

## REVIEW ARTICLE ON HEALTH BENIFITS OF CYPERUS ROUTENDUS

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<p><b>*For Correspondence:</b> Department of Pharmacognosy, Sree Vidyanikethan College of Pharmacy, Sree Sainathnagar, Chandragiri (M), Tirupati, Andhra Pradesh, India-517102.</p>	<p><b>ABSTRACT</b> Cyperus rotundus (Cyperaceae), additionally called purple nut grass or sedge, could be a common perennial plant. This is often a utile plant, largely utilized in ancient medication round the world to treat varied diseases like upset stomach, constipation, dysentery, abdominal distention, animal tissue stomach ache, chest pains, irregular catamenia, painful catamenia, skin diseases, staphylococcal infections, leprosy, sprains and bruises, and fever. it's the property of therapeutic actions like Anti lesion activity, Analgesic activity, Antimicrobial activity, anti-inflammatory Activity, Antipyretic activity, medication activity, Anti-emetic activity, Tranquilizing activity, Antiurolithatic activity, Antispatic activity, Antidiarrhoeal Activity, Anti-obesity activity, Wound healing activity, medication Activity, inhibitor activity, Antimalarial drug Activity, metastatic tumor activity, antidiabetic drug activity, Anti allergic activity, Anti blood platelet impact, Anti rheumy activity, Hypolipidaemic Activity, Gastroprotective activity, Hepatoprotective activity, hypotensive activity, Ovicidal and larvicidal activitiy, Anti fungus activity, Cytoprotective impact. This paper provides review on medicinal properties of nut grass.</p> <p><b>KEY WORDS:</b> Cyperus rotundus, Analgesic activity, Wound healing activity, Anti-obesity activity, Hepatoprotective activity, Ovicidal and larvicidal activitiy.</p>
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## INTRODUCTION

Cyperus rotundus belongs to the family Cyperaceae. It additionally called purple nut grass or sedge, could be a common perennial weed with slender, scaly creep rhizomes, bulbous at the bottom and arising separately from the tubers that square measure regarding 1-3 cm long. The tubers square measure outwardly achromatic in color and red white within, with a characteristic odour. The stems grow to regarding twenty five cm tall and also the leaves square measure linear, dark inexperienced and grooved on the side. Inflorescences square measure tiny, with 2-4 bracts, consisting of little flowers with a red husk. The nut is oblong-ovate, three-angled, starting it is yellow in color and black when it ripe. C.rotundus is native to Bharat, however square measure currently found in tropical, semitropical and temperate regions <sup>1</sup>. The rhizomes of nut grass, wide utilized in ancient medication round the world to treat varied diseases like

constipation, dysentery, abdominal distention, animal tissue stomach ache, chest pains, irregular catamenia, painful catamenia, skin diseases, staphylococcal infection infections, leprosy, sprains and bruises, and fever, analgesic, sedative, medication, antimalarial drug, abdomen disorders, diarrhoea <sup>2,3</sup>. A number of medicine and biological activities as well as Anti-lesion activity, Analgesic activity, Antimicrobial activity, anti-inflammatory Activity, Antipyretic activity, medication activity, Anti-emetic activity, Tranquilizing activity, Antiurolithatic activity, Antispatic activity, Antidiarrhoeal Activity, Anti-obesity activity, Wound healing activity, medication Activity, inhibitor activity, antimalarial drug Activity, metastatic tumor activity, antidiabetic drug activity, Anti allergic activity, Anti blood platelet impact, opposing rheumy activity, Hypolipidaemic Activity, Gastroprotective activity, Hepatoprotective activity, hypotensive activity, Ovicidal and larvicidal activitiy, Anti fungus activity, Cytoprotective impact <sup>3,4,5</sup>. Previous phytochemical studies on C.rotundus disclosed the

presence of alkaloids, flavonoids, furochromones, glycosides, starch, steroids, tannins, synthetic resin compounds, reducing sugars and plenty of novel sesquiterpenoids<sup>3,6,7</sup>.

