nm. The percent hindrance was figured based on examination with a clear measure framework. One unit of Turf was characterized as that measure of protein required to hinder the autooxidation of pyrogallol by half in standard examine arrangement of 3 ml. The particular movement was communicated as units/min/mg protein.

Assay of glutathione peroxidase (Paglia & Valentine, 1967)

Procedure: To 0.5 ml cradle, 0.2 ml chemical source, 0.2 ml GSH, 0.1 ml H2O2 were included and brooded at room temperature for 10 min alongside a control tube containing all reagents aside from catalyst source. The response was captured by including 0.5 ml of 10% TCA, centrifuged at 4000 rpm for 5 min. furthermore, GSH content in 0.5 ml of supernatant was evaluated. The movement was communicated as µg of GSH expended/min/mg protein.

Glutathione reductase (Bjomstedt, et. al., 1994, Brigelius-Flohe, 1999)

Procedure: The system contained 0.5 ml of buffer, 0.1 ml of EDTA, 0.1 ml of NADPH, 0.96 ml of refined water and 0.1 ml of compound source (150 µg protein). The response was started by the expansion of 0.24 ml GSSG. The adjustment in absorbance was recorded at 1 min interims at 340 nm for 5 min. The particular movement is communicated as µmol of NADPH oxidized/min/mg protein utilizing an eradication coefficient for NADPH of 6.22 cm-1 mmol-1.

Glutathione-S-transferase (Banerjee, et. al., 1993, Habig, et. al., 1974)

Methodology: The examine framework contained 1.7 ml of support, 0.2 ml GSH and 0.04 ml chemical source (40 µg protein). The response was started by 0.06 ml CDNB. The adjustment in absorbance was recorded at 1 min interims at 340 nm for 5 min and the movement was computed utilizing a termination coefficient of CDNB-GSH conjugate as 9.6 mM-1 and communicated as mmoles of CDNB-GSH conjugate framed/min/mg protein.

Test of catalase (Johansson &Borg, 1988)

Procedure:The test framework contained 1.9 ml support and 1.0 ml H2O2. The response was started by expansion of 0.1 ml catalyst source (45 µg protein). The diminishing in absorbance was observed at 1 min interim for 5 min at 240 nm and movement was communicated as "n" moles of H2O2decomposed/min/mg protein.

Diuretic Activity (Adam, et. al., 2013, Meera, et. al., 2009)

Experimental animals.

Mice weighing amid175-200 g of either sex were rummage-sale in the research, The Albino experimental procedure was accepted by the Official Animal Principled Committee, and these animals were used to evaluate the diuretic activity of Ethanolic and petroleum Ether Extracts of the plant *kyllinga triceps* rottb. The animals were preserved under normalfarming conditions for an accommodationdated of 15 days before execution the trials. All mice were housed in metal cages six in each and malaisekept at 22±2°C.

Drug used (Kumar, et. al., 2013, Kanakam, et. al.,)

Furosemide 10 mg/ml (Sanofi Aventis, Andheri East, Mumbai).

Experimental model

Lipschitz test

The process of lipschitz et.al was engaged for the valuation of diuretic action. Six groups of 6 albino Mice, each weighing 175-200 g were abstained and destitute of water for 18 hours previous to the experiments. On the day of the experiment all the

animals were assumedusual saline orally 25 ml/kg body mass.

Group –I - Control

Group –II - Furosemide (10 mg/kg) standard

Group –III - Petroleum Ether Extract (100 mg/kg)

Group – IV - Petroleum Ether Extract (200 mg/kg)

Group – V - Ethanolic Extract (100 mg/kg)

Group – VI - Ethanolic Extract (200 mg/kg)

Directly after dosing, the animals were located in metabolic birdcagesparticularlyintended to distinct urine and feaces and kept at area temperature of 25 ± 0.5 °C. The urine was collected in measuring cylinder, every 30 minutes for 5 hours in all groups and at the end of 5th hour the collected urine stored at -20 ^{0}C until further analysis.During this period no meal was made obtainable to the animals. The wholecapacity of urine collected was unrushed for the switch and preserved groups. The limits taken for each discrete rat were body weight total urine volume urine attentions of Na^{+}, K^{+}, CL^{+},Na^{+} and K^{+}concentration were restrained by flicker photometery and Cl deliberationswas probable titrimetrically. To attain diuretic action, the diuretic action of the extract was associated to the diuretica action of the normal drug in the examination group (Adam, et. al., 2013, Meera, et. al., 2009, Kumar, et. al., 2013)

Estimation of Urinary Electrolytes

Sodium, potassium and chloride levels of urine and the plant extract were analyzed.

Statistical Analysis

Theexperimental results wereexpressed as the mean ± standard error of mean and the statistical significance was evaluated by using students't'test.

RESULT AND DISCUSSION

PHARMACOGNOSTICAL STUDIES

Microscopy of Leaf

The leaf is collapsed adaxially as "V", the two edges being extended horizontally. The surface of the leaf is smooth and glabrous. The abaxial side is even while the adaxial side is fairly uneven because of the existences of expanded bulliform cells. The midrib present in 250 µm in vertical plane and 220µm in level plane there is a solitary conspicuous round Vascular package in the midrib. The package has two wide round metaxylem components and a pounded roundabout protoxylem lacuna. Phloem happens in a roundabout fix in the middle of the metaxylem components. Lamina is 150 µm thick it has wide widened epidermal layer on the adaxial side; the cells are radially elliptical and thin walled. At specific places, the adaxial epidermis turn out to be exceedingly enlarged and vertically stretched shaping bulliform cells or engine cells. nearness of anomocytic stomata is the characteris Highlight of T.S. of Kyllinga triceps rottb. Stamatal No. is 14 and record in 19.44.

Microscopy of culm (stem)

The airborne stem or the culm is triangular in cross sectional view with three noticeable wings the wings are half circle The epidermis of the culm has genuinely thick epidermal layer made up of rectangular or squarish cells. The vascular arrangement of the culm comprises of external vascular packs and internal vascular strands. The external vascular strands are littler round and security.

Microscopy of Root

The root in thin and sinewy it has pounded epidermal layer. The cortex has external zone of three or four layers of shrinken parenchyma cells and internal zone of considerably more extensive air chambers. The endodermis and pericycle are thick walled and sclerenchyma cells are available. The vascular barrel has a wide round focal meta xylem and a few spiral lines of protoxylem components. Phloem happens in the middle of the metaxylem components.

Microscopy of Rhizome

The leaf sheath has two layers of epidermis with extensive air-chambers in the middle of . The external and, inward epidermal layers are single layered with rectangular cells. The edges of the leaf sheath are a few layered and there are expansive, round vascular packs set noticeable all around loads in a solitary line. There are littler vascular packs arranged along the external epidermis. In the district where the vascular packs happen, the epidermis winds up three layered.The rhizome is roundabout and even in plot. It is 2mm in distance across. It has single layered epidermis. The epidermal cells are rectangular, tight and thin walled. There is wide cortex containing homogenous parenchyma tissue. The cortical cells are little, precise thin walled and minimal. The cortex is 700 µm wide. The steel is focal, round and 2401.tm in distance across.

Microscopy of Inflorescence

In sectional view, the inflorescence pivot has numerous edges and wrinkles. The florets are

altached to the hub in the wrinkles with a short stalk. The florets have thin, membranous perianth individuals.

Powder Microscopy

Powder of the rhizome, ethereal stem and leaf was considered under the magnifying instrument and the accompanying components were watched.

