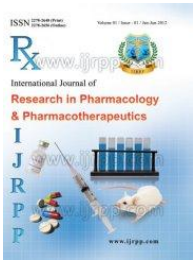
International Journal of Research in Pharmacology & Pharmacotherapeutics



ISSN Print: 2278-2648 ***IJRPP |Vol.6 | Issue 3 | July - Sep - 2017***
ISSN Online: 2278-2656 ***Journal Home page: www.ijrpp.com***

Review article ***Open Access***

A Review of Ethanobotanical and Phytopharmacology of *Ottelia alismoides (L.)* PERS

G.Sumithira*, V.Kavya, A.Ashma, M.C.Kavinkumar

The Erode College of Pharmacy, Erode, Tamilnadu, India
***Corresponding author: G.Sumithira**

ABSTRACT

The use of natural products as medicinal plants presumably predates the earliest recorded history. In the past 20 years public dissatisfaction with the cost prescription medications, combined with an interest in returning to natural or organic remedies, has led to an increase in herbal medicine use. Herbal medicine also called botanical medicine or phytomedicine refers to using a plant's seeds, berries, roots, leaves, barks and flowers for medicinal purposes. *Ottelia alismoides* is an traditional aquatic plant. The plant well below the surface of water usually anchored. Found both in stagnant and running water. It is used as medicinal plant for treating diseases like cancer, asthma, diabetes, tuberculosis, haemorrhoids, febrifuge, and rubifacient. Our present aim is to review all the work performed on the plant to get the clear idea to evaluate its various medicinal principles relating to ethanobotanical and phytopharmacological approaches.

Keywords: Aquatic plant, Medicinal plant, *Ottelia alismoides.*

INTRODUCTION

Aquatic plants undoubtedly play important ecological roles as the dominant primary producer component of swallow water ecosystems. They are also referred to as **hydrophytes** or **macrophytes.** They directly provide shelder and food to a variety of consumer organism (especially fish and birds) and also serve as the major source of energy for an even greater diversity of biota. In addition to these values, aquatic plants are also of great economic importance to mankind, though it has not been fully appreciated. Summarised the human uses of aquatic plants but found them of 'limited economic value in the modern world'. He recognised them as sources of food 'in parts of the tropics or in times of famine' and also their medicinal and nutritional values 'in the past'. In the Indian subcontinent, however, aquatic plants have been extensively used for a diversity of purposes since historical times, and are used (and often cultivated) even today particularly for food, fibre and medicine [1-3].

From those, *Ottelia alismoides* (Duck lettuce) have adapted to living in aquatic environments (salt water and fresh water). The plants require special adaptations for living submerged in water, or at the water's surface [4-6]. It is the only species we have with flowers surrounded by a winged or ribbed spathe. The plant is entirely submersed except for the

flower, which is projected to the water surface by the elongate peduncle[7].

BIOLOGICAL SOURCE [8]

Botanical name :*Ottelia Alismoides (L.)*Pers.
Synonym : Stratiotesalismoides
: Damasoniumalismoides
Family : Hydrocharitaceae(Frog's Bit Family)

Vernacular names [9]

Common name : Duck lettuce, Waterplantain.
Tamil name : Nirkuliri
Malayalam : Ottel ambel
Kannada : Hasiru neeru paathre
Bengali : Parmikalla
Marathi : Olek-alsem
Telugu :Edukula thaamara, Neeruveniki
Dutch : Duikerbloem [10]
Malaya : Keladi Ayer
Spanish : Espada,Tangila
Philippine : Kalabua
India : Pokokkelur, Dainithalir.

