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AN OVERVIEW OF NUT GRASS (CYPERUS ROTUNDUS) WITH SPECIAL REFERENCE TO AYUSH

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ABSTRACT

Plants have always been a common source of medicament either in the form of traditional preparations or pure active principles. It is well known that traditional herbal medicines existed before the application of the modern scientific methods to health care; and even today majority of the world population depends on herbal health care practices\textsuperscript{1}. Cyperus rotundus is a plentiful species occurring throughout the plains of India, especially South India. It is well documented in ancient literature for the therapeutic uses of skin, urinary, digestive and reproductive diseases. The present review covers the basic botanical information, Physical properties, Therapeutic actions, Phytochemistry, Ethno medicinal uses, Experimental Pharmacology and Classical preparations from AYUSH (Ayurveda, Yoga, Unani, Siddha & Homeopathy) systems of Medicine.

KEY WORDS: Cyperus rotundus, Traditional herbal medicines, Nut grass, Purple nut sedge, AYUSH.

INTRODUCTION

Cyperus rotundus (purple nut sedge) is a weed in over 90 countries. The word cyperus derives from the Greek (kupros) and rotundus is from Latin, meaning round. Cyperus grows rapidly and fills the soil with its tangle of roots and rhizomes. The Romans used this plant as emmenogogue in uterine complaints. It is regarded in Traditional Chinese medicine, as the
chief of all herbs the first line of choice for treating Gynecological disorders. Cyperus rotundus was held in high esteem by the ancient sage’s of India. It is widely distributed throughout India up to 1828m. This super bulb has been used throughout the ages for the treatment of numerous illnesses. It enjoys an important place among medicinal herbs in India science ancient times. The plant is mentioned in the ancient Indian Ayurvedic medicine Charaka Samhita in 100 A.D. In India Cyperus rotundus is one of the Indigenous medicinal plants of high commercial value in Balaghat District.

**Taxonomic Hierarchy**

Kingdom : Plantae  
Sub kingdom : Tracheobionta  
Superdivision : Spermatophyta  
Division : Magnoliophyta  
Class : Liliopsida  
Subclass : Commelinidae  
Order : Cyperales  
Family : Cyperaceae  
Genus : Cyperus.L  
Species : Cyperus rotundus.L  

**Synonyms**

- Chlorocyperus rotundus (L.) Palla  
- Cyperus olivaris *Targioni-Tozzetti*  
- Cyperus purpuro-variegatus *Boeckeler*  
- Cyperus stoloniferum pallidus *Boeckeler*  
- Cyperus tetrastachyos Desf.  
- Cyperus tuberosus *Roxb.*  
- Pycreus rotundus (L.) *Hayek*  

**Vernacular names**

- Tamil : Korai, Muthakasu  
- Malayalam : Muththann  
- Kannada : Tangahullu  
- Gujarati : Motha  
- Telugu : Tungamuste
Hindi : Motha, Mutha
Marathi : Nagarmotha, Motha
Sanskrit : Bhadramusta, Mutha
English name : Nut grass, Purple nut sedge.

**Geographical Distribution**
Purple nut sedge is present in 92 countries. It is located in temperate, subtropical and tropical regions of the world. *Cyperus rotundus* is native to Africa, Southern and central Europe and Southern Asia. In India it is distributed throughout the country and in Ceylon 1800m from the sea level.

**Genetics**
Haploid (441 chromosomes)

**Cultivation**
*Cyperus rotundus* is found in cultivated fields, farmlands, neglected areas, wastelands, grasslands, at the edges of forests, and on roadsides, sandy or gravelly shores, riverbanks and irrigation canal banks, agricultural areas, coastland, water course. Purple nut sedge grows well in almost every soil type, over a wide range of soil moisture, pH and elevation. It is encouraged by frequent cultivation and grows best in moist fertile soils.

**Habitat**
A perennial glabrous herb 10-20 cm long, ovoid root tubers of 0.8-2.5 cm diameter, root fibers clothed with flexuous hairs, stems sub solitary 10-75 cm long triquetrous at the top, umbel or compound inflorescence, bearing short spikes of 3-10, spikelet of 1.6-3.8 cm with 10-50 flowers, stamens 3, nut 1.6 mm long, ovoid and trigonous, style 1.6mm long, stigma 3. Propagation by seeds and vegetative means seeds are shown on sunken moist seed beds in April. Germination takes about 15-20 days. Root slips from well matured cyperus are dibbed into the moist bed at 7-10 cm apart the soil is kept moist by frequent watering and is ready for harvesting in four months.

