Cyperus rotundus Linn., (*family Cyperaceae*), is a medicinal plant, known as purple nutstedge or nutgrass. It is a common perennial weed with slender, scaly creeping rhizomes, bulbous at the base and arising from the tubers which are about 1-3 cm long. The tubers are externally blackish in colour and reddish white inside, with a characteristic odour. The stems grow to about 25 cm tall and the leaves are linear, dark green and grooved on the upper surface. Inflorescences are small, with 2-4 bracts, consisting of tiny flowers with a red-brown husk. The nut is three angled, oblong-ovate, yellow in colour and black when ripe. *C. rotundus* is indigenous to India, but are now found in tropical, subtropical and temperate regions. (Pooley, 1998)

This Plant is one of the most invasive weeds known, having spread out to a world-wide distribution in tropical and temperate regions. *C. rotundus* has been called “the world’s worst weed” as it is known as a weed in over 90 countries and infests over 50 crops worldwide. Like other sedges, the plant is mostly found growing in farmlands, pastures, wastelands, sandbeds, damp and marshy places (Swift, 1989). This plant is an annual, growing to heights between 20 and 40 cm and produces prominent subterranean swollen tuberous bases. These tuberous bases remain dormant after the growing season and in adverse conditions and are linked together in a chain by short lengths of thin rhizomes.
In Tamil, this plant is known as Koraikizangu, Thunga in Telugu, Nutgrass in English) is a perennial sedge distributed throughout India. It is pestiferous perennial weed with dark green glabrous culms, arising from underground tubers (Kirtikar and Basu, 2001). The genus *Cyperus rotundus* includes common weeds found in upland and paddy fields in temperate to tropical regions. In Asian countries, the rhizomes of *Cyperus rotundus*, which are used as traditional folk medicines for the treatment of stomach and bowel disorders and inflammatory diseases, have been widely, investigated (Gupta *et al.*, 1971; Singh *et al.*, 1971; Weenen *et al.*, 1990; Thebtaranonth, 1995).

Roots and rhizomes of this plant are used in different diseases like nausea, fever and inflammation, for pain reduction, for muscle relaxation and many other disorders (Dilipkumar *et al.*, 2009). The main active substances which have been identified in *Cyperus rotundus* include: cyperone, selinene, cyperene, cyperotundone, patchoulenone, sugonol, kobusone, and isokobusone that may scientifically explain its folk- and alternative-medicine uses (Lawal and Oyedeji, 2009). In Iranian traditional medicine, *C. rotundus rhizome* has been used for nausea, inflammation and epilepsy (Zargari, 1991). Experimental reports have shown the potent antioxidant and free radical scavenger activity of the plant (Yazdanparast and Ardestani, 2007; Kilani-Jaziri *et al.*, 2006). It is also a home remedy for indigestion, disorders of stomach. The tubers are used in Ayurvedic medicine and have been mentioned in ancient texts for various ailments (Agarwal *et al.*, 2005).
Cyperus rotundus (Cyperaceae) is a traditional herbal medicine used widely as analgesic, sedative, antispasmodic, antimalarial, stomach disorders and to relieve diarrhea (Zhu, 1997). The tuber part of C. rotundus is one of the oldest known medicinal plants used for the treatment of dysmenorrhea and menstrual irregularities (Bhattarai, 1993). The rhizomes are cooling, intellect promoting, nerve tonic, diuretic, antiperiodic and used to treat diarrhea, dysentery, leprosy, bronchitis, amenorrhea and blood disorders (Cerutti, 1991). The rhizomes are intellect promoting, nerve tonic, diuretic, antiperiodic, and traditionally used to treat diarrhoea, dysentery, leprosy, bronchitis, amenorrhoea, dysmenorrhoea, renal and vesical calculi, ophthalmic disorders, blood disorders and general debility (Sharma et al., 2001).

The rhizomes have been used in ancient medicine for several clinical conditions like fever and arthritis (Kiritikar and Basu, 1994). Pharmacological studies denote the rhizomes as analgesic, anti-inflammatory, antipyretic (Gupta et al., 1971) anti diabetic (Raut and Gaikwad, 2006). Besides, the methanolic extract of rhizomes has been found to inhibit nitric oxide and superoxide production in murine macrophage cell line (Seo et al., 2001). The phytochemical investigation of Cyperus rotundus rhizomes has revealed the presence of flavonol glycoside (Singh and Singh, 1986), polyphenol (Komai, 1994). Infusion of this herb has been used in pain, fever, diarrhoea, dysentery, an emmenagogue and other intestinal problems (Uddin et al., 2006; Vidal and Les, 1963). This plant is used for treating fevers, digestive system disorders, dysmenorrhea and other maladies. Arabs of the Levant traditionally used roasted tubers to treat wounds,
bruises and carbuncles, etc. And modern alternative medicine recommends using this plant to treat nausea, fever and inflammation; for pain reduction; for muscle relaxation and many others disorder (Talukdar et al., 2011).

An ayurvedic formulation containing *Cyperus rotundus* was claimed as a remedy for some inflammatory disorders because of its significant inhibition against colitis and enterocolitis in rats. The same formulation was also found to be useful for ulcerativecolitis in a clinical trial (Jagtap et al., 2004). A number of pharmacological and biological activities including anti-*Candida*, anti-inflammatory, antidiabetic, anti-diarrhoeal, cytoprotective, antimutagenic, antimicrobial, antibacterial, antioxidant, cytotoxic and apoptotic, anti-pyretic and analgesic activities have been reported for this plant (Durate et al., 2005; Sundaram et al., 2008). A novel norsesquiterpene, named norcyperone, and three known compounds: (-)-clovane-2,9-diol, rosenonolactone, and 5α,8α-epidioxy-(20S,22E,24R)-ergosta-6,22-dien-3β-ol were isolated from the rhizomes of *Cyperus rotundus* L (Yan Xu et al., 2008).