## PHARMACOLOGICAL ACTIVITIES

### **Anti-lesion activity:**

Cyperus rotundus tuber powder was administered orally scale back lesion by amine iatrogenic peptic ulcer methodology. Nut grass has shown important peptic ulcer repressing impact and cytoprotective impact against grain alcohol iatrogenic stomachal ulceration in rats. The protecting role of nut grass could also be thanks to the presence of flavonoids jointly of their constituents<sup>8,9</sup>.

### **Analgesic activity:**

The grain alcohol extract and oil of nut grass square measure according to possess analgesic activity. The analgesic activity was performed by tail-flick methodology. The protecting role of nut grass could also be thanks to the presence of terpenoid jointly of their constituents<sup>10,11,12</sup>.

### **Antimicrobial activity:**

The binary compound and ethanolic extracts of nut grass square measure according to possess antimicrobial activity. The activity was performed by agar disc diffusion and agar well diffusion methodology. Ethanolic extracts of nut grass was active against all the investigated microorganism strains, and binary compound extract was inactive. Antimicrobial activity was administered against staph aureus, genus Pseudomonas aeruginosa, enterobacteria pneumoniae, Moraxella catarrhalis Acineto bacter, Monilia albicans, Aspergillus niger and escherichia. The protecting role of nut grass could also be thanks to the presence of terpenoid jointly of their constituents<sup>13,14</sup>.

### **Anti-Inflammatory activity:**

The alcoholic, fossil oil ether extract and oil of nut grass square measure according to possess anti-inflammatory activity. The activity was performed by carrageenin iatrogenic edema and additionally found effective against aldehyde iatrogenic inflammatory disease in unusual person rats. In this fossil oil ether extract shows a high potent medicinal drug activity. The protecting role of nut grass could also be thanks to the presence of triterpenoids, flavonoids and proteins as their constituents. In inflammatory diseases gas and superoxide square measure necessary mediators within the pathological process<sup>2,15</sup>.

### **Antipyretic activity:**

The alcoholic and fossil oil ether extract of nut grass square measure according to possess opposing pyretic activity against symptom made in unusual person rats by the injection of suspension of dried Brewer's yeast in gum arabic in traditional saline. The protecting role of

nut grass could also be thanks to the presence of triterpenoids, flavonoids and proteins are constituents<sup>16,17</sup>.

### **Anticonvulsant activity:**

The ethanolic extract of nut grass square measure according to possess opposing pyretic activity caused important protection against phytotoxin and leptazol-induced convulsions in mice. The protecting role of nut grass could also be thanks to the presence of flavonoids<sup>18,19</sup>.

### **Anti-emetic activity:**

The grain alcohol extract of nut grass square measure according to possess anti-emetic activity. The anti-emetic activity was performed by morphine iatrogenic innate reflex in dogs. The protecting role of nut grass could also be thanks to the presence of terpenoid jointly of their constituents<sup>20</sup>.

### **Tranquilizing activity:**

Ethanolic extract of nut grass showed potent ataraxic activity in reduced the spontaneous motor activity, potentiated the yellow jacket unconsciousness and crazed the motor coordination, abolished the conditional response response in animals. terpenoids square measure chargeable for its ataraxic activity of nut grass<sup>20</sup>.

### **Antispastic activity:**

Ethanolic extract of nut grass made relaxation of rabbit small intestine and medication impact against contractions iatrogenic by neurotransmitter, metal chloride and 5-hydroxitriptamine, showing a right away relaxant action on the sleek muscle. The protecting role of nut grass could also be thanks to the presence of terpenoid jointly of their constituents<sup>21</sup>.

### **Antidiarrhoeal Activity:**

The methyl alcohol extract of rootstock nut grass given orally showed important antidiarrhoeal activity in aperient iatrogenic symptom in mice. Tannins and flavonoids generally, are according to possess medicament activity<sup>21</sup>.