1. Vessel components: The vessel components are long, tight and barrel shaped. They are 90 µm and 20 µm wide.

2. Xylem fibers:They have long tight pointed finishes. The dividers are thick and lignified. Pits are missing they are 400-550 µm long.

3. Vessel component and fiber of the aeronautical stem are any longer and smaller. The vessel component is 550 µm long. The filaments are additionally thin and long upto 600 µm

4. The epidermal cells are vertically oval and parallel to each other. The anticlinal dividers are thick and straight.

PHYTOCHEMICAL STUDIES

Table-1: TLC of Ethanolic Extract and Petroleum Ether Extract of Powdered Rhizome of Kyllinga Triceps Rottb.

S. No	Extract	Solvent System	No of Spots	Colour of Spots	RF Value
1	Petroleum ether extract	Ethyl Acetate: Hexane (30:70)	3	Dark Blue Greenish Blue Black	0.60 0.48 0.40
2	Ethanolic Extract	Chloroform Ethyl Acetate (60:40)	3	Dark Blue Greenish Blue Black	0.52 0.45 0.50

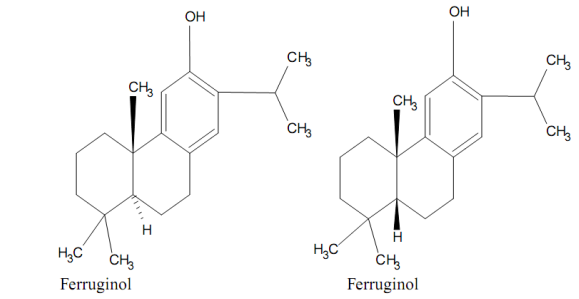
Table-2: TLC of Isolated Fractions of columan

S. No	Isolated Fractions	Solvents	Colour of Spot	RF Value
1	F21	chloroform Ethyl Acetate: (60:40)	Blue	0.6
2	F22	chloroform Ethyl Acetate: (60:40)	Blue	0.61
3	F23	chloroform Ethyl Acetate: (40:60)	Blue	0.61
4	F24	chloroform Ethyl Acetate: (60:40)	Blue	0.61

Establishment of Structure of isolated Compound.

Constituent separated from petroleum ether extract of rhizomes of *kyllinga triceps* rottb. Has the molecular formula $C_{20}H_{30}O$,was established by its mass spectrum data as its showed molecular ion-peak at m/z (%) 286 (35) where the base peak is at 271. The fragment ion peaks are at 253(12), 187(78), 145(30), 117(14) and 91(9). The ^{1}HNMR spectral data confirm the structure of the compound the presence of phenolic OH which was observed at δ 4.62 ppm. The aromatic protons were reported at δ 6.79 and 6.63 ppm. An angular methyl of *trans*configuration were recorded at δ 1.06 ppm. The geminal methyls of isopropyl moiety were observed at δ 1.12 ppm. The structure was finally confirmed by its ^{13}CNMR spectra. A shift at δ 151.0 ppm revealed the presence of a phenolic OH at C-13. The aromatic carbons were found at δ 132.0, 127.3, 125.7, and 110.7 ppm. The geminal dimethyl carbons of isopropyl moiety were at δ 22.5 ppm. The trans configuration of the compound was finally confirmed by the comparison of ^{13} CNMR data with its *cis*-isomers, where in the ring carbon C-3 and C-2 of *cis*-isomer were reported at δ 37.6 and 50.1 ppm, which are more shielded than the ring carbons of *trans*-isomer,Present at δ 40.7 and 54.2 ppm of carbons C-1 and C-2.Similarly two carbons being shared by the cyclohexane and aromatic moiety of both the isomers possess different values. The carbons of *cis*-isomers at C-7 and C-9 are found at δ 126.0 and 145.3 ppm, whereas in *trans*-isomer they were found at δ 127.0 and 146.4 ppm.

Fig. 4 : Structure of isolated compound of petroleum ether extract of *Kyllinga triceps* rottb



PHARMACOLOGICAL STUDIES

Assessment of Hepatoprotective activity

Marked increase in the levels of SGOT, SGPT, ALP, ACP and DB ($P < 0.01$) in the group treated with CCl4, when compared with normal control was observed. The marked elevation in serum hepatic biochemical markers in rats treated with CCl4 (hepatotoxicant) was an indication of hepatotoxicity. The groups received the pre-

treatment of KTR extracts at dose levels of 100 and 200 mg/kg body weight significantly controlled the change in the biochemical parameters in dose dependant manner. All the extracts at dose levels of 200 mg/kg exhibited significant activity compared to lower doses.

Body weight

Mean body weights of 7 experimental groups at 0 days (initial) and 60 days (final) were summarized in table 04. All the rats survived the experimental period of 60 days, till they were sacrificed. Body weights of the rats significantly decreased in the CCl_4treated groups, but increased in the normal control, KTR extract treated group and Silymarin treated group.

Relative Liver weight

Relative tissue weights per l00 gms body weight of liver was measured in all groups (Table. 05).Group I (Normal control) the liver weights was not significantly different, whereas, group II (CCl_4 treated) liver tissues showed significantly increase in weight over Normal control In this study administration of discontinuous CCl_4 treatment for 60 days resulted in significant ($p<0.05$) increased in the weights of liver . The liver weight showed significant increase in the CCl_4 group probably because of increased accumulation of fat vacuoles shown by hematoxylin and eosin staining and increased hepatic cholesterol and triglyceride levels. In the present study CCl_4 plus Kyllinga triceps rottb extract treatment showed significant ($p<0.05$) decreased in the weight of liver compared to CCl_4 treated ones. In conclusion, by administration of Kyllinga triceps rottb extract significantly restored the body weight and liver weights almost nearer to control ones. More over Kyllinga triceps rottb extract treatment showed almost equal results with reference drug.

Histopathological Studies of the Liver

Group-I: The control group animals have shown normal architecture, with normal hepatic cells and no pathological changes observed in normal control animals.

Group- II: CCl_4 challenged animals have shown congested blood vessel, necrosis hepatocytes, with portal infiltration portal infiltration, fatty change, kupffer cell hyperplasia and hydrophic changes with ballooning degeneration.

Group-III: The animals treated with 200 mg/kg of the petroleum ether rhizome extract of *Kyllinga triceps* rottb. Have exposeddiscount in the necrosis which is additionalunadorned form of damage is noticeablybanned. It has also shown decrease in fatty wasting changes.

Group IV: The animals treated with 200 mg/kg of the Ethanolic rhizome extract of Kyllinga triceps rottb Have shown the necrosis which is markedly prevented. Slighter form of injury like fatty revolution and reduced necrosis persevered by the excerpt.

Group V: The animals were treated with Silymarin have shown much reduction in ballooning degeneration, and fatty changes of hepatocyte necrosis which is more severe form of injury is markedly prevented.

Lipid profile

Lipid profile levels (total cholesterol and triglycerides) in group II rats (CCl_4 treated group) were significantly ($p<0.05$) increased than Normal control rats, whereas, group IV, V, VI and VII showed the significantly ($p<0.05$) decreased levels over the group II. The group V (CCl_4 + PE-KTR 200 mg/kg) and group VII (CCl_4 + AE-KTR 200 mg/kg) showed significant decreased levels of lipid profile over group IV (CCl_4 + PE-KTR 100 mg/kg) and group VI (CCl_4 + AE-KTR 100 mg/kg) not significantly different with group III (siylamarin treated group). The results were shown in the Table 06.

