

Investigation of morphological characterization, qualitative analysis and antimicrobial activities of *Jussiaea repens* L.

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Abstract

The selected plant is locally known as (Ye-ka-nyut) and it is one of the wild species of medicinal plant scientifically called as *Jussiaea repens* L. It belongs to the family Onagraceae. It was collected from South Okkalapa Township, Yangon Region and then the verification of plant was done according to the literatures. In this research, qualitative analysis and antimicrobial activities of *Jussiaea repens* L. were carried out. In morphological study, the plant *Jussiaea repens* L. is perennial herb, partly creeping in the mud and partly floating on the surface of tanks and pneumatophores are present. Leaves are alternate and simple. Flowers are bisexual, actinomorphic, pentamerous and epigynous. The qualitative examination showed the presence of alkaloids, α -amino acid, flavonoids, glycosides, phenolic compounds, proteins, reducing sugar, saponins, steroids, tannins and terpenoids. Physicochemical characterization such as moisture content, total ash, acid insoluble ash, water soluble ash, polar to non-soluble matter content were carried out. According to this examination, the powdered samples were more soluble in polar solvents. In the study of antimicrobial activity, the different solvent extracts (acetone, chloroform, ethyl acetate, ethanol, methanol, petroleum ether, and watery) of powdered samples were also investigated as six microorganisms such as *Aspergillus flavus*, *Bacillus subtilis*, *Candida albicans*, *Echerichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. According to the result, methanolic extract showed the most significant antimicrobial activity against tested organisms.

Keywords: *Jussiaea repens* L. morphological characters, qualitative analysis, antimicrobial activity.

Introduction

Jussiaea repens L. of Onagraceae family which is a creeping water primrose, grows in fresh water, ponds, canals of road side and wetlands (Pradhan *et al.*, 2014). The plant occurs in temperate and subtropical regions especially in the New World (Cronquist, 1981).

In Myanmar, the plant is commonly known as Ye-ka-nyut, floating primrose Willow in English (Benson, 1957). The phytochemical analysis of *Jussiaea repens* L. revealed that the plant contained quercetin, quercitrin, methyl gallate, gallic acid and myricitrin (Al-Snafi, 2018). In Myanmar, the plant is used in traditional medicine in the treatment of diuretic, astringent, expectorant and good for bile and blood (San Hla, 1960). Pharmacologists reported the clinical uses of this plant as hepatoprotective, antiinflammatory, antidiabetic and having antibacterial activity. The whole plant was used as antiseptic and as a poultice in ulcers. The plant was also used as emetic, laxative, anthelmintic and antidysenteric. It was also used as diuretic, Jaundice, gonorrhoea and for the treatment of fever (Al-Snafi, 2018). The herb is used as a paste or in poultice for ulcers and skin (Wealth of India, 1948). The plant extract was found to be non-toxic (Pradhan *et al.*, 2013). The aim and objectives of this research are to determine the phytochemical and physicochemical properties; to examine the antimicrobial activity from the plant *Jussiaea repens* L.

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Materials and Methods

Collection and identification of *Jussiaea repens* L.

The plant *Jussiaea repens* L. was collected from South Okkalapa Township Yangon Region from October to December (2017). The collected plants were identified with the help of available literature of Hooker (1885), Kirtikar and Basu (1935) and Backer (1965).

Preliminary Phytochemical Investigation

Preliminary phytochemical investigation of the whole plants of *Jussiaea repens* L. has been carried out for the presence or absence of alkaloids, α -amino acid, carbohydrate, flavonoid, glycoside, phenolic compounds, protein, reducing sugars, saponin, starch, steroids, tannins and terpenoid compounds by using the British Pharmacopoeia (1968), Marini Bettolo *et al.*, (1981), Central Council for Research in Unani Medicine (1987) and Trease and Evans (2002).

Physicochemical Investigation

The physicochemical characters such as moisture contents, total ash contents, water soluble ash, acid insoluble ash, pet-ether, chloroform, ethyl acetate, acetone, ethanol, methanol, and watery soluble matter contents were carried out according to the method of British pharmacopoeia (1968) and WHO (1998).

Antimicrobial activities of different solvent extracts from *Jussiaea repens* L. plant

Antimicrobial activities of different solvent extracts (acetone, chloroform, ethyl acetate, ethanol, methanol, petroleum ether, and watery) of *Jussiaea repens* L. were tested on six pathogenic microorganisms such as *Aspergillus flavus*, *Bacillus subtilis*, *Candida albicans*, *Echerichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* at Botany Department, University of Yangon.

Results

Morphological Characters of *Jussiaea repens* L.