### **Anti-obesity activity:**

The alkane series extract of stalk and liquid and alcoholic extract of leaf Cyperus rotundus are according to possess anti-fat activity against on weight management in weighty Zucker rats. Phenols and alkaloids are the active constituents of Cyperus rotundus<sup>22</sup>.

### **Wound healing activity:**

An alcoholic extract of tuber Cyperus rotundus are according to possess wound healing activity within the style of ointment in 3 styles of wound models on rats: the excision, the incision and dead house wound model<sup>23</sup>.

### **Antibacterial Activity:**

Eessential oil of Cyperus rotundus are according to possess anti-microorganism activity. The anti-

microorganism activity was performed by inhibition zone technique. The minimum repressing concentration and minimum antiseptic concentration for every microorganism were calculable. The protecting role of *Cyperus rotundus* could also be because of the presence of flavonoids united of their constituents. The oil of *Cyperus rotundus* showed a noteworthy activity against gram-positive bacterium *cocci aureus* and *Enterococcus faecalis*<sup>23, 24</sup>.

**Antioxidant activity:**

Methanol extract of *Cyperus rotundus* are according to possess inhibitor activity. The inhibitor activity was performed against atom evoked aerophilic injury. Phenols and flavonoids are the active constituents of *Cyperus rotundus*<sup>25,26</sup>.

**Antimalarial Activity:**

The alkane series extract and volatile oil of *Cyperus rotundus* are according to possess anti protozoal infection activity against *Plasmodium falciparum*. The protecting role of *Cyperus rotundus* could also be because of the presence of sesquiterpenes united of their constituents<sup>27,28</sup>.

**Anticancer activity:**

*Cyperus rotundus* ethanolic extract and volatile oil are according to possess anti-cancer activity. For ethanolic extract used neuro-2a cells for screening of plants with tumoricidal effects. And volatile oil was terribly effective against L1210 leucaemia cells line. The protecting role of *Cyperus rotundus* could also be because of the presence of constituent sesquiterpenes<sup>29,30</sup>.

**Antidiabetic activity:**

Hydro-ethanolic extract of *Cyperus rotundus* administered orally scale back polygenic disease by alloxan evoked polygenic disease technique. The protecting role of *Cyperus rotundus* could also be because of the presence of radical scavenger activity, O free radicals are concerned during this activity. *Cyperus rotundus* has associate repressing result on the assembly of NO and superoxide. The antihyperglycemic activity of *C. rotundus* could also be because of its atom scavenging activity against alloxan evoked free radicals<sup>31,32,33</sup>.

**Anti-allergic activity:**

*Cyperus rotundus* ethanolic extract scale back allergic reaction by immediate-type furthermore as delayed-type hypersensitivity. The protecting role of *Cyperus rotundus* could also be because of the presence of sesquiterpenes united of their constituents<sup>34</sup>.

**Anti-platelet activity:**

Ethanol extract of *Cyperus rotundus* are according to possess anti-living substance activity. The antiplatelet activity was performed against rat living substance aggregation technique. Terpinoids are the active constituents of *Cyperus rotundus*<sup>35</sup>.

**Anti-rheumatoid activity:**

Essential oil of *Cyperus rotundus* are according to possess anti-rheumatoid activity. The anti-rheumatoid activity was performed against gas evoked inflammatory disease model in Wistar unusual person rats. The protecting role of *Cyperus rotundus* could also be because of the presence of flavanoids, sesquiterpenes, glycosides united of their constituents<sup>36</sup>.

**Hypolipidaemic Activity:**

Aqueous extract of *Cyperus rotundus* are according to possess hypolipidaemic activity. hypolipidaemic activity was performed against High fat diet evoked hyperlipidaemia in Wistar rats. Protecting result of *Cyperus rotundus* by lowering the amount of total sterol, triglycerides and cholesterol<sup>37</sup>.

**Gastroprotective activity:**

*Cyperus rotundus* extract according to possess gastroprotective activity. Gastroprotective activity of *Cyperus rotundus* extract protected against internal organ membrane injury evoked by ischaemia and reperfusion in rats. The mean ulceration index of rats treated with *Cyperus rotundus* extract were considerably less than that of management<sup>38</sup>.