Plasma Total Proteins, Albumins and Globulins

The data presented in Table.06 showed the changes in plasma parameters like total protein, albumins and globulins in all groups. levels of plasma total proteins, albumins and globulins with control group (Group I vehicle control) and Group III (Silymarin control), Group IV (CCl_4 + PE-KTR 100 mg/kg) and group V (CCl_4 + PE-KTR 200 mg/kg), VI (CCl_4 + AE-KTR 100 mg/kg), VII (CCl_4 + AE-KTR 200 mg/kg). But group V & VII showed the significantly ($p<0.05$) increase in levels of proteins, albumins and globulins comparable to group II.

Plasma Urea and Creatinine levels

Urea and creatinine levels in group II (CCl_4 treated group) were significantly increased ($p<0.05$) with normal control group (group I) whereas, the groups IV, V, VI and VII showed the significantly decreased levels ($p<0.05$). The group V (CCl_4 + PE-KTR 200 mg/kg) and group VII (CCl_4 + AE-KTR 200 mg/kg) showed significant decreased levels of urea and creatinine over group IV (CCl_4 + PE-KTR 100 mg/kg) and not significantly different with group III (CCl_4+sylamarin treated rats).

Kyllinga triceps rottb extracts significantly ($p<0.05$) improved, the plasma concentrations of total protein and albumin, while significant recovery of the urea and creatinine levels. Kyllinga triceps rottb extracts showed almost nearer results with CCl_4 plus reference drug (silymarin).

Antioxidant Study

Lipid peroxidation

LPO in liver tissue was studied on 7 experimental groups and data presented in Table. 07, Group II (CCl_4treated group) showed significantly ($p<0.05$) increased levels of MDA as compared to normal control group, whereas, group IV, V, VI and VII showed the significantly ($p<0.05$) decreased levels. Group V (CCl_4 + PE-KTR 200 mg/kg) showed a significant decreased level of MDA over group IV (CCl_4 + PE-KTR 100 mg/kg), VI (CCl_4 + AE-KTR 200 mg/kg) and VII(CCl_4 + AE-KTR 100 mg/kg) and not significantly different with group III (silymarin treated group).

Antioxidant enzyme levels

Liver antioxidant enzymes

The data presented in Table:08 showed analysis of various antioxidant enzymes like Catalase (CAT), Superoxide dismutase (SOD), Gluthione peroxidise (GPx), Glutathione reductase (GR), Glutathione-S-transferase (GST) activities were studied in liver tissue in all groups. Group II (CCl_4 treated alone) showed significant ($p<0.05$) decrease in the activity of CAT, SOD, GPx, GR and GST with Normal control group, whereas, group IV, V, VI and VII showed significant ($p<0.05$) increase in the antioxidant activity over the group II. Group V (CCl_4 + PE-KTR 200 mg/kg) showed a significant increase in the activity of CAT, SOD, GPx, GR and GST over group IV (CCl_4 + AE-KTR 100 mg/kg), group VII (CCl_4 + AE-KTR 200 mg/kg) and group VI (CCl_4 + PE-KTR 100 mg/kg) and not significantly different with group III (CCl_4 + silymarin treated group).

Diuretic Activity

The higher measurement of both the PE and alcoholic concentrates created equivalent impact to that of furosemide. Far and away superior impact was seen with the oil ether remove, as it had a diuretic action significantly more than the standard medication. Diuretic movement is thought to be great on the off chance that it is more than 1.50, direct in the event that it is 1.00-1.50, little on the off chance that it is between 0.72-1.00 and nil on the off chance that it under 0.72.The impact of the concentrates on water discharge was joined by urinary electrolyte discharge impact, since there had all the earmarks of being an expanded salt discharge when contrasted with the control gathering, which bolsters the diuretic impact was of the saluretic compose rather than aquaretic type, which is a common component of most phytodiuretic operators. The bigger measurements of the two concentrates had an intriguing natriuretic impact and hence could have an advantageous impact in various edematous conditions. The outcomes demonstrate that the concentrates increment sodium discharge more than potassium, which is considered as a decent wellbeing profile of diuretic specialists, as hypokalemia is one of the potential antagonistic impacts of manufactured diuretics.

CONCLUSION

The liver is an indispensable organ present in vertebrates and some different creatures. It has an extensive variety of capacities, including detoxification, protein amalgamation, and creation of biochemicals important for absorption. This organ assumes a noteworthy part in digestion and has various capacities in the body, including glycogen stockpiling, deterioration of red platelets, plasma protein blend, hormone creation and detoxification. Along these lines, to keep up a solid liver is a critical factor for by and large wellbeing and well-being.But it is persistently and variedly presented to ecological poisons, and manhandled by poor medication propensities, and liquor and endorsed and over-the-counter medication which can in the end prompt different liver infirmities like hepatitis, cirrhosis and alcoholic liver disease.Today, individuals are uncovered every day to certain natural toxins and outside synthetic compounds aggregately alluded to as xenobiotics which are causing genuine medical issues. Liver infections have turned into a worldwide issue and around 20,000 passings happen each year because of liver issue. Around two million individuals kick the bucket every year from hepatic related issue on the planet. Liver ailments are the tenth driving reason for death and record for noteworthy dismalness over the whole age and sexual orientation range of the US populace. Endless liver maladies are regular worldwide and are described by a dynamic advancement from steatosis to unending hepatitis, fibrosis, cirrhosis, and hepatocellular carcinoma.

Different xenobiotics are known to cause hepatotoxicity, one among them is carbon tetrachloride (CCI4) that may cause lipid peroxidation. It was the main poison for which was demonstrated that the damage it produces is to a great extent or totally intervened by a free extreme system. Harmful levels directed to creatures deliver greasy aggregation in the liver because of blockage in the blend of lipoproteins that divert triglycerides from this organ. It is trusted that CCI4 is utilized by the P450 framework to give the trichloromethyl radical. A few P450 are included including CYP2E1, the 'ethanol-inducible' cytochrome P450-Consequently, CCI4 incited hepatotoxicity fills in as a fantastic model to think about the atomic, cell and morphological changes in the liver. There are expanding confirmations that free radicals and receptive oxygen species (ROS) assume a critical part in the different advances that start and manage the movement of liver infections autonomously of the operator in its root. Oxidative

pressure is additionally associated with liver harm prompted by liquor manhandle, viral disease, adjustment of lipid and sugar digestion and xenobiotics. Steroids, antibodies, and antiviral medications, have been utilized as treatments for liver pathologies, have potential antagonistic symptoms, particularly if regulated constantly or sub-incessantly. Along these lines, home grown items and customary solutions with better viability and safe profiles are required as a substitute for concoction therapeutics. As oxidative pressure assumes a focal part in liver pathologies and their movement, the utilization of cell reinforcements have been proposed as helpful specialists, and in addition medicate co-adjuvants, to neutralize liver harm. There are no point by point gives an account of the cancer prevention agent guard of Kyllinga triceps rottb in CCI4 incited hepatotoxicity. Subsequently we thought of it as advantageous and completed this examination to evaluate the impact of Kyllinga triceps rottb on marker chemicals, enzymatic cancer prevention agents in CCI4 actuated hepatotoxicity in rats. CCI4 instigated rats indicated diminished body weight, increment in liver tissue weights, raised levels in serum marker compounds, cell reinforcement protein levels (Feline, Grass, GPx, GST, GR). Though, clinical indications (previously mentioned) of CCI4 inebriation were redressed with Kyllinga triceps rottb treatment. In opposite Kyllinga triceps rottb (PE-KTR 200mg/kg) is successful treatment and it indicated relatively close outcome with standard medication treatment (silymarin). In this way our outcomes firmly bolster the thought that treatment with Kyllinga triceps rottb to CCI4induced cirrhotic subjects would help in accomplishing hepatoprotection. Because of cell reinforcement potential it could be gainful for security and easing of the liver fibrosis inconveniences.