The plant is a perennial herb, with white, erect, herb partly creeping in the mud and partly floating on the surface of tanks. The stem is floating or creeping herbaceous, cylindrical, glabrous, greenish-brown. The short spindle-shaped pneumatophores are in cluster at nodes of floating stems. Leaves alternate, simple, both surface glabrous; petiole glabrous, stipulate. Flowers axillary and solitary, yellowish white, ebracteate, pedicelate, bracteolate, complete, bisexual, actinomorphic, pentamerous, epigynous. Sepals 5, free, lanceolate, valvate, inner surface glabrous outer surface glabrate, persistent. Petals 5, free, obovate, imbricate, both surfaces glabrous, creamy-white with yellow base, caducous. Stamen 5 + 5, free, 2 - whorled filament unequal, inserted, anther dithecal, dorsifixed, introrse, longitudinal dehiscence. Carpel 5, fused, pentacarpellary, axile placentation, one to many ovules in each locule, style stout, stigma capitate, ovary inferior. Fruit capsule, oblong, pubescent. Seeds many, quadrate, minute, glabrous. Results were shown in (Fig. 1).



Habit



Leaves



Inflorescence

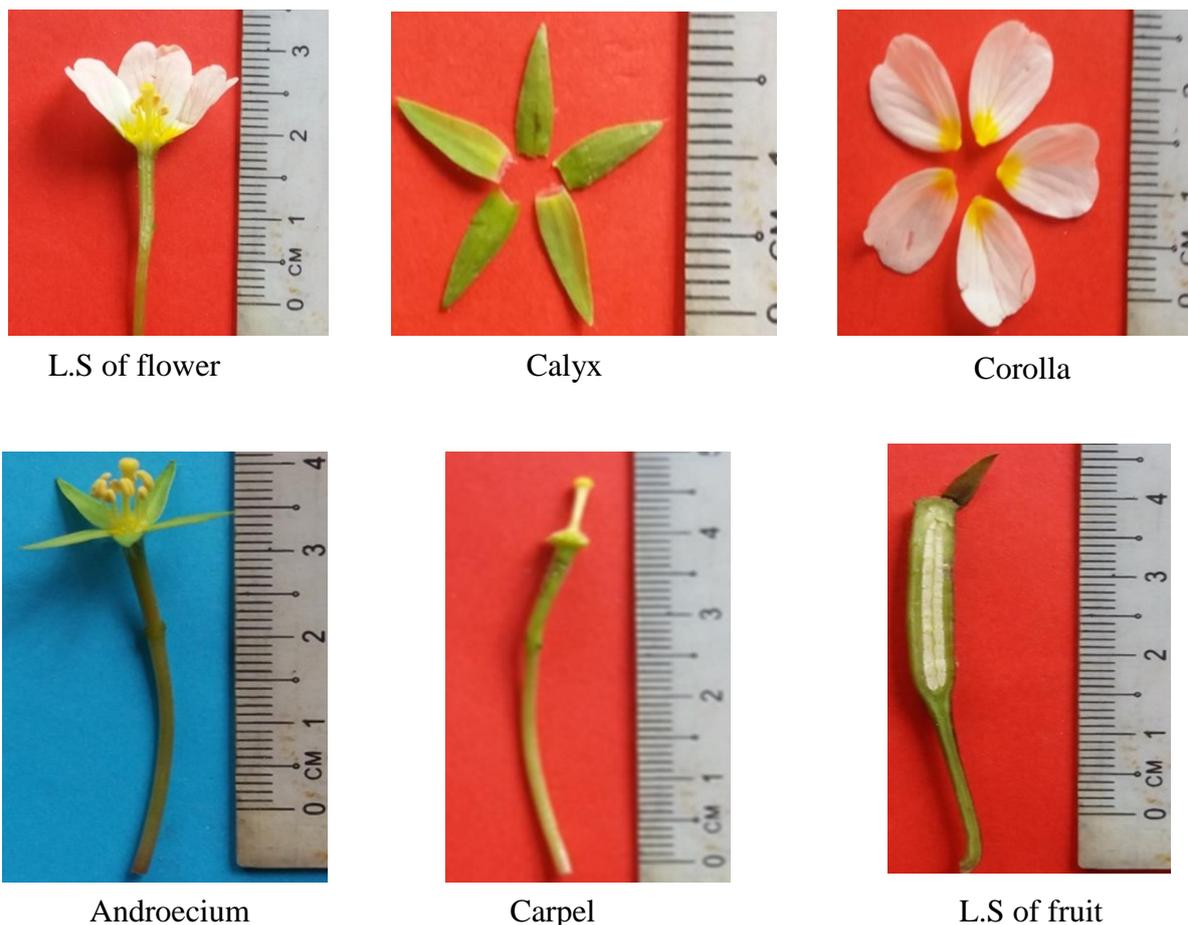


Fig. (1) Morphological characters of *Jussiaea repens* L.