**Hepatoprotective activity:**

Ethyl acetate extract and 2 crude fractions, solvent ether and ester, of the rhizomes of *Cyperus rotundus* are according to possess hepatoprotective activity. Hepatoprotective activity in rats by inducement liver injury by tetrachloromethane. The ester extract at associate oral exhibited a major protecting result by lowering liquid body substance levels of glutamic oxaloacetic aminopherase, glutamic pyruvic aminopherase, alkaline phosphatase and total animal pigment. These organic chemistry observations were supplemented by histopathological examination of liver sections. Silymarin was used as positive management<sup>39</sup>.

**Hypotensive activity:**

The alcoholic extract of *Cyperus rotundus* are according to possess hypotensive activity. It made gradual and protracted fall in vital sign and aroused the respiration. The responses of hormone and neurotransmitter on vital sign weren't altered by the extract; however that of aminoalkane was partly blocked<sup>40</sup>.

**Ovicidal and larvicidal activity:**

Essential oil of *Cyperus rotundus* are according to possess Ovicidal and larvicidal activity. It absolutely was studied on eggs and fourth arthropod larvae of mosquito. The eggs and larvae were exposed to the oils, the oil showed exceptional ovicidal and larvicidal activities. Anti-fungus activity: Essential oil and alcoholic extract of *Cyperus rotundus* are according to possess anti-fungus activity. Chemical analyses showed the presence of compounds with best-known antimicrobial activity, as well as one, 8-cineole, geraniol, germacrene-D, limonene, linalool, and application<sup>41,42</sup>.

**Cytoprotective effect:**

The stalks of *Cyperus rotundus* extract are according to possess cytoprotective result. Cytoprotective result of *Cyperus rotundus* was assessed for its cytoprotective effects against alcohol evoked internal organ injury<sup>43</sup>.

#### **Inhibitory activity on Brain metallic element +/K+-ATP-ase:**

Extract of *C. rotundus* showed high potent repressing activity on crude accelerator Na<sup>+</sup>/K<sup>+</sup>-ATP-ase from rat brain<sup>44</sup>.

#### **Antiuro lithatic activity:**

Ethanol extract of *Cyperus rotundus* stalk according to possess antiuro lithatic activity. The antiuro lithatic activity was performed by victimisation poly glycol evoked rats. phytoconstituents like flavanoids, saponins and terpenoids ar accountable for its antiuro lithatic efficiency of *Cyperus rotundus*<sup>45</sup>.

## **DISCUSSION**

*C. rotundus* Linn. usually called nut grass and domestically. It's aforesaid to possess medicine, medicine and antipyretic activities. The tubers are utilized in Ayurvedic medication and are mentioned in ancient texts for numerous ailments. Some studies have reported medicine activity of *C. rotundus*. Medicine action in castor oil-induced internal organs symptom and in irritable bowel syndrome in animal models has been incontestable. Previous studies with the volatile oil of *C. rotundus* showed it to be a lot of germicidal against gram-positive microorganism. The major constituents gift in *C. rotundus* are volatile oil, alkaloids, flavonoids, polyphenol and triterpenes. However, none of those are attributed with medicine activity. The boiling used showed the presence of amino acids, carbohydrates, flavonoids, proteins, reducing sugars, saponins and tannins. Tannins and flavonoids, in general, are reported to possess medicine activity. This study shows that *C. rotundus* has restricted antimicrobial action and have. *C. rotundus* with an oversized range of biologically active phytochemicals has various style of pharmacologic properties, as delineate on top of, has been found effective within the treatment of chronic disorders. Its therapeutic effects are wonderful and no adverse reaction was ascertained.