Diuretic action might be exceptionally valuable in various conditions like hypertension, hypercalciuria, and cirrhosis of liver. Since diuretics are utilized clinically in the treatmentof edema, it would be profoundly essential to exhibit adequacy within the sight of electrolyte and water. Consequently, it is dared to be favorable to 'pre-treat' or 'prime' the guinea pigs with different liquids in screening specialists for potential diuretic action. The oil ether and alcoholic concentrates demonstrated an expansion in pee volume that seemed to change with measurement and time and additionally the idea of the concentrate. Contrasted with the alcoholic concentrate, the oil ether extricate created a superior diuretic impact. The lower measurements of the two concentrates did not deliver an obvious impact, but rather, while the high dosage of the oil ether extricate could create huge impact starting from the fourth hour, a similar measurement of the alcoholic concentrate was without any impact until the finish of the perception time frame. This could presumably recommend that the lower measurements may speak to subthreshold dosages.

Table 2. Acute toxicity of Kyllinga triceps rottb extracts.

Plant	Extracts	Dose (mg/kg)	D/T	Mortality Latency	Toxic symptoms	Safe dose (mg/kg)
Kyllinga triceps rottb	Ethanolic	2000	0/6	Nil	Nil	>2000
	Petrolem ether	2000	0/6	Nil	Nil	>2000

D/T = dead/treated rats; Nil = no toxic symptoms observation; Mortality latency = time to death (in hours) after oral administration.

Table 3. Effect of KTR extracts on rat serum parameters after carbon tetra-chloride (CCl4) administration.

Group	SGOT (IU/L)	SGPT (IU/L)	ALP (IU/L)	ACP (IU/L)	DB (mg/dl)
Normal Control	58.2 ±1.9	47.2 ± 1.2	93.6 ± 2.3	71.8 ± 0.064	0.43 ± 0.06
CCl_4 control	191.1 ± 2.7[a]	171.3 ± 4.7[a]	218.6 ± 6.3[a]	118.8 ± 2.3[a]	1.08 ± 0.01[a]
Silymarin 25mg/kg	71.4 ± 1.3[b]	57.03 ± 2.4[b]	108.8 ±2.3[b]	86.3 ± 0.8[b]	0.52 ± 0.01[b]
CCl_4+PE KTR 100mg/kg	143.2 ± 2.2[b]	99.6 ± 2.4[b]	144.8 ± 1.6[b]	125.8 ± 1.2[b]	0.68 ± 0.05[b]
Cl_4+PE KTR 200mg/kg	87.3 ± 2.1[b]	68.07 ± 1.7[b]	105.6 ± 2.4[b]	116.04 ± 24[b]	0.61 ± 0.03[b]
CCl_4+AE KTR 100mg/kg	147.03 ± 4.7[b]	127.9 ± 1.8[b]	159.1 ± 4.7[b]	120.4 ± 0.95[b]	0.77 ± 0.03[b]
CCl_4+AE KTR 200mg/kg	119.6 ± 3.5[b]	78.3 ± 1.7[b]	109.7 ± 2.7[b]	66.± 0.18[b]	0.66 ± 0.04[b]

Values are the mean ± SEM, n=6.[a]P<0.01 when compared with control; [b]P<0.01 when compared with toxicant; [c]P<0.05 when compared with toxicant; [d]P >0.05 when compared with toxicant. PE-KTR- Petroleum ether KTR extract, AE-KTR- alcoholic extract KTR SGOT = serum glutamate oxaloacetate transaminase, SGPT = serum glutamate pyruvate transaminase, ALP = alkaline phosphatase, ACP- Acid Phosphatase, DB = direct bilirubin

Table: 4 Body weight of CCl_4-treated rats with or without Kyllinga triceps rottb. Extract.

Body Weight	Group I (Normal Control)	Group II(CCl_4 control)	Group III (CCl_4 +Silymarin control)	Group IV (CCl_4 + PE-KTR 100 mg/kg)	Group V (CCl_4 + PE-KTR 200 mg/kg)	Group VI (CCl_4+ AE-KTR 100 mg/kg)	Group VII (CCl_4 + AE-KTR 200 mg/kg)
0 days							
Mean	186.54[a]	186.54[a]	219.36[a]	185.65[a]	171.28[b]	208.45[a]	177.84[b]
S.D.	±15.32	±26.54	±15.21	±16.84	±18.47	±16.24	±15.84
60 days							
Mean	278.28[a]	205.57[b]	270.25[a]	248.45[a]	239.87[b]	262.65[a]	250.51[a]
S.D.	±28.38	±24.56	±16.22	±26.92	±27.54	±28.26	±26.11
Weight gain							
Mean	91.74[a]	19.03[b]	50.89[b]	62.8[b]	68.59[a]	54.2[b]	72.67[b]
S.D.	± 23.45	± 15.52	± 16.11	± 25.72	± 17.07	± 22.42	± 23.09

Values are mean ± S.E.M. of 6 rats; Values with different superscripts within the column are significantly different at P<0.05 (Duncan's Multiple Range Test)

Values are mean ± S.E.M. of 6 rats;

Values with different superscripts within the column are significantly different at P<0.05 (Duncan's Multiple Range Test)

Table: 5. Body weight and relative organ weight of CCl_4-treated rats with or without Kyllinga triceps rottb. Extract.

Name of the parameter	Group I (Normal Control)	Group II (CCl4 control)	Group III (CCl4 +Silymarin control)	Group V (CCl4 + PE-KTR 100 mg/kg)	Group IV (CCl4 + PE-KTR 200 mg/kg)	Group VII (CCl4 + AE-KTR 100 mg/kg)	Group VI (CCl4 + AE-KTR 200 mg/kg)
Body weight (final)							
Mean	278.28^{a}	205.57^{b}	270.25^{a}	248.45^{a}	239.87^{a}	262.65^{a}	250.51^{a}
S.D.	±24.56	±16.22	±27.54	±26.11	±26.92	±8.26	±28.26
Relative liver weight/100 gm body weight							
Mean	2.88^{c}	4.496^{c}	3.566^{b}	3.5^{b}	2.965^{a}	3.6^{c}	3.05^{b}
S.D.	±0.4	±0.27	±0.29	±0.269	±0.335	±0.295	±0.097

Values are mean ± S.E.M. of 6 rats;

Values with different superscripts within the column are significantly different at P<0.05 (Duncan's Multiple Range Test)

Table : 6 Effect of Kyllinga triceps rottb extracts on blood serum parameter.