**Physio-chemical Properties**
1. White starch content : 24.1%
2. Viscosity at : 20°C
3. Adhesive strength &
line-spread: at 50ºC
Amylose content: 26.73%
Total Ash: 5.9 -6.35%
Acid soluble Ash: 3%
Water soluble Ash: 1.10%
Alcohol soluble extract: 9.068%
Water soluble extract: 16.36%

Phytochemistry
Table.1 Information about the Phyto constituents.

<table>
<thead>
<tr>
<th>Parts</th>
<th>Chemical constituents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhizomes</td>
<td>α-cyperolone, α-rotunol, β-cyperone, β-pinene, β-rotunol, β-selinene, Calcium, Camphene, Copaene, Cyperene, Cyperenone, Cyperol, Cyperolone, D-copadiene, D-epoxyguaiae, Isocyperol, Isokobusone, Kobusone, Limonene, Linoleic-acid, Linolenic-acid, Mustakone, Myristic acid, Oleanolic acid, Oleic acid, P-cymol, Patchoulenone, Rotundene, Rotundenol, Rotundone, Selinatriene, Sitosterol, Stearic acid, Sugetiol, Sugetriol, Caryophyllene, Cyperotundone.</td>
</tr>
<tr>
<td>Leaves</td>
<td>Luteolin and auresidin.</td>
</tr>
<tr>
<td>Arial</td>
<td>Sitosteryl(6-hentriacontanoyl)-β-D-Galactopyranoside, Some furochromones, khellin, visnagin and ammiol, bezo- α-pyrene (coumarin), salicylic acid, caffeic acid, protocatechuric acid, P-coumaric acid, tricin and isohamnetin.</td>
</tr>
</tbody>
</table>

The essential oil from the plant contains atleast 27 components comprising sesquiterpene hydrocarbons, contains α-copaene (1.97%), Cyperene (15.73%), α-hisaholene (2.14%), α-gurjunene (1.29%)15, 2-methoxy-8-methyl-1,4-naphthalenedione (4.01%), β-selinene (17.99%) Oxo- α-ylangene (3.00%), 4, 4 α-5, 6, 7, 8-hexahydro-4 α-5dimethyl-3-(1-methyl ethylidene)-2(3H)-naphthalenone (8.11%), α-cyperone (26.15%), Logipinocarvone (1.11%). Overall Presence of Glucose (8.3~9.1%), Fructose (1.0~1.7%), Starch (40-41.1%), Protein (4.9%), Mg 1285.7µg.

Substitutes or Adulterants16
Similar species – Cyperus esculentus
Cyperus is a substitute for Aconitum heterophyllum (Ativisha)

Actions3,11,17
Analgesic, Anti-inflammatory, Anthelmentic, Alterative, Anti-dyspeptic, Anti-perspirant, Anti-spasmodic, Anti-tussive, Aphrodisiac, Aromatic, Carminative, Diaphoretic, Diuretic,
Emmenogogue, Galactogogue, Hypotensive, Lithotriptic, Liver tonic, Nervine tonic, Stomachic, Stimulant.

**Traditional Uses**

**Internal Uses**

1. **Chest pain**: Boil to decoction 4 to 9 gms of dried drug preparation together with 4 gms of Citrus and drink.

2. **Irregular menstruation, Painful menstruation**: It is also one of the most effective menstrual regulators. It helps to promote and regulate the menstruation. 2 to 6 gms of dried material in a standard cup of water, boil to concentration and drink.

3. **Dysentry**: 1. Tubers powdered and mixed with ginger and honey is used. 2. Grind nut grass tuber and ginger with honey into pill form taken orally in the dosage of solanum torvum size.

4. **Diarrhoea**: 1. Tubers boiled in milk with three folds of water cures diarrhea. 2. Tubers are useful in infusion or as soup in fever, diarrhea, dysentery, dyspepsia, vomiting, cholera, etc. 3. About 5g of tubercles are crushed and boiled in about 300ml of water obtained from rice wash (chaulani) and the decoction is given with 2 teaspoon full of honey thrice a day for 3 or more days to relieve diarrohea.