## **CONCLUSION**

The on top of collected data recommend that *C. rotundus* has restricted activity against completely different types of infectious symptom because of its selective activity against diarrhoeic pathogens. Ancient uses of natural compounds, particularly of plant origin received a lot of attention as they're well tested for his or her effectualness and usually believed to be safe for human use. Thorough screening of literature accessible on *C. rotundus* portrayed the actual fact that it's a preferred remedy among the assorted ethnic teams,

Ayurvedic and ancient practitioners for treatment of ailments. Researchers area unit exploring the therapeutic potential of this plant because it has a lot of therapeutic properties that don't seem to be better-known.

## **REFERENCES**

1. Gordon-Gray, K.D; Cyperaceae in Natal; National Botanical Institute: Pretoria, South Africa, 1995; pp. 45-76.
2. Sri Ranjani Sivapalan; Medicinal uses and Pharmacological activities of *Cyperus rotundus* Linn –A Review; International Journal of Scientific and Research Publications, Volume 3, Issue 5, May 2013 1 ISSN 2250-3153.
3. Sri Ranjani Sivapalan & Prince Jeyadevan; Physico-chemical and Phyto-chemical study of rhizome of *Cyperus rotundus* Linn; International Journal of Pharmacology and Technology (IJPT) , 2012, ISSN: 2277- 3436, Volume-1, Issue-2.
4. Durate, M.C.T., Figueira, G.M., Sartoratto, A., Rehder, V.L.G., Delarmelina, C.; Anti-Candida activity of Brazilian medicinal plant; J. Ethnopharmacol. 2005, 97, 305-311.
5. Neffatti, A., Ben Ammar, R., Dijoux-Franca, M.G., Ghedira, K., Chekir-Ghedira, L.; In vitro evaluation of antibacterial, antioxidant, cytotoxic and apoptotic activities of the tubers infusion and extracts of *Cyperus rotundus*; Bioresour. Technol. 2008, 99, 9004 9008.
6. Harborne, J.B., Williams, C.A., Wilson, K.L.; Flavonoids in leaves and inflorescences of Australian *Cyperus* species; Phytochemistry 1982, 21, 2491-2507.
7. Sri Ranjani, S., Prince, J.; Physico-chemical and Phyto-chemical study of rhizome of *Cyperus rotundus* Linn; International Journal of Pharmacology and Pharmaceutical Technology (IJPT), 2012, ISSN: 2277 – 3436, Volume-1, Issue- 2, 42-46.
8. Mohammad Arshad, B.H.Nagarajaiah & B.L.Kudagi; Experimental Evaluation of Antiulcer Activity of *Cyperus Rotundus*; Asian Journal of Biochemical and Pharmaceutical Research 2012, 2(2), ISSN: 2231-2560.
9. Min Zhu, Katherine T. Lew and Po-lau Leung; Protective effect of a plant formula on ethanol-induced gastric lesions in rats; Phytotherapy Research may 2002 Volume 16, Issue 3, pages 276–280.
10. Gupta MB, Palit TK, Singh N, Bhargava KP; Pharmacological studies to isolate the active constituents from *Cyperus rotundus* possessing anti-inflammatory, anti-pyretic and analgesic activities; Indian Journal of Medical Research 1971; 59: 76–82.
11. Birdar S, Kangralkar V A, Mandavkar Y, Thakur M and Chougule N; Anti-inflammatory, anti-arthritic, analgesic anticonvulsant activity of cyperus essential oils; Int J Pharm Parmaceut Sci, 2010, 2(4), 112-115.
12. Di stasi, L.C., Cotal, M., Sigrid L.S. Mendacolli M; Screening in Mice of some medicinal plants used for