Parameter		Group I (Normal Control)	Group II (CCl_4 control)	Group III (CCl_4 +Silymarin control)	Group IV (CCl_4 + PE-KTR 100 mg/kg)	Group V (CCl_4 + PE-KTR 200 mg/kg)	Group VI (CCl_4 + AE-KTR 100 mg/kg)	Group VII (CCl_4 + AE-KTR 200 mg/kg)
Total Proteins	Mean	9.665^{a}	6.09^{d}	9.23^{c}	8.545^{b}	8.765^{c}	7.994^{b}	8.012^{b}
g/dL	S.D.	±0.335	±0.1714	±0.1245	±0.3	±0.2843	±0.314	±0.301
Albumin	Mean	5.7^{a}	3.41^{d}	4.98^{b}	4.37^{c}	4.92^{b}	4.72^{c}	5.04^{b}
g/dL	S.D.	±0.284	±0.274	±0.084	±0.174	±0.192	±0.180	±0.112
Globulins	Mean	3.965^{a}	2.654^{b}	4.135^{a}	3.904^{a}	4.056^{a}	4.128^{a}	4.214^{a}
g/dL	S.D.	±0.49	±0.39	±0.142	±0.111	±0.212	±0.154	±0.102
Urea	Mean	29.54^{d}	66.7^{a}	36.5^{c}	36.1^{c}	32.4^{b}	37.8^{c}	33.5^{b}
mg/dl	S.D.	±0.2547	±0.6647	±0.4412	±0.3623	±0.3212	±0.3745	±0.2142
Creatinine	Mean	0.6317^{e}	1.7452^{a}	0.756^{d}	0.798^{c}	0.712^{b}	0.817^{b}	0.719^{c}
mg/dl	S.D.	±0.02	±0.035	±0.01	±0.003	±0.007	±0.02	±0.031
Total Cholestrol	Mean	68.147^{e}	108.15^{a}	75.251^{d}	72.541^{b}	71.987^{c}	84.532^{b}	79.332^{c}
mg/dl	S.D.	±0.564	±0.412	±0.3984	±0.418	±0.478	±0.652	±0.456
Triglycerides	Mean	105.16^{c}	185.62^{a}	109.58^{d}	121.36^{b}	112.98^{c}	119.35^{b}	116.87^{c}
mg/dl	S.D.	±0.365	±0.542	±0.198	±0.504	±0.385	±0.354	±0.485

Table .7 Effect of Kyllinga triceps rottb extract on CCl_4 treated rats lipid peroxidation expressed as TBARS formation

S. No	Parameter	Group I (Normal Control)	Group II (CCl_4 Control)	Group III (Silymarin Control)	Group IV (CCl_4 + PE-KTR 100 mg/kg)	Group V (CCl_4 + PE-KTR 200 mg/kg)	Group VI (CCl_4 + AE-KTR 100 mg/kg)	Group VII (CCl_4 + AE-KTR 200 mg/kg)
1.	TBARS(nmol malondialdehyde (mg/liver protein)	1.8167^{C} ±0.0369	17.7492^{a} ±0.4013	2.732^{d} ±0.1885	1.8484^{C} ±0.0381	1.8133^{c} ±0.547	3.7032^{b} ±0.33	2.5755^{c} ±0.22

Values are mean ± S.E.M Values with different superscripts with in the

Column are significantly different at P<0.05(Duncan's multiple Range Test)

Table 8. Effect of Kyllinga triceps rottb. Extract on antioxidant enzyme activities in the liver of rats treated with CCl_4.

Name of Parameter	Group I (Normal Control)	Group II (CCl_4 control)	Group III (CCl_4 +Silymarin control)	Group VI (CCl_4 + PE-KTR 100 mg/kg)	Group VII (CCl_4 + PE-KTR 200 mg/kg)	Group IV (CCl_4 + AE-KTR 100 mg/kg)	Group V (CCl_4 + AE-KTR 200 mg/kg)
GPx (µg of GSH/min/mg protein)							
Mean	13.6^{a}	8.16^{d}	12.4^{b}	11.08^{c}	12.2^{b}	10.87^{c}	11.97^{b}
S.D.	±0.59	±0.26	±0.5	±0.59	±0.67	±0.56	±0.64
GST(µM/min/mg protein)							
Mean	6.65^{a}	2.65^{d}	5.86^{b}	5.01^{c}	5.74^{b}	4.15^{c}	5.04^{b}
S.D.	±0.14	±0.2	±0.05	±0.19	±0.24	±0.17	±0.09
GR (µM/min/mg protein)							
Mean	0.145^{a}	0.0641^{d}	0.136^{b}	0.119^{c}	0.134^{b}	0.111^{c}	0.124^{b}
S.D.	±0.001	±0.001	±0.0037	±0.0032	±0.009	±0.007	±0.0052
CAT (µM H_2O_2/min/mg protein)							
Mean	68.7^{a}	28.236^{e}	65.48^{b}	65.12^{d}	65.89^{c}	60.65^{d}	64.56^{c}
S.D.	±0.372	±0.257	±0.148	±0.365	±0.554	±0.654	±0.248
SOD (U/mg protein)							
Mean	13.25^{a}	5.12^{e}	11.97^{b}	10.52^{d}	11.91^{c}	9.57^{d}	10.11^{c}
S.D.	±0.274	±0.1894	±0.2	±0.456	±0.561	±0.241	±0.358

Values are mean ± S.E. M Values with different superscripts within the column are significantly different at P<0.05 (Duncan's Multiple Range Test) GPx- Glutathione peroxidise, GST- Glutathione S – transferase, GR- Glutathione reductase, CAT- Catalase, SOD- superoxide dismutase

Table 9: Effect of Petroleum ether and alcoholic extracts on 5 h urinary electrolyte excretion in rats.

GROUP	Urinary electrolyte concentration(mmol/L)			Saluretic index			Na^+/K^+	$Cl^-/Na^+ + K^+$
	Na+	K+	Cl−	Na+	K+	Cl−		
CON	59.97 ± 7.83	43.7 ± 5.80	44.2 ± 2.58				1.37	0.43
F10	101.3 ± 6.01^{a3}	92.07 ± 13.85^{a3}	73.85 ± 11.27	1.68	2.1	1.67	1.1	0.38
PEKTR100	90.37 ± 5.8^{a1,c1}	97.5 ± 13.2	55.74 ± 6.23	1.50	2.23	1.26	0.92	0.29
PEKTR200	101.7 ±4.72^{a2,c2}	100.6 ± 11.7	56.82 ± 8.06	1.69	2.3	1.29	1.01	0.28
AEKTR100	49.70 ± 2.74^{b3}	57.5 ± 5.94^{b1}	50.87 ± 10.58	0.83	1.32	1.13	0.86	0.47
AEKTR200	80.62 ± 4.89	72.85 ± 2.66	58.75 ± 8.34	1.34	1.67	1.33	1.11	0.38

(n = 6); For petroleum ether extract: ^{a}against control, ^{b}against standard, ^{d}against PE-KTR 200 mg/kg mg/kg, ^{e}against PE-KTR 100 mg/kg, ^{f}against AE - KTR 100 mg/kg, ^{g}against AE - KTR 200 mg/kg; For alcoholic extract ^{a}against control, ^{b}against standard; $^{1}p < 0.05$, $^{2}p < 0.01$, $^{3}p < 0.001$; PE refers to petroleum ether extract and AE to alcoholic extract; F10: Furosemide 10 mg/kg CON: controls treated with distilled water; Numbers refer dose in mg/kg.