5. **Asthma**: 25 gms of powdered tuber of Cyperus rotundus, 21 numbers of piper nigrum, 10 gms of ginger, 5 gms of clove and 5 gms of cumin seeds were boiled with ghee for few minutes, then cool it to become a paste. Take 10 ml of this paste thrice a day for 5 days with a little honey.

6. **Worm infection**: 1. Grind together the leaves of Cyperus rotundus (7no.) with the entire plant of Cyperus rotundus (3no.) in to a paste. Make tablets with this paste. Take one tablet orally thrice a day for one or two days. 2. The rhizome is made into a paste and 10-20g of it is eaten 3 times a day for 2-3 days for its reputed anthelmintic action. In case of children, the dose is usually halved.

7. **Rheumatoid arthritis**: Cyperus rotundus root powder and Withania somnifera root powder each 1 gm is given orally twice a day for Rheumatoid arthritis. Anti-rheumatic activity was found to be eight times that of Hydrocortisone.

8. **Dental diarrhea in Children**: Mustaka is highly praised as the best panacea for dental diarrhea in children. It works well in combination with karkadaga singi (Rhus succedanea) and Ativisa (Aconitum heterophyllum) in such condition.

9. **Mental debility and Epilepsy**: It is given along with cow’s milk.
10. **Burning micturition:** It can be used with Satavari (Asparagus racemosus) in proportions of 1:4 in burning micturition, urinary calculi, haematuria etc., mustaka renders excellent results, as it is diuretic in property.

11. **Polydipsia in diabetes:** Tuber is sliced and dried in sun and powdered, to the 5 gm of powder add 2 black pepper and is prescribed for polydipsia in diabetes\(^21\).

12. **Lactation:** The decoction of its roots is the best remedy for purifying the breast milk in lactating mothers.

13. **Malaria:** The whole plant extract is given in malaria.

14. **Obesity:** Oral administration of 1 gm of nut grass root powder twice a day shows significant reduction of body weight and also decreases blood pressure in hypertensive obese patients.

15. **Bronchitis:** A decoction prepared from 10g of the crushed tubercles in 100ml of water with a little salt is given twice a day for 2-5 days to treat bronchitis. Its prolonged use is also said to relieve bronchial asthma.

**External uses\(^ {20, 21} \)**

1. **Wounds, bruises, carbuncles:** Arabs of the Levant traditionally us roasted tubers, while they are still hot, or hot ashes from burned tubers, to treat wounds, bruises, carbuncles.

2. **Galactagogue:** Fresh tubers are applied to the breast in the form of paste or warm plaster as a galactogogue.

3. **Spreading ulcer:** Dry powder of tuber is used as dusting in Spreading ulcer\(^ 22 \).

4. **Skin diseases and itching in vagina:** Grind 25 g of Cyperus rotundus into paste. Apply this paste on itching area, vagina once daily for 3 to 4 days. Wash the diseased portion with the hot decoction.

5. **Headache:** Grind the tuber of Cyperus rotundus into paste. Apply this paste on fore head only once to relief from headache.

6. **Sores on head:** Grind the tubers of Cyperus rotundus (25 g), leaves and the tender leaves of Terminalia bellerica into paste. Apply this paste on head before taking bath once daily for 3 days.

7. **Scabies, eczema:** The external application of its paste reduces the foul odour due to excessive sweating, and is salutary in skin diseases like scabies, eczema etc.

8. **Obesity:** The massage with its dry powder (Udvartana) is extremely beneficial for reducing the subcutaneous fat deposition.
9. *Sprains, bruises, furuncle infections:* Use pounded fresh material as poultice or cook the pulverized drug material in vinegar and apply as hit poultice.

10. *Conjunctivitis:* The root extract oil instilled into eyes in conjunctivitis reduces the pain, redness and ocular discharges.