Preliminary Phytochemical Examination of *Jussiaea repens* L.

The preliminary phytochemical examination of the plant *Jussiaea repens* L. indicated the presence of alkaloids, α -amino acid, flavonoids, glycosides, phenolic compounds, proteins, reducing sugar, saponins, steroids, tannins and terpenoids. The results of preliminary phytochemical tests were shown in Table (1)

Physicochemical charactes of *Jussiaea repens* L.

Physicochemical characters of moisture content are usually determined by drying to constant weight and taking the loss in weight as moisture. Total ash, acid insoluble ash, and water soluble ash content were also examined and recorded. All these values were useful for the quality control system regarding to the foreign usage matters for medicinal purpose. The solubility tests were carried out to find the amount of total solids soluble matter in solvents. From this result, the most solubility (20.75) % was in water and the least solubility (2.50) % was in petroleum ether. These characters were shown that most solubility in polar and least solubility in non-polar solvents. These results were shown in Table (2).

Antimicrobial activities of different solvent extracts of *Jussiaea repens* L.

In antimicrobial activities, the different solvent extracts (acetone, chloroform, ethyl acetate, ethanol, methanol, petroleum ether, and watery) of *Jussiaea repens* L. were investigated with six types of microorganisms such as *Aspergillus flavus*, *Bacillus subtilis*, *Candida albicans*,

Echerichia coli, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. The results were shown in Table (3) and Figures (2).

Table (1). Preliminary Phytochemical Examination of *Jussiaea repens* L.

No	Test	Extracts	Test Reagents	Observation	Results
1	Alkaloids	3% Acetic acid	Mayer's reagent	White ppt	+
			Wagner's reagent	Reddish brown ppt.	+
			Hager's reagent	Yellow ppt.	+
2	α -amino acid	H ₂ O	Ninhydrin reagent	Purple spot	+
3	Flavonoid	EtOH	HCl / Mg	Pink color	+
4	Glycosides	H ₂ O	10% lead acetate	Brown ppt.	+
5	Phenol	EtOH	1% FeCl ₃	Deep blue ppt.	+
6	Protein	H ₂ O	Millon's reagent	red on heating	+
7	reducing sugar	H ₂ O	Benedict's solution	Reddish brown ppt.	+
8	Saponins	EtOH	Distilled water	Frothing	+
9	Steroid	EtOH	Chloroform + Conc: H ₂ SO ₄	Bluish green colour	+
10	Tannins	H ₂ O	FeCl ₃	Brownish green ppt	+
11	Terpenoid	EtOH	Chloroform + Conc: H ₂ SO ₄	Red colour	+

+ = Present, ppt = Precipitate

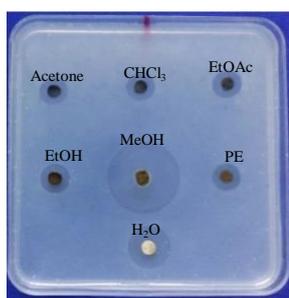
Table (2). Physicochemical characters of *Jussiaea repens* L.

No	Physicochemical characters	Quantity determination %
1	Moisture content	8.00
2	Total ash	16.50
3	Acid insoluble ash	18.00
4	Water soluble ash	30.00
5	Water soluble matter content	20.75
6	Methanol soluble matter content	7.25
7	Ethanol-soluble matter content	7.75
8	Acetone soluble matter content	6.00
9	Ethyl acetate soluble matter content	5.10
10	Chloroform soluble matter content	3.70
11	Pet-ether soluble matter content	2.50

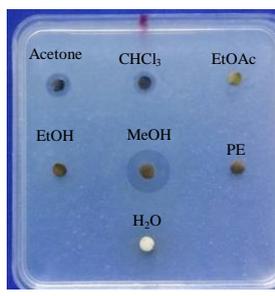
Table (3). Antimicrobial activities of different solvent extracts of *Jussiaea repens* L.