Table 10: Effect of Petroleum Ether and alcoholic extracts on 5 h urine volume

GROUP	VOLUME OF URINE (ML)					DIURETIC ACTION	DIURETIC ACTIVITY
	1 h	2 h	3 h	4 h	5 h		
CON	0.62 ± 0.13	0.81± 0.11	0.97 ± 0.11	1.0 ± 0.11	1.05 ± 0.10	1	
F10	1.18 ± 0.07^{a1}	1.46 ± 0.09^{a3}	1.64 ± 0.08^{a1}	1.79 ± 0.09^{a2}	2.05 ± 0.11^{a2}	1.95	1
PE-KTR 100 MG/KG	$0.38 \pm 0.04^{b3,c3}$	$0.69 \pm 0.05^{b3,c2}$	0.98 ± 0.17^{b2}	$1.11 \pm 0.18^{b2,c1}$	$1.16 \pm 0.17^{b3,c2,d1}$	1.1	0.56
PE-KTR 200 MG/KG	$0.56 \pm 0.08^{b3,c2}$	1.09 ± 0.07	1.41 ± 0.12	1.68 ± 0.13^{a1}	2.03 ± 0.13^{a2}	1.93	0.99
AE-KTR 100 MG/KG	$0.45 \pm 0.46^{b3,c2}$	0.62 ± 0.07^{b3}	$0.68 \pm 0.72^{b3,c2}$	$0.84 \pm 0.07^{b3,c2}$	$1.1 \pm 0.85^{b3,c3}$	1.06	0.54
AE-KTR 200 MG/KG	$0.48 \pm 0.09^{b3,c1}$	0.71 ± 0.09^{b3}	0.91 ± 0.12^{b3}	$1.08 \pm 0.13^{b2,c1}$	$1.31 \pm 0.11^{b2,c2}$	1.25	0.64

(n = 6); For petroleum ether extract: [a]against control, [b]against standard, [d]against PE-KTR 200 mg/kg mg/kg, [e]against PE-KTR 100 mg/kg, [f]against AE - KTR 100 mg/kg, [g]against AE - KTR 200 mg/kg; For alcoholic extract [a]against control, [b]against standard; [1]$p < 0.05$, [2]$p < 0.01$, [3]$p < 0.001$; PE refers to petroleum ether extract and AE to alcoholic extract; F10: Furosemide 10 mg/kg CON: controls treated with distilled water; Numbers refer dose in mg/kg.

REFERENCES

1. Matthew K.M. (1983). *The flora of the Tamil Nadu Carnatic (Rapinat Herbarium tiruchirapalli), I^st edition*, part-3, P.N. 1768.
2. Kirtikar K.R. Basu B.D. (1918). *Indian medicinal plants I^st edition,* 3rd reprint 1918, P.N. 316.
3. Kirtikar K.R. Basu B.D. (1991). *Indian Medicinal plant part-IV*, P.N. 331-332.
4. Gamele J.S. (1928). *Flora of the presidency of madras*, vol-3rd, part-8th, P.N. 1620-1624.
5. Pandey B.P. (1989). *Taxonomy of angiosperms, 5th edition*, S. Chands Publishers, P.N. 563-566.
6. Mukerjee S.K. (1984). *College botany, I^st edition*, vol-3rd, New Delhi central book, agency (Pvt) Ltd. Kolkata, P.N. 75.
7. Shukla Priti, Mishra P. Shital (2002). *An introduction to taxonomy of angiosperms I^st edition,* vol-IV, Vikas Publishers New Delhi, P.N. 515-518.
8. Singh V., Pandey P.C., Jain D.K. (2005). *A text book of Botany*, I^st edition, Rastogi publications, P.N. 262-264.
9. Vasishtha P.C. (1984). *Taxonomy of angiosperms*, 7th edition, R. Chand Publisher new Delhi, P.N. 850.
10. Narayan Swami, R.V., K.N. Rao (1992). A. Raman, *Outlines of botany*, 5th edition, S. Vishwanathan printers and publishers Chennai, P.N.-309-310.
11. Orient Longman (1994). *Indian Medicinal plants*, I^st edition, orient longman ltd, madras, P.N. 285-286.
12. Anonymous *wealth of India Raw materials* vol-4, H.K., CSIR New Delhi. P.N. 331-332.
13. Vanapatla Swaroopa Rani, Krishna Mohan G., Ravi Kumar B. : Effect of root extract fractions of *kyllinga triceps* rottb on streptozotocin induced diabetic rats, *Stamford Journal of Pharmaceutical Sciences,* 4(1): pp. 25-30.
14. Lal V.K., Gupta P.P., And Pandey Awanish (2012). Hypoglycemic effect of *kyllinga triceps* in stz induced diabetic rats, *Diabetes & Metabolism*, 3:6, pp. 1000203-1000204.
15. Verma Nishant, Jha K.K., Ahmad Shamim, Garg Kumar Vipin (2013). Assessment of antidiabetic potential of *kyllinga triceps* rottb in streptozotocin-induced diabetic rats, *Scientific Research & Reviews*, vol.1(1) pp. 8-11.
16. Siddabathuni Aneela, Akalanka Dey And Somnath De (2014). Evaluation Of Anthelmintic activity of *kyllinkga triceps*, *International Journal of Pharmacy & Life Sciences, 5*(3): pp. 3385-3388.
17. Shiddamallayya, N., Shantha T.R., Rama Rao V. and Venkateshwarlu G. (2015). Compearative pharmacognosy of *cyperus rotundus* linn and *kyllinga bulbosa* p.beauv., *International Journal of Pharmaceutical Development & Technology*, 5(2), pp. 83-88.
18. Verma Nishant, Chaudhary Amit, Shamim Ahmad, Garg Vipin (2016). Analgesic Anti Pyretic Potential of methanolic extract of *kyllinga triceps* rottb, *International Journal of Pharma Professional's Research*, volume-7, issue-1, January-2016, pp. 1314-1318.
19. Kirtikar K.R. Basu B.D. (1918). *Indian medicinal plants I^st edition,* 3rd reprint, P.N. 316.
20. Kirtikar K.R. Basu B.D. (1991). *Indian Medicinal plant part-IV*, P.N. 331-332.

21. Gamele J.S. (1928). *Flora of the presidency of madras*, vol-3rd, part-8th, P.N. 1620-1624.

22. Mukerjee S.K. (1984). *College botany, Ist edition*, vol-3rd, New Delhi central book, agency (Pvt) Ltd. Kolkata, P.N. 75.

23. Shukla Priti, mishra P. Shital (2002). *An introduction to taxonomy of angiosperms Ist edition,* vol-IV, Vikas Publishers New Delhi, P.N. 515-518.

24. Singh V., Pandey P.C., Jain D.K. (2005). *A text book of Botany*, Ist edition, Rastogi publications, P.N. 262-264.

25. Vasishtha P.C. (1984). *Taxonomy of angiosperms*, 7th edition, R. Chand Publisher New Delhi, P.N. 850.

26. Narayan Swami, R.V., K.N. Rao, A. Raman (1992). *Outlines of botany*, 5th edition, S. Vishwanathan printers and publishers Chennai, P.N.-309-310.

27. Beatriz Eugenia Jaramillo-Colorado, Eduardo Luis Martinez-Caceres and Edisson Duarterestrepo (2016). Volatile chemical composition and bioactivities from colombian *kyllinga pumila* michx (cyperaceae) essential oil, *Acta Scientiarum Biological Sciences*, v. 38, n. 3july-sept., 2016, pp. 273-282.

28. Ayyanar M., Lgnacimuthu, S. (2009). Herbal medicines for wound healing among tribal people in southern india: ethnobotanical and scientific evidences, *International Journal of Applied Research in Natural Products,* vol. 2(3), pp. 29-42.