The chemical composition of the volatile oils of *C. rotundus* has been extensively studied and four chemotypes (H-,K-,M-O-types), of the essential oils from different parts of Asia have been reported (Kilani et al., 2008; Komai and Tang, 1989). The H-type from Japan was found to contain α-cyperone (36.6%), β-selinene (18.5%), Cyperol (7.4%) and Caryophyllene (6.2%). The M-type from China, Hong Kong, Japan, Taiwan and Vietnam had α-Cyperone (30.7%), Cyperotundone (19.4%), β-selinene (17.8%), cyperene (7.2%) and cyperol
The O-type from Japan, Taiwan, Thailand, Hawaii and the Philippines was characterized by cyperene (30.8%), cyperotundone (13.1%) and β-elemene (5.2%). In addition, the Hawaiian O-type had cyperotundone (25.0%) and cyperene (20.7%) as the major compounds. Finally, the K-type, also from Hawaii, was dominated by Cyperene (28.7%), Cyperotundone (8.8%), Patchoulenyl acetate (8.0%) and Sugeonyl acetate (6.9%) (Komai et al., 1994). Sesquiterpenes (Thebtaranonth et al., 1995; Ohira et al., 1998) such as patchoulenone, caryophyllene-α-oxide, 10,12 peroxy calamene, 4,7-dimethyl-1-tetralone(1), 4,5- secoeudesmanolide, cyperolone, mustakone and other eudesman-type were isolated and identified in the hexane extract of *C. rotundus* L (Hikino and Aota, 1976).

Inspite of various references, still there are many lacunae to be filled. Immunomodulating characteristics, antibacterial, antifungal studies and screening for bioactive compounds are to be done in this plant.
1.2 DISTRIBUTION

Throughout India, as a weed in wastelands from sea level to 1800 m.

1.3 PLANT DESCRIPTION

A perennial glabrous herb with elongate slender stolons bearing hard black fragrant tubers and triquetrous aerial stems; leaves numerous, narrowly linear, finely acuminate, flat, one nerved; spiklets in compound expanded umbels, spikelets liner to lanceolate, glumes imbricate; nut trigonous, broadly obovoid, grayish black. Root Rhizomes and tubours occur on the same plants. Tubers are oblong, ridged initially white in colour, eventually turning brown or black, and are bitter to the taste; purple nutsedge produces chains of tubers that develop along the entire rhizome.

1.4 WORLDWIDE USES OF Cyperus rotundus Linn

**India**  Astringent, Bowel, Stomach, Tumor(Abdomen), Vermifuge

**China**  Abdomen, Headache, Stomachache, Anenorrhea, Anodyne, Aphrodisiac, Bactericide, Bladder, Cervical cancer, Chest, Circulation, Congestion, Deobstruent, Depression, Diarrhoea, Dyspepsia, Emmenagogueue, Enery, Gastralgia, Hemicrania, Impotency, Lactogogue, Menozenia, Metritis, Metroxenia, Side, Tonic, Trauma, Virility, Vulnerary

**Egypt**  Astringent, Scorpion Bite, Diaphoretic, Diuretic, Dyspepsia, Emmenagogue, Emollient, Fever, Stomachic, Ulcer, Vermifuge

**Japan**  Anodyne, Emmenagougue, Wound

**Java**  Diuretic, Edema, Felon, Gravel, Leucorrhea, Sore, Stone, Whitlow

**Sudan**  Astringent, Diaphoretic, Dyspepsia, Fever.
2. OBJECTIVES OF THE WORK

1. Identification and collection of the Medicinal plant *Cyperus rotundus* Linn (Cyperaceae).

2. Extraction of Phytochemicals from rhizomes of *Cyperus rotundus* Linn. using polar grade solvents.

3. Isolation, fractionation, screening and characterization of phytochemicals in the rhizome extracts and various fractions separated using column Chromatography, preliminary phytochemicals screening test, UV Spectrophotometry, Gas Chromatography- Mass Spectrometry (GC-MS).

4. Identification of pharmacological properties: The Effect of antimicrobial activities of pharmacologically active substances of the crude rhizome extracts and column separated various fractions of *Cyperus rotundus* Linn against the pathogenic bacterial and fungal strains isolated from human and standard bacterial strain collected from NCIM, Pune.

5. *Invitro* Antioxidant studies on crude root extracts and on the column separated fractions of *Cyperus rotundus* Linn. Antioxidant *invivo* studies using Wistar rats (*Rattus norvegicus*) and Histopathological evaluation of liver and kidney for toxicity.

6. Effect of bioactive substances present in the extracts of rhizome of *Cyperus rotundus* L. on immunological parameters in Wistar rats.
Identification & Collection of Rhizome of the *Cyperus rotundus* Linn. (Cyperaceae)

Extraction and Fractionation

- Soxhlet apparatus
- Column Chromatography

Phytochemical characterization

- Phytochemical screening Test
- TLC analysis
- UV-Spectrophotometer analysis
- GC-MS analysis

Pharmacological studies

- Antimicrobial activities: Antifungal and Antibacterial
  - *In vitro* and *in vivo* antioxidant activities on Wistar rats
  - Immunological studies on Wistar rats
  - Histopathological studies