Taxonomy [7]

Kingdom : Plantae
Subkingdom : Tracheobionta
Super division : Spermatophyta
Division : Magnoliophyta
Class : Liliopsida
Subclass : Alismatidae
Order : Hydrocharitales
Family : Hydrochritaceae
Genus : OtteliaPers
Species :*Ottelia Alismoides* (L.) Pers

ORIGIN AND GEOGRAPHICAL DISTRIBUTION

First discovered in the United States in 1969 in rice field ditches of Cameron Parish, Louisiana. Expanding east by 1986 to the Bayou Teche drainage and other coastal zones of Louisiana, such as the Barataria Basin. Recorded by 1993 from four additional parishes, within the Calcasieu Mermentau and Vermilion drainages of south western Louisiana. A single population discovered 1977 in Butte County, California, (the Lower Butte drainage), was quickly eradicated and no plants have been observed since. Not recorded again until 2000 when found in Missouri at newly created marsh ponds in the black river drainage [11]. It has been reported from many countries across tropical and subtropical Asia and Australia and covers a wide geographic range. In India the plant is found in tanks, ponds, streams and ditches [8]. The plant is strikingly noticeable in several places like the aquatic herb at the back waters of Madhuban Dam near Dudhani, Silvassa region, Kamrup dist Assam, Ariyalur and Kunnathur tank Madurai dist Tamilnadu [8] and also Agaram village kudapakkam villianur Pondicherry.

Biology & Spread

Flowers bloom throughout the spring into summer. *Ottelia alismoides* produces solely by seed and subsequent spread to new areas is limited by water flow [12].

CULTIVATION AND COLLECTIONS

It grows in shallow waters, ponds and in rice fields. It faces no major threats and is therefore listed as Least Concern [13-16]**.** It does well under strong light and harder water with a rich substrate. It is an annual and grows from seed each year. CO_2 fertilisation and pH control make growing this plant in the aquarium less difficult. It grows very large in the aquarium and is best used as a feature plant [17]. seeds may remain viable for up to four years noted that fish prefer to eat the seeds, but it is unknown how this affects germination Seeds will germinate in 25-30 °C, and germination may be influenced by light availability and burial depth, but substratum (mud or sand) and oxygen availability had no significant effect[18].

Fig no :1

Fig no : 2

Fig no :3

Fig no :4

Fig no:5

Fig no:6

BOTANICAL DESCRIPTION

Habitat

This species grows in streams, lakes, marshes, ponds, ditches and canals [19-21]. Depth and turbidity of water affecting the penetration of light a clayey and reducing substratum and little biotic disturbance.[22] (Fig no: 1).

Leaves

Leaves are extremely variable, with short or long petioles according to the depth of the water. Blades of the submerged leaves are often narrow; the floating ones, ovate or somewhat rounded, with a rounded or often heart shaped base, thin and translucent 5 to 20 centimeters long [10]. (Fig no: 2).

Flowers

Flowers are white about 2cm in length Inflorescences 1-flowered; spathes 3-10 winged. Flowers sepals 10-15, stamens 3-12; ovary 1,3-9 carpellate [10]. wrapped within spathes, cylindrical structures 2-4 cm long, composed of green bracts that are ornamented with 3 or more ruffled wings. Spathes born on long, angled stalks that become spiraled after flowering. Sepals and short-lived petals of male flowers exert from the tip of the spathe just above the water surface. Spathes containing female and/or bisexual flowers are self fertile and remain submersed. Petals white, pink, blue or purple, often tinged with yellow at the base23. Flowering period autumn to spring [24].(Fig no : 3).

Fruit

Fruit is oblong, 2.5 to 4 centimeters long [10], ovoid to cylindrical [24] and Fleshy encapsulated fruits contain as many as 2000 seeds. Fruit with numerous seeds [23]. (Fig no: 4).

Seeds

Seeds densely covered with whitish, unicellular hairs[24]. Seeds fusiform 1–2 mm long, 0.3–0.7 mm in diameter, with 2 faint slightly curved longitudinal ridges. Testa light brown, dull to semi glossy, faintly wrinkled, with a tuft of unicellular white hairs. Hilum inconspicuous. Embryo linear-spatulate endosperm absent. [25] (Fig no : 5).