29. Paudel Prajwal, Satyal Prabodh, Khadka Ganesh and William N. Setzer (2012). Leaf essential oil composition of *kyllinga brevifolia* rottb. From Nepal, *Journal of Essentioal Oil Bearing Plants,* Jeobp 15(5) pp. 854-857.

30. Shanmugam S., Gayathri N., Sakthivel B., Ramar S., and Rajendran K. (2009). Plants used as medicine by paliyar tribes of Shenbagathope in Virudunagar district of tamilnadu, India. *Ethanobotanical Leaflets* 13:, pp. 370-78.

31. Sengupta Rupa, Sheorey Sonali D., Hinge Madhuri A. (2012). Analgesic and Anti-Inflammatory Plants: an updated review, *International Journal of Pharmaceutical Sciences Reviews And Research*, volume 12, issue 2, pp. 114-118.

32. Jain Jitendra B. , Kumane Sheetal C. & Bhattacharya S. (2006). Medicinal flora of madhya pradesh and chattisgarh – a review, *Indian Journal of Traditional Knowledge,* vol.5(2), pp. 237-242.

33. Ramadoss Karthikeyan, Somasundaram Arumugam, Vadivel Velmurugan, Muthu Raja: Evaluation of hepatoprotective activity of K. nemoralis (Hutch & Dalz) rhizomes, Journal of ethnopharmacology 127(2): pp. 555-7.

34. Singh Arvind (2014). Observations on the vascular wall flora of varanasi city, india. *International Journal of Modern Biology and Medicine,* 5(2): pp. 40-55.

35. Padmavathy A., Anbarashan M. (2013). Ethnobiology of unconcerned floras in organic and inorganic agricultural fields-bahour, puducherry- india. *Journal of Medicinal Plants Research,* vol. 7(44), pp. 3254-3262, 25.

36. Majumder Pulak (2013). Investigation of anthelmintic activity of an ignored plant *'kyllinga nemoralis*' tuber- a potential hope, *International Journal of Pharma and Bio Sciences*, 4(1): (p) 45-52.

37. Sindhu T., Rajamanikandan S. and Srinivasan P. (2014). In vitro antioxidant and antibacterial activities of methanol extract of *kyllinga nemoralis*, *International Journal of Pharmaceutical Sciences*, pp. 170-174.

38. Rajagopal P.L., Sajith Kumar P.N., Sreejith K.R., Premaletha K. (2016). Phytochemical and antioxidant screening of the aerial parts of *kyllinga nemoralis,International Journal of Science and Researchmethodology*, vol. :4, issue:2. pp. 66-76.

39. Prodyut Mondal, Bhuyan Niroj, Das Sonjit, Kumar Mritunjay, Borah Sudarshana, Mahato Kabita (2003). Herbal medicines useful for the treatment of diabetes in north-east india: *International Journal of Pharmacy and Biological Sciences*, volume 3,issue 1, pp. 575-589.

40. Dhivya S.M., Kalaichelvi K. : Ethno medicinal knowledge of plants used by irula tribes, nellithurai beat, the Nilgiris, Tamil Nadu, india, *Asian Journal of Medical Sciences*, Vol. 7, Issue 5, pp. 124-127.

41. Sharma Shikah, Mistry Sunil, Lariya Shailendra (2013). Contribution of indigenous medicinal plants in treatment of

diabetes, *Int.R.J.Pharm.Sci.*;04(01); pp. 0014-0020.

42. Matthew K.M. (1983). *The flora of the Tamil Nadu Carnatic (Rapinat Herbarium Tiruchirappalli), Ist edition*, part-3, P.N. 1768.

43. P. Gopalakrishna Bhat, Raju Thomas Jacob and T. N. Pattabiraman (1981). Enzyme inhibitors from plants: Enterokinase inhibitors in tubers and seeds, J. Biosci., Vol. 3, Number 4, pp. 371-378.

44. Yaya Mahmout, Jean Marie Bessiere, Rene Dolmazon (1993). Composition of the essential oil from *kyllinga erecta* s, *j.Agric.Food Chem*., 41, pp. 277-279.

45. Hari Venkatesh. K.R., Ankur Patel, Ravi Mundugaru, B. Ravishankar (2015). Evaluation of "YAK001" for safety profile: acute oral toxicity study, *International Research Journal of Pharmacy,* 6(8), pp. 559-561.

46. Aneela S., Somnath De, Lakshmi Kanta Kanthal, Choudhury N.S.K., B. Lohi Das And K. Vidhya Sagar (2011). Acute oral toxicity studies of pongamia pinnata and annona squamosal on albino wister rats, *International Journal of Research in Pharmacy and Chemistry,* 1(4), pp. 820-824.

47. Erhirhie Earnest Oghenesuvwe, Ekene, Nwoke E. and Ajaghaku Daniel Lotanna (2014). Guidelines on dosage calculation and stock solution preparation in experimental animals' studies, Journal of Natural Sciences Research, Vol.4, No.18, pp. 100-106.

48. Shankar M.B., Parikh J.R., Geetha M., Mehta R.S., Saluja A.K. (2005). Hepatoprotective activity of a benzopyrone from tephrosia purpurea pers, *Journal of Natural Remedies,* vol 5/2, pp. 115-120.

49. Sengottuvelu S., Duraisamy R. Nandhakumar J., and Sivakumar T. (2017). Hepatoprotevtive activity of cleome viscosa against carbon tetrachloride induced hepatotoxity in rats, *Pharmacog.Mag*. vol.3, issue 10, pp. 121-124.

50. Dash G.K., Samanta A., Kanungo S.K., Sahu S.K., Suresh P., and Ganapaty S. : Hepatoprotective activity of leaves of abutilon indicum*, Indian J.Nat. Prod*. 16(2), pp. 25-26.

51. Jaiprakash B., Aland R., Karadi R.V, Savadi R.V. and Hukkeri V.I. (2003). Hepatoprotective activity fruit pulp of *balanites aegyptiaca* linn, *Indian Drugs* 40(5) pp. 296-297.

52. Kumar Gaurav Singhal, Ghanshyam Das Gupta (2012). Hepatoprotective and antioxidant activity of methanolic extravt of flowers of nerium oleander agenst ccl_4-induced liver injury in rats, *Asian Pacific Journal of Tropical Medicine*, pp. 677-685.

53. Hai Zhong Huo, Bing Wang, Yong Kang Liang, Yong Yang Bao and Yan Gu (2011). Hepatoprotective and antioxidant effects of licorice extract against ccl_4-induced oxidative damage in rats, *International Journal of Molecular Sciences*, 12, pp. 6529-6543.

54. Lin Yin, Lei Wei, Rao Fu, Lisheng Ding, Yiran Guo, Lin Tang and Fang Chen (2014). Antixodant and hepatoprotective ativity of veronica ciliate fisch. Exracts against carbon tetrachloride-induced liver injury in mice, *Molecules 2014*, 19, pp. 7223-7236.

55. Balne Divya, Pallerla Praneetha, Swaroopa Rani Vanapatla, Bobbala Ravi Kumar (2013). Hepatoprotective effect of whole plant extract fractions of marsilea minuta linn, *Asian Journal of Pharmaceutical and Clinical Research,* vol 6, issue 3.