- analgesic purposes in the state of Sao Paulo; *J. Of Ethnopharmacol* 24:205-211, 1988.
13. Zeid Abdul-Majid Nima, Majid Sakhi Jabier, Raghidah Ismaeel Wagi, Huda Abd Al-Kareem Hussain; Extraction, Identification and Antibacterial activity of *Cyperus* oil from Iraqi *C. rotundus*; *Eng. & Technology*, 2008, Vol. 26, No. 10.
  14. Singh S, SK Sharma; *Indian J. Nat. Prod.*, 2005, 21, 1, 16-17.
  15. Sandeep biradar, V.A. Kangralkar, Yuvaraj Mandavkar, Megha Thakur, Nilesh Chougule; Anti-inflammatory, antiarthritic, analgesic and anticonvulsant activity of *Cyperus* essential oils; *Int J Pharm Pharm Sci*, vol 2, issue 4, 112115.
  16. Singh N, Kulshrestha V K, Gupta M B and Bhargava K P; A Pharmacological study of *Cyperus rotundus*; *Indian J Med. Res.*, 1970, 58, 103-109.
  17. Gupta M B, Palit T K, Singh N and Bhargava K P; Pharmacological study to isolate the active constituents of *Cyperus rotundus* responsible for anti-inflammatory, antipyretic and analgesic activity; *Indian J Med Res*, 1971, 59, 76-82.
  18. Pal D, Dutta S and Sarkar, A evaluation of CNS activities of ethanol extract of roots and rhizomes of *Cyperus rotundus* in mice; *Acta Poloniae Pharmaceut Drug Res.* 2009, 66(5), 535-541.
  19. Shivakumar S I, Suresh H M, Hallikeri C S, Hatapakki B C, Handiganur J S, Kuber S and Shivakumar B; Anticonvulsant effect of *Cyperus rotundus* Linn. Rhizomes in rats; *J Nat Rened*, 2009, 9(2), 192-196.
  20. Singh N, Kulshrestha VK, Gupta MB and Bhargava K P; A pharmacological study of *Cyperus rotundus*; *Indian J Med, Res.*, 1970, 58, 103-109.
  21. Uddin SJ, Mondal K, Shilpi JA, Rahnan MT; Antidiarrhoeal activity of *Cyperus rotundus*; *Fitoterapia* 2006; 77 (2): 134-13
  22. Bambhole V D; Effect of some medicinal plants preparations on adipose tissue metabolism; *Ancient Sci Life* 1988, 8, 117-124
  23. Puratchikody A, Devi Nithya C, Nagalakshmi G; Wound healing activity of *Cyperus rotundus* Linn; *Indian journal of pharmaceutical sciences* 2006; 68: 97-101.
  24. Jigna Parekh, and Sumitra Chanda; In-vitro Antimicrobial Activities of Extracts of *Launaea procumbens* Roxb. (Labiatae), *Vitis vinifera* L. (Vitaceae) and *Cyperus rotundus* L. (Cyperaceae); *African Journal of Biomedical Research*, Vol. 9, Vol. 2, May, 2006, pp. 89-93.
  25. Natarajan B, Paulsen BS; An ethnopharmacological study from Thane district, Maharashtra, India: Traditional knowledge compared with modern biological science; *Pharmaceutical Biology*. 2000; 38: 139-151.
  26. Asad Bashir, Bushra Sultana, Faheem Hassan Akhtar, Adil Munir, Muhammad Amjad and Qadeer ul Hassan; Investigation on the Antioxidant Activity of Dheela Grass (*Cyperus rotundus*); *African Journal of Basic & Applied Sciences* 4 (1): 01-06, 2012 ISSN 2079-2034.
  27. Thebtaranonth, C., Thebtaranonth, Y., Wanauppathamkul, S., and Yuthavong, Y.; Antimalarial sesquiterpenes from tubers of *Cyperus rotundus*: structure of 10,12-peroxyca-lamenene, a sesquiterpene endoperoxide; *Phytochemistry*, 1995, 40, 125-128.
  28. Bunyapraphatsara, N.; *Thai Medicinal Plants Used in Preliminary Health Care*; Thunkamol Press, Bangkok (in Thai), 1986, Vol. 1, p. 231.
  29. Mazziro E A and Soliman K F A; In vitro screening for the tumoricidal properties of international medicinal herbs; *Phytother Res*, 2009, 23(3), 385-398.
  30. Kilani, S., Ledauphin, J., Bouhleb, I., Ben Sghaier, M., Boubaker, J., Skandrani, I., Mosrati, R., Ghedira, K., Barillier, D., Chekir-Ghedira L; Comparative study of *Cyperus rotundus* essential oil by a modified GC/MS analysis method. Evaluation of its antioxidant, cytotoxic, and apoptotic effects; *Chem. Biodivers.* 2008, 5, 729-742.
  31. Raut, N.A.; Gaikwad, N.J; Antidiabetic activity of hydro-ethanolic extract of *Cyperus rotundus* in alloxan induced diabetes in rats.; *Fitoterapia* 2006, 77, 585-588.
  32. Ardestani A and Yazdanparast R; *Cyperus rotundus* suppresses AGE formation and protein oxidation in a model of fructose-mediated protein glycoxidation; *Int J Biol Macromol*, 2007, 41(5), 572-578.
  33. Nishikant A. Raut, Naresh J. Gaikwad; Antidiabetic activity of hydro-ethanolic extract of *Cyperus rotundus* in alloxan induced diabetes in rats; *Fitoterapia* 77 (2006) 585-588.
  34. Jeong Ho Jin, Dong-Ung Lee, Yeong Shik Kim, and Hyun Pyo Kim; Anti-allergic Activity of Sesquiterpenes from the Rhizomes of *Cyperus rotundus*; *Arch Pharm Res* 2011, Vol 34, No 2, 223-228.
  35. Eun Ji Seo, Dong-Ung Lee, Jong Hwan Kwak, Sun-Mee Lee, Yeong Shik Kim, Yi-Sook Jung; Antiplatelet effects of *Cyperus rotundus* and its component (+) nootkatone; *Journal of Ethnopharmacology* 135, 2011, 48-54.
  36. AM, Morfno FN, Campos MM; Analgesic effects of *Callus* culture extracts from selected species of *Phyllanthus* in mice; *J Pharm Pharmacol.* 1994, 46:755-759.
  37. Friedwald W. T., Levy R. I, Fredrickson D. S.; Estimation of concentration of Low-Density Lipoprotein cholesterol in plasma, without use of preparative ultracentrifuge; *Clinical chemistry* 1972, 18: 499-502.
  38. Zhu M, Luk HH, Fung HS, Luk CT; Cytoprotective effects of *Cyperus rotundus* Linn. Against ethanol induced gastric ulceration in rats; *Phytother Res* 1997, 11(5): 392-94.
  39. Kumar S. V. S., Mishra H; Hepatoprotective Activity of Rhizomes of *Cyperus Rotundus* Linn against Carbon Tetrachloride-Induced Hepatotoxicity; 2005, 67:1: 84-88.