Stems & Roots

Stem small and corm-like, occasionally forked, with fibrous roots [23] .The roots in the sediment in water to 2 feet deep and has short [26]. (Fig no: 6).

GROWTH AND REPROTECTIVE CHARACTRISATION

Ottelia alismoides grew best in nutrient-rich water with mud substratum. The optimal water depth for the growth of the species was approximately 50 cm compared with 20 and 90 cm. However, the reproductive allocation and seed set rate did not change much in different nutrient and water depth conditions. The seeds were produced by cleistogamous flowers in a depth of 90 cm[27].

CHEMICAL CONSITITUENTS

Chemical constituents including Glycosides, Alkaloids, Flavonoids, Flavones, Terpenoids, Tannins and Phenolic compounds [28-30] were present in the *Ottelia alismoides*.

Major constituents

Studies revealed that isolated two diastereomeric 4-methylene-2-cyclohexenones, Otteliones A and B, ten new diarylheptanoids (2,3,4,5a-d,6,7and8) together with a hydroxylated analog of otteliones A and B and 3a-hydroxyottelione[31, 32].

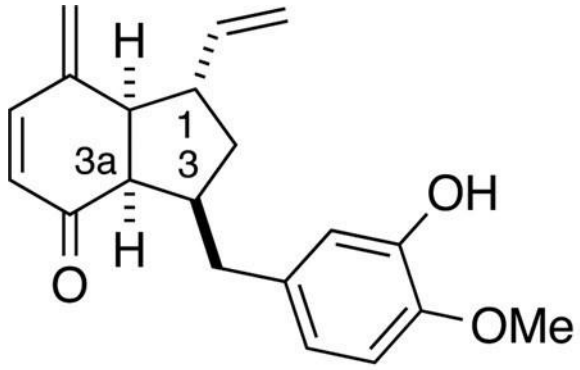


Figure. 7: Ottelione A

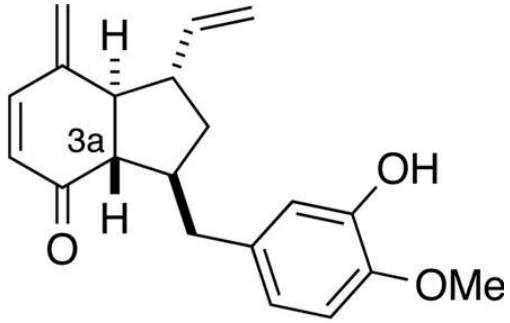


Figure. 8: Ottelione B

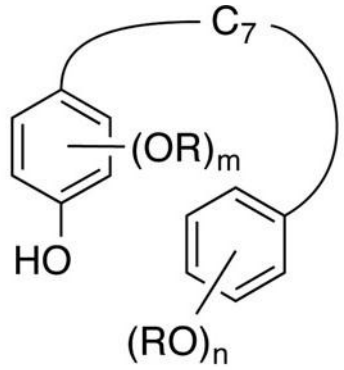


Figure.9 : Diaryl heptanoids

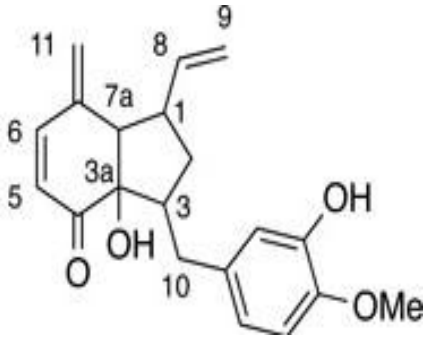


Figure.10 :3a hydro xyottelione

EVALUATION AND ANALYSIS

Physicochemical Tests

Following physicochemical parameters were determined in coarsely powdered whole plant of *Ottelia alismoides*as per the standard procedures [33-35].

Ash value

Total ash, acid insoluble ash and water soluble ash were determined in the powdered whole plant of *Ottelia alismoides* according to the standard procedure. These values are used to determining the quality and purity of crude drug in powdered form.