56. Refaey M.S., Mustafa M.A.H., Mohamed A.M., Ali A.A. (2015). Hepatoprotective and antioxidant activity of odontonema cuspidatum (nees) kuntze against ccl4-induced hepatic injury in rats, *Journal of Pharmacognosy and Phytochemistry,* 4(2): pp. 89-96.

57. Rajangam Jayaraman, Christina A.J.M. (2013). Evaluation of hepatoprotective and antioxidant potential of methanolic extract of polyalthiya longifolia fruits: an in- vitro and in – vivo approach, *Journal of Applied Pharmaceutical Sciences* vol. 3 (02), pp. 069-076.

58. Singh Dharmendra, Arya Priya Virat, Aggarwal Ved Prakash and Gupta Radhey Shyam (2014). Evaluation and hepatoprotective activities of moringa oleifera lam. Leaves in carbon tetrachloride-intoxicated rats,*Antioxidant*, 2014, 3, pp. 569-591.

59. Kunio Kihara, Eiki Yasukawa, Mitsuhiro Hayashi, Sachio Hirose (1984). Determination of glutamate-pyruvate transaminase activity in blood serum with a pyruvate oxidase/poly(vinyl chloride)

membrane sensor, *Analytica Chimica Acta*,Volume 159, Pages 81-86.

60. Elias Amador, Robert J. Franey, and Mary F. Massod (1966). Serum Glutamic-Oxaloacetic Transaminase Activity: Diagnostic Accuracy of the Revised Spectrophotometric and the Dinitrophenyihydrazine Methods, *Clinical Chemistry*, Vol, 12, No. 8, pp. 475-480.

61. G. Ellis (1976). Quality Control of Serum Alkaline Phosphatase Assays: Project Report and Discussion of Some Factors Affecting the Assay*, Ann. din. Biochem*. 13, pp. 327-335.

62. A .Westwood (1991). The analysis of bilirubin in serum, *Ann CIin Biochem* 28: pp. 119-130.

63. Cabre M, J. Camps and J.L. Patemain (2000). Time-course of changes in hepatic lipid peroxidation and glutathione metabolism in rats with carbon tetrachlorideinduced cirrhosis. *Clin. Exp. Pharmacol. Physiol.* 27(9): pp. 694-699.

64. Röschlau P, Bernt E, Gruber W. (1974). Enzymatic determination of total cholesterol in serum (author transl),Z Klin Chem Klin Biochem, Sep;12(9): pp. 403-7.

65. Comporti M. (1985). Biology of disease: lipid peroxidation and cellular damage in toxic liver injury. *Lab Invest.* 53: pp. 599-623.

66. Boll M., L.W. Weber, E. Becker, A. Stampfl (2001). Hepatocyte damage induced by carbon tetrachloride: inhibited lipoprotein secretion and changed lipoproteincomposition Z. *Naturforsch .C.* 56(3-4): pp. 283-290.

67. V.Chinnapa Reddy, V. Amulya, Ch. Anusha Laxshmai,D. Bala Praveen Kumar Reddy, D.Pratima, A. Thanga Thirupathi, K. Pavan Kumar, S. Sengottuvelu (2012). Effect Of Simvastatin In Gentamicin Induced Nehrotoxicity In Albino Rats, Asian Journal of Pharmaceutical and Clinical Research,Vol 5, Issue 1, pp. 36-40.

68. Anitha M., Daffodil E.D., Muthukumarasamy S., and Mohan V.R. (2012). Hepatoprotective and antioxidant activity of ethanol extract of cynoglossum zeylanicum (vahl ex hornew) thurnb ex lehm in ccl_4 treated rats,*Journal of Applied Pharmaceutical Science* vol.2(12), pp. 99-103.

69. Sindhu T., Rajamanikandan S. and Srinivasan P. (2014). In vitro antioxidant and antibacterial activities of methanol extract of *kyllinga nemoralis*, *International Journal of Pharmaceutical Sciences*, pp. 170-174.

70. Rajagopal P.L., Sajith Kumar P.N., Sreejith K.R., Premaletha K. (2016). Phytochemical and antioxidant screening of the aerial parts of *kyllinga nemoralis, International Journal of Science and Researchmethodology*, vol. :4, issue:2, pp. 66-76.

71. Kumar Sunil (2014). The importance of antioxidant and their role in pharmaceutical science, *Asian Journal of Research in Chemistry and Pharmaceutical Sciences*, 1(1), pp. 27-44.

72. H. Kuthan, H. J. Haussmann, and J. Werringloer (1986). A spectrophotometric assay for superoxide dismutase activities in crude tissue fractions, *Biochem J*. 1986 Jul 1; 237(1): pp. 175–180.

73. Poonam Kakkar, Ballabh Das, P. N. Viswanathan (1984). A Modified Spectrophotometric Assay of Superoxide Dismutase,*Indian Journal of Biochemistry & Biophysics*, Vol. 21,pp. 130-132.

74. Bjomstedt M., J. Xue, W. Huang, B. Akesson, A. Holmgren (1994). The thioredoxin and glutaredoxin systems are efficient electron donors to human plasmaglutathione peroxidase. *J. Biol. Chem.* 269: pp. 29382-29384.

75. Brigelius-Flohe R. (1999). Tissue-specific functions of individual glutathione peroxidases. *Free Radio. Biol. Med.* 27: pp. 951-965.

76. Banerjee S., Ecavade A., Rao A. R. (1993). Modulatory influence of sandalwood oil on mouse hepatic glutathione-S-transferase activity and acid soluble sulphydryl level, Cancer Lett, 68, pp. 105-109.

77. Habig, W.H., M.J. Pabst, W.B. Jakoby (1974). Glutathione-S-transferases. The firstenzymatic step in mercapturic acid formation. *J. Biol. Chem.* 246: pp. 7130-7139.

78. Lars H.Johansson L. A. Håkan Borg (1988). A spectrophotometric method for determination of catalase activity in small tissue samples, *Analytical Biochemistry,* Volume 174, Issue 1, Pages 331-336.

79. Adam Y., Nasaruddin A.A., Zuraini, Arifah A.K., Fauzee M.S. Omar, Zakaria Z.A., Somchit M.N. (2013). Diuretic activity of roots from *carica papaya* L. and *Ananas comosus* L, *International Journal of Pharmaceutical Sciences* , 23(1), 32, pp. 163-167.

80. Meera R., Devi P., Muthumani P., Kameswari B., Eswarapriya B. (2009). Evaluation of diuretic activity from *tylophora indica* leaves extracts, *Journal of Pharmaceutical Sciences and Researc*h,vol.1(3), pp. 112-116.

81. Kumar Anurag, Sutar Niranjan, Sharma Shankar Uma, Kumar Sailesh, Singh Namrata (2013). Diuretic activity of *butea monosperm*a flowers extract, *International Research Journal of Pharmacy*, 4(9), pp. 110-112.

82. Kanakam Vijayabhaskar, Adduri Shiva Prasad, Mohd Thousif Uddin, Majjiga Vamshi, Gundu Rahul Gopal and Burugadda Ravi, Evaluation of diuretic activity on whole plant methanolic extract of *Euphorbia hirta* in rats with comparison of furosemide, vasopressin (antidiuretic hormone), *World Journal of Pharmacy and Pharmaceutical Sciences,* vol.5, Issue 5, pp. 1337-1346.

83. Paglia D. E. & Valentine W. N. (1967). Studies on the quantitative and qualitative characterization of erythrocyte glutathione peroxidase. *J. Lab. Cm. Med*. 70: pp. 158-69.

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