### Classical Preparations in AYUSH

Table 2: The List of the drugs, in which C. rotundus as a main ingredient:

<table>
<thead>
<tr>
<th>Formulations</th>
<th>Internal medicines</th>
<th>External medicines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siddha Formulations&lt;sup&gt;2,18&lt;/sup&gt;</td>
<td>Sivathai chooranam</td>
<td>Chukku thylam</td>
</tr>
<tr>
<td></td>
<td>Dhratchathi chooranam</td>
<td>Naasiroga naasa thylam</td>
</tr>
<tr>
<td></td>
<td>Nilavembu kudineer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kattuvanga thylam</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Veppu ennai</td>
<td></td>
</tr>
<tr>
<td>Ayurvedic Formulations&lt;sup&gt;11,18&lt;/sup&gt;</td>
<td>Mustakadi Kwath</td>
<td>Triphaladi Thailam</td>
</tr>
<tr>
<td></td>
<td>Mustak arishta</td>
<td>Maharajaprasarini Thailam</td>
</tr>
<tr>
<td></td>
<td>Balasanjivani churna</td>
<td>Manjishtadi Thailam</td>
</tr>
<tr>
<td></td>
<td>Gangadhar churna</td>
<td>Musta taila</td>
</tr>
<tr>
<td></td>
<td>Shandgapaniya</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mustadi leha</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mustadi churna</td>
<td></td>
</tr>
<tr>
<td>Unani Formulations&lt;sup&gt;18&lt;/sup&gt;</td>
<td>Jawarish jalinush</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Majun murraval-ul-anwah</td>
<td></td>
</tr>
</tbody>
</table>

### Experimental Pharmacology

*Anti oxidant property*

*Parast et al* reported that the hydroalcoholic extract of *C. rotundus* (CRE) exhibited high reduction capability and powerful free radical scavenging, especially against DPPH and superoxide anions. CRE also showed inhibited lipid peroxidation in rat liver homogenate induced by Fe<sup>2+</sup>/ascorbate and prevented deoxyribose degradation in both non-site-specific and site-specific assays showing the hydroxyl radical scavenging and metal chelating activity of the hydroalcoholic extract. Cyperus rotundus root extract has a potent superoxide radical scavenging effects<sup>24</sup>.

*Wound healing activity*

*Puratchikody et al* reported that, Ethanolic extract of powdered tubers (500gm), extract ointments showed considerable difference in response in all wound models on male Wistar rats (the excision, incision and dead space wound model) comparable to those of a standard drug nitro furazone ointment (0.2%w/w NEZ). Due to the presence of active terpenes, flavonol glycosides and β-sitosterol in tuber part of Cyperus rotundus this may be effective in
reducing tissue swelling and oozing of tissue fluid accompanying inflammation revealed a positive healing profile\textsuperscript{25}.

**Antimicrobial Activity**

Sharma et al reported that, Cyperus rotundus Linn. Rhizome extracts were evaluated against six important pathogenic microbes viz. Staphylococcus epidermidis, Bacillus cereus, Pseudomonas aeruginosa, Escherichia coli, Aspergillus niger and Candida albicans. The ethanolic extract was found to exhibit highest activity against tested bacteria\textsuperscript{26}. However all extracts were ineffective against fungal strains. The inhibitory effect is very similar and comparable with that of standard drug.

**Anti diabetic activity**

Raut et al ,Evaluated the antidiabetic activity of fractions of hydro-ethanol extract of C. rotundus. Dried powdered material of C. rotundus is taken and induced by intra-peritoneal administration of alloxan monohydrate (120 mg/kg) on days 1 and 12 and blood glucose levels were estimated on 15th day. Various oral doses were tried and significant antidiabetic activity (p<0.001) was found at a dose of 300 mg/kg in acetone fraction and residue left after successive fractionation comparable to metformin (450 mg/kg, per oral)\textsuperscript{27}. The results suggested that, fractions possess antidiabetic activity attributed to the presence of polyphenols.

**Anti Inflammatory Activity**

Biradar et al, evaluated the effects of oils in anti-inflammatory carrageenan induced inflammation (paw edema) in Rats. The results showed dose dependent activity, indicated by reduction in paw edema in anti-inflammatory and antiarthritic activity\textsuperscript{34}, and significant reduction (p<0.01) in the MES induced convulsion in comparison to control. From literature survey as well as experiments performed, it can be said that essential oil posses a good Anti-inflammatory due to the presence of beta- Sitosterol\textsuperscript{28} and flavonoids.