Total ash

About 2gm (accurately weighed) each of the air dried powdered whole plant of *Ottelia alismoides* were taken in previously ignited and tarred silica crucibles. The material was spreaded uniformly and incinerated in an incinerator at a temperature not more than 450ºC until free from carbon. The crucibles were cooled in desiccators and weighed. The procedure was repeated till constant weight was obtained. The percentage of the total ash was calculated using the expression given below:

Total ash (% w/w) = (Weight of ash/ Weight of sample) × 100.

Acid insoluble ash

The total ash was boiled with 25 ml of dil. hydrochloric acid for five minutes, filtered through ashless filter paper and insoluble ash was washed with hot distilled water until the filtrate was neutral. The insoluble ash along with ashless filter paper was taken in tarred silica crucible, incinerated at 450ºC, cooled and weighed. The percentage of acid insoluble ash so obtained was calculated as follow:

Acid insoluble ash (% w/w) = (Weight of acid insoluble ash/ Weight of sample) × 100

Water-soluble ash

The total ash was boiled with 25 ml of distilled water for 5 minutes, filtered through an ashless filter paper. The insoluble ash along with ash less filter paper was transferred into tarred silica crucible and incinerated at 450ºC and cooled in desiccator and weighed. The weight of water soluble ash was obtained by subtracting the weight of the ash so obtained and weight of the total ash. The percentage of water soluble ash was calculated using the expression given below:

Water soluble ash (% w/w) = (Weight of water soluble ash/ Weight of sample) × 100

Sulphated ash

Heat a silica or platinum crucible to redness for 10 minutes, allow to cool in a desiccator and weigh. Unless otherwise specified in the individual monograph, transfer to the crucible 1g of the substance under examination and weight the crucible and the contents accurately. Ignite , gently at first, until the substance is thoroughly charred. Cool, moisten the residue with 1ml of sulphuric acid, heat gently until the white fumes are no longer evolved and ignite at 800º ± 25º until all black particles have disappeared. Conduct the ignition in a place protected from air currents. Allow the crucible to cool, add a few drops of sulphuric acid and heat. Ignite as before, allow to cool and weigh. Repeat the operation until two successive weighings do not differ by more than 0.5mg[36].

Weight of sulphated ash (%w/w) = (Weight of sulphated ash/ weight of sample) x 100

Determining of extractive value

Extracting values are useful for determining of crude drugs & it gives an idea about the nature of the chemical Constituents present [37].

Determination of alcohol soluble extractive value

About 5g of air-dried coarse powdered drug was weighed and macerated with 100ml of 90%alcohol in a closed flask for 24 hrs, shaking frequently during the first 6 hrs& these were allowed standing for 18 hrs. Thereafter it was filtered rapidly taking precautions against loss of the solvent. 25 ml of the filtrate was evaporated to dryness in a tarred flat bottomed swallowed dish, dried at 105°C & weighed. The percentage of the alcohol soluble extractive value was calculated with reference to the air-dried drug.

Extractive Value (% w/w) = [(Weight of residue ×100) / (25×weight of sample)] × 100

Determining of Water soluble extractive value

About 5gm of air-dried distilled powdered drug was taken & macerated with 100 ml of distilled water in a closed flask for 24 hrs shaking frequently during the first 6 hrs. And then allowed to stand for 18 hrs. Thereafter, it was filtered rapidly taking precautions against loss of the solvent. 25 ml of the filtrate was evaporated to dryness in a tarred flat bottomed shallow dish, dried at 105 &weighed. The percentage of the water soluble extractive value was calculated with reference to the air-dried distilled drug.