40. Singh N, Kulshrestha VK, Gupta MB and Bhargava K P; A pharmacological study of *Cyperus rotundus*; Indian J Med, Res, 1970, 58, 103-109.
41. Kemprajvivek, Bhat Sumangala K; Ovicidal and larvicidal activities of *Cyperus giganteus* Vahl and *Cyperus rotundus* Linn. Essential oils against *Aedes albopictus* (Skuse); Natural Product Radiance 2008, 7(5): 416-419.
42. Duarte MC, Figueira GM, Sartoratto A, Rehder VL, Delarmelina C; Anti-Candida activity of Brazilian medicinal plants; J Ethno pharmacol. 2005; 28, 97(2): 305-11.
43. Zhu M., Luk H. H., Fung H. S. ,Luk C. T.; Cytoprotective effects of *Cyperus rotundus* against ethanol induced gastric ulceration in rats PTR; Phytotherapy research ISSN 0951-418X 1997, vol. 11, no5, pp. 392-394.
44. Ngamrojanavanish N, Manaki S and Pornpakakul S; Inhibitory activity of selected Thai medicinal plants on Na<sup>+</sup>/K<sup>+</sup>-ATP-ase; Fitoterapia, 2006, 77 (6), 481-483.
45. Jadav Pinakin D, Zalavadiya Sohin K, Ghodasara Jaydip V, Rachchh Manish A; evaluation of antiurolithatic activity of *Cyperus rotundus* linn. Rhizomes in rats; Ethnopharmacology, 2013.