**Anti convulsant activity**

Shivakumar et al evaluated the anticonvulsant effect of Cyperus rotundus Linn rhizomes against maximal electroshock (MES) and pentylenetetrazole (PTZ) induced tonic seizures in albino rats. The ethanol extract (100 mg / kg, p.o.) reduced hind limb extension and duration of convulsion significantly, (P < 0.001) which was comparable to standard drug phenytoin (25 mg / kg, i.p.) and diazepam (4 mg /kg, i.p.) respectively. The ethanol extract of Cyperus...
rotundus rhizomes is worthwhile to develop the potent phytoconstituent for treatment of epilepsy and the flavonoids present in ethanol extract could be attributed for anticonvulsant activity\textsuperscript{29}.

**Hepato protective activity**

Kumar et al reported that, Ethyl acetate extract and two crude fractions, solvent ether and ethyl acetate, of the rhizomes of Cyperus rotundus (Cyperaceae) were evaluated for hepatoprotective activity in rats by inducing liver damage by carbon tetrachloride. The ethyl acetate extract at an oral dose of 100 mg/kg exhibited a significant protective effect by lowering serum levels of glutamic oxaloacetic transaminase, glutamic pyruvic transaminase, alkaline phosphatase and total bilirubin\textsuperscript{30}. These biochemical observations were supplemented by histopathological examination of liver sections. Silymarin was used as positive control. Result shows Significant.

**Anti-obesity activity**

Athesh et al, evaluated the anti-obesity potential of the aqueous tuber extract of Cyperus rotundus L. (ATECR) in high fat cafeteria diet (HFCD) fed obese rats. Wistar strain of albino rats were divided into six groups comprising of six rats each. Group I served as normal control fed with normal pellet chow, group II served as disease control fed with high fat cafeteria diet, group III, IV and V animals, received ATECR at a dose level of 100, 200 and 300mg/kg bw along with HFCD for 40 days, while, group VI served as standard drug control, which received Orlistat at a dosage of 50mg/kg bw along with HFCD\textsuperscript{31}. The result shows the significant weight reduction activity.

**Anti-Platelet Activity**

Seoa et al investigated the antiplatelet effects of Cyperus rotundus EtOH extract (CRE) and its constituent compounds. The antiplatelet activities of CRE and its eight constituent compounds were evaluated by examining their effects on rat platelet aggregations in vitro and ex vivo, and on mice tail bleeding times. During the in vitro platelet aggregation study, CRE showed significant and concentrationdependent inhibitory effects on collagen-, thrombin-, and/or AA-induced platelet aggregation. Of its eight components, (+)-nootkatone was found to have the most potent inhibitory effect on collagen-, thrombin-, and AA-induced platelet aggregation. In addition, CRE- and (+)-nootkatone-treated mice exhibited significantly prolonged bleeding times. Furthermore, (+)-nootkatone had a significant inhibitory effect on rat platelet aggregation ex vivo. This study demonstrates the antiplatelet effects and might be
of therapeutic benefit for the prevention of platelet-associated cardiovascular diseases.\textsuperscript{32} Antimalarial activity C. rotundus Linn. has already been investigated by many groups and several mono- and sesquiterpenes have been isolated. Some terpenes isolated from this plant have also been tested for antimalarial activity, with moderate in vitro activities being recorded. In our screening through the usual procedure, it was noted that the crude hexane extract of the air-dried tubers of C. rotundus Linn. showed high potency in the in vitro test against Plasmodium falciparum (EC_{50} = 0.66 pg ml\textsuperscript{-1}); the result shows the significant antimalarial activity.\textsuperscript{33}

CONCLUSION

The concept of Single herbs as potent therapeutic agents is being experimentally and clinically documented now-a-days. Even major Pharmaceuticals preparing poly herbal formulations are now concentrating in this concept. This development is because of the multi-faceted therapeutic properties which the single herbs possess. In that way, Nut grass (Cyperus rotundus) has experimentally proven Anti-oxidant, Anti-inflammatory, Antimalarial, Hepato-protective, Anti-obesity and Anti-convulsant properties. It is the right time to do more work on this herb to further explore the wonderful therapeutic properties for the benefit of the mankind.

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