Extractive Value (% w/w) = [(Weight of residue ×100) / (25×weight of sample)] × 100

MOISTURE CONTENT

1gm air-dried coarse powder of whole plant of *Ottelia alismoides*were accurately weighed in previously tarred crucible and dried at 105°C in hot air oven to constant weight and cooled in desiccator. Percentage of Moisture content was calculated using the expression given below [33-35].

$$\text{Mositure content (\%w/w)} = \frac{\text{Difference in weight before and after drying}}{\text{Weight of the sample before drying}} \times 100$$

EVALUATION OF PHYSICOCHEMICAL PARAMETES OF *OTTELIA ALISMOIDES*

Table: 1 Estimation of physicochemical parameter of *Ottelia alismoides*

Determination of ash value

Different ash value of plant material

S.NO	Total ash(%w/w)	Acid insoluble ash(%w/w)	Water soluble ash(%w/w)	Sulphated ash(%w/w)
1.	26%	21.3%	13.3%	7%

Determination of Extractive value

Different extractive of plant material

S.NO	Alcohol soluble Extractive value(%w/w)	Water soluble Extractive value(%w/w)
1.	10.4%	12.2%

Moisture content Estimation

Moisture content of plant material

S.NO	Moisture content(%w/w)
1.	15%

ETHANOBOTANICAL USES

The plants are used to improve the water quality in fish ponds by capturing floting mud particles. The petioles and leaves are eaten as a vegetable with excellent flavour; the leaves are used in Thailand for seasoning rice. The fruit is also edible. The plant is used in the treatment of haemorrhoids and applied as the poultice against fever. It is also grown as an aquarium plant [38].

Table:2 Summarises the traditional use of different parts of the plant for various ailments.

Plants part	Uses/ailments	Reference No
Leaves	1. Applied on poultice arm & leg in fever, Topical for haemorrhoids.	39
	2. Decoction of ground leaves mixed with shoots of ipomoea aquatic, alium sativum, lasiaspinosa, ocimum sanctum and Typhaangustata for the treatment of pneumonia.	40
	3. It is used as a rubefacient.	39
	4. It is used as the treatment of stomach disorder.	41
	5. It is used as spice for the rice and vegetables.	42
	6. Leaves used to check bleeding.	40

Flowers	1. Flower paste 10-12 gram is taken orally early in morning to curing piles.	43
	2. Local people eat lower part of the flower as raw or as vegetable.	44
Fruit	1. Arresting cough and inducing diuresis.	45
	2. Fruit eaten as raw.	46
Whole plant	1. It is a promising drug raw material having anti-tuberculosis activity.	39
	2. Plant prepared as paste and applied to abscesses of the breasts cancer, ulcers and burns.	39
	3. It is also used for treatment of Asthma and applied externally for skin diseases.	45
	4. Clearing away from heat.	45
	5. Eliminating phlegm	45
	6. It is used for the treatment of diabetes.	8

PHARMACOLOGICAL ACTIVITIES

Anti-Tubercular

A clinical trials, extract of *Ottelia alismoides* cured two cases of bilateral tuberculosis of cervical lymph glands within 3 months. Results suggest *Ottelia alismoides* to be a promising medicinal herb with anti-tubercular effect [47].

Ottelione A Analogues / cytotoxicity

Isolated Ottelione A the natural products showed remarkable *in vitro* cytotoxicity against various cancer cell lines [31].

Ottelione A Analogues / Anticancer

Ottelione A, isolated from the fresh water plant *Ottelia alismoides*, is among the most potent natural product that possess in vitro antiproliferative activity, with an IC50 in the pM-nM range against 60 human cancer cell lines. Study established the relationship of antimitotic ottelione against tubulin and various cancer cell lines [48].

CONCLUSION

In conclusion, this review confirms the potency of *Ottelia alismoides* is used as an important ingredient in various ailments just on the basis of its traditional medicinal uses. The plant shows the presence of many chemical constituents which are responsible for varied pharmacological and medicinal property. The physicochemical parameters provided as a valuable source of information related to the quality of the plant material for future application or study.