No.	Solvents	<i>A. flavus</i>	<i>B. subtilis</i>	<i>C. albicans</i>	<i>E.coli</i>	<i>P. aeruginosa</i>	<i>S. aureus</i>
1.	Acetone	14 mm	12 mm	12 mm	12 mm	12 mm	-
2.	Chloroform	14 mm	10 mm	14 mm	14 mm	14 mm	12 mm
3.	Ethyl acetate	14 mm	-	12 mm	14 mm	14 mm	-
4.	Ethanol	14 mm	-	12 mm	14 mm	16 mm	-
5.	Methanol	30 mm	18 mm	28 mm	24 mm	28 mm	20 mm
6.	Per-ether	14 mm	-	12 mm	14 mm	12 mm	-
7.	Aqueous	18 mm	-	14 mm	14 mm	16 mm	12 mm

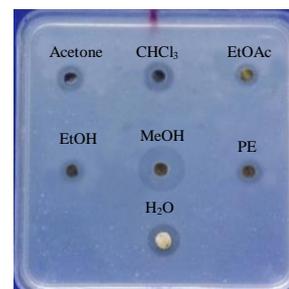
Paper disc size = 6 mm



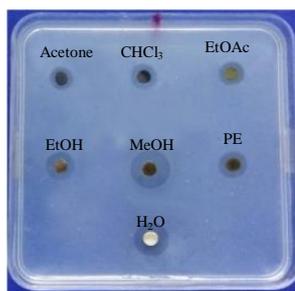
Aspergillus flavus



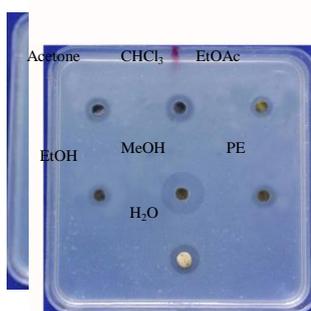
Bacillus subtilis



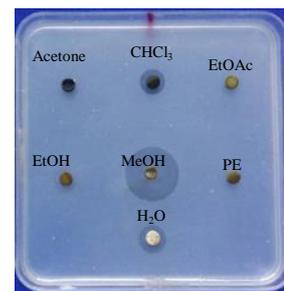
Candida albicans



Escherichia coli



Pseudomonas aeruginosa

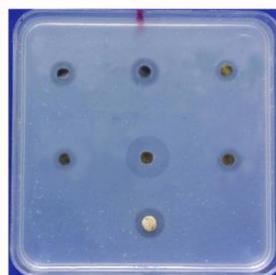


Staphylococcus aureus.

Fig. (2) Antimicrobial activity

tracts of *Jussiaea repens* L.

In this research, morpho physicochemical characterization and *A* Ye-ka-nyut is a floating aquatic herb and nodes of floating stems are present. The Datta (1931) Rendle (1967) and Pradha These characters were agreed with the (1995). The leaves shaped are oblance mentioned by Cooke (1958) and Gambl



Candida

phytochemical investigation, ere carried out. Myanmar name d pneumatophores in clusters at ed with those of Hooker (1885), ; are alternate, simple, stipulate. burgh (1971) and Dassanayake was in agreement with those s are axillary and solitary. These

characters were agreed with those of Roxburgh (1971). Flowers are yellowish white, ebracteate, bracteolate, pedicellate, complete, bisexual, actinomorphic, pentamerous, epigynous. These characters were in agreement as described by Cooke (1958), Backer (1965) and Dassanayake (1995). Sepals are free and persistent. These characters were agreed with those of Nu Nu Ngwe (1980). Petals white, free and caducous. These characters were agreed with those of Hutchinson (1926), Gamble (1958) and Dassanayake (1995). Stamens 5+5 and filament unequal. These characters were agreed with those of Gamble (1958), Nu Nu Ngwe (1980) and Dassanayake (1995). Anther dorsifixed. This character was agreed with those of Nu Nu Ngwe (1980).

Ovary pentacarpellary and axile placentation. These characters were agreed with those of Hutchinson (1926). Stigma capitate. This character was in agreement with those reported by Aye Aye Nyunt (1980). Fruits are capsule. This character was agreed with those of Hooker (1885), Hutchinson (1926) and Henderson (1949). Seeds are many, quadrate, minute, glabrous and smooth. These characters were agreed with those of Hooker (1885) and Hutchinson (1926). These mentioned characters can be used for identification of plant.

The plant *Jussiaea repens* L. contains alkaloids, α -amino acid, flavonoids, glycosides, phenolic compounds, proteins, reducing sugar, saponins, steroids, tannins and terpenoids. In the physicochemical characterization, powdered samples of the plant *Jussiaea repens* L. were more soluble in polar solvents.

In this experiment, the antimicrobial activities of *Jussiaea repens* L. were tested with six different microorganisms (*Aspergillus flavus*, *Bacillus subtilis*, *Candida albicans*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*) by using different solvent extracts such as acetone, chloroform, ethyl acetate, ethanol, methanol, petroleum ether, and aqueous extracts.

Al-Snafi (2018) stated that the methanolic extract of *Jussiaea repens* L. showed antibacterial activity against *Escherichia coli*.