REFERENCES

[1]. Anonymous. *Making aquatic weeds useful: Some perspective for developing countries.* Washington: National Academy of Sciences; 1976.
[2]. Gaudet JJ. *The normal role of vegetation in water. Aquatic vegetation and its use and control.* UNESCO, Paris: 1974.
[3]. Sculthorpe CD. *Biology of Aquatic Vascular Plants*. Arnold, London: 1967.
[4]. Aquatic plant From Wikipedia.
[5]. Hutchinson GE. *A Treatise on Limnology*. New York: John Wiley; 1975.
[6]. Cook CDK. *Water Plants of the World*. The Hague: Dr W Junk Publishers; 1974.
[7]. WWW.discoverlife.org/mp/20q?search=ottelia+alismoides (Accessed on 2017)
[8]. Pullaiah T, Chandrasekhar naidu K. *Antidiabetic plants in india and herbal based antidiabetic research.*Botany Medical: Daya Books; 2003.
[9]. http://www.theplantlist.org/tpl/record/kew-308360 (Accessed 2017)
[10]. http://www.stuartxchange.org/Kalabua.html (Accessed 2017)
[11]. Yatskievych and Raveill.*Addtions and non-native angiosperms in Missouri,* SIDA. 19(3), 1984, 706-708.

[12]. http://www.texasinvasives.org/plant_database/detail.php?symbol=OTAL(Accessed on 2017).
[13]. http://www.iucnredlist.org.
[14]. Zhuang X. Otteliaalismoides. IUCN Red List of Threatened Species. 2010.
[15]. Li H. The flourishing and declinning of Otteliaacuminata in the Lake Dian Chi. *Jouranl of Yunnan University*.5(6), 1985, 13-1472.
[16]. Yu D, Chomg Y, Tu M, Wamg X, Zhou X. Study on the threatened aquatic higher plant species of China. *Chinese Biodiversity*.6(1), 1998, 13-21.
[17]. http://www.aquagreen.com.au/plant_data/Ottelia_alismoides.html (Accessed 2017).
[18]. Kaul RB. Morphology of germination and establishment of aquatic seedlings in Alismataceae and Hydrocharitaceae. *Aquatic Botany.* 5(3), 1978, 139-147.
[19]. http://www.hear.org/pier/species/ottelia_alismoides.html(Accessed 2010)
[20]. Medley T. Noxious weeds; deletions and additions to list.1995.
[21]. Benson AJ, Fuller PL, JaconoCC. *Summary report of nonindigenous aquatic species in U.S. Fish and Wildlife Service Region 4.*US Geological Survey. Gainesville FL: Florida Caribbean Science Center; 2001.
[22]. VarshneyJ, Rzoska. *Aquatic weeds in South East Asia*.1976.
[23]. Cook CDK, Symoens J, Urmi-König K. A revision of the genus Ottelia(Hydrocharitaceae) I. Generic considerations. *Aquatic Botany*.18(3), 1984, 263-274.
[24]. Stephens M, Ralph M, Dowling. *Wetland plants of Queensland*.
[25]. http://idtools.org(Acessed 2015).
[26]. Patrick J,Oconnor-marel ,Karthykeatley.*Statewide Integrated pest management project.* Garvey:Agriculture and Natural resource publications;2001.
[27]. Meiyi Jiang. YasuroKadono. Growth and reproductive characteristics of an aquatic macrophyteOtteliaalismoides (L.) Pers. (Hydrocharitaceae). *SpringerLink.*16(4), 2001, 687–695.
[28]. Solomon Charles Ugochukwu, ArukweUche, OnuohaIfeanyi. Preliminary phytochemical screening of different solvent extracts of stem bark and roots of *Dennetiiatripetala*G.Baker. *Asian J.plantSci.Res.*3(3), 2013, 10-13.
[29]. PrashantTiwari, Bimlesh Kumar, MandeepKaur, GurpreetKaur, HarleenKaur. Phytochemical Screening and Extraction:A Review. *International PharmaceuticaSciencia*.1(1), 2011, 98-106.
[30]. 30.SahiraBanu K, Cathrine L. General technique involved in Phytochemical Analysis. International journal of Advanced Research In Chemical Science.2(4), 2015, 25-32.
[31]. Seif-Eldin ,Ayyad N, Andrew S Judd. *Otteliones* A and B: potently Cytotoxic 4-Methylene-2-cyclohexenones from*Otteliaalismoides. Org.chem*.63(23), 1998, 8102-8106.
[32]. Thomas R, Hoye, Seif-Eldin, Ayyad N, Hollie J, Beckord et al,. New Diarylheptanoids and a Hydroxylated*Ottelionealismoides*. *Nat prod commun*.8(3), 2013, 351-358.
[33]. Mukherjee PK. *Quality Control Of Herbal Drugs, An Approach to Evaluation of Botanicals*. New Delhi: Buisness Horizons Pharmaceutical Publishers; 2002.
[34]. Khandelwal KR. *Practical Pharmacognosy: Techniques and Experiments.* Pune: NiraliPrakashan; 2008.
[35]. WHO. *Quality Control Methods for Medicinal Plant Materials, WHO*. Geneva: APTBS Publisher; 1998.
[36]. http://www.pharmaguideline.com/2011/06/test-for-sulphated-ash-and-total-ash.html (Acessed on 2011)
[37]. Goswami S, Singhai R. Evaluation of physicochemical parameters of *moringaoleifera* leaves *Flora and Fauna.*21(2), 2015, 69-172.
[38]. http://uses.plantnet_project.org/en/ottelia_alismoides_(PROSEA) (Accessed on 2017) .
[39]. Swapna M. Prakashkumar R, Anoop KP, Manju CN, Rajith NP.A review on the medicinal and edible aspects of aquatic and wetland plants of india.*Journal of Medicinal Plants.*5(33), 2011, 7163-7176.
[40]. BinuDaimari. Shafiqul Islam BhuyanBhabanandaBaruahl.Traditional Medicinal Uses of Monocot Plants by Bodo Community in Udalkuri District (BTAD) Assam North east India. *Ejbps*.3(9), 2016, 554-560.
[41]. Taranisen Panda, Nirlipta Mishra, Bikram Kumar Pradhan, RajballavMohanty. Some less known folk medicine in Bhadrak and Kendrapara districts of Odisha, India. *Micromedicine.*4(1), 2016, 8-20.
[42]. Cook, Erhardt, Hanelt, Seidemann, Taufel, Wiersemal Leon. *Word spice plants: Economic usage,botany, taxonomy*.1993.

[43]. Das NJ, SaikiaSP,Sarkar S, Devi K. Medicinal plants of North-Kamrup district of Assam used in primary healthcare system. *Indian Journal of Traditional Knowledge.* 5(4), 2006, 1-5.
[44]. Malaya K ,Misra, Anima Panda, DeenabandhuSahu. Survey of useful wetland plants of South Odisha, India.*Indian Journal of Traditional Knowledge.*11(4), 2012, 658-666.
[45]. Chen anmin, Gaoyuan, Gaozhemin, Mayingfu. *Encyclopedia reference of traditional Chinese medicine*. Newyork: springer; 2003.
[46]. NamitaDeka, Nilakshee Devi. Wild edible aquatic and marshland angiosperms of Baksa district, BTC area, Assam, India. *Asian Journal of Plant Science and Research*. 5(1), 2015, 32-48.
[47]. Li H, Qu X, Zhao D et al / ZhongguoZhong Yao ZaZhi, Preliminary study on the anti-tubercular effect of Otteliaalismoides (L.) Pers. 20(2), 1995, 115-116, 128.
[48]. Tsai-Yuan Chang, Yun-PengTu, WinYin Wei, Hsiang Yu Chen,Chih-Shang Chen, Ying-Shuan E. Synthesis and Antiproliferative Activities of Ottelione A Analogues.*Med ChemLett*. 3(12), 2012, 1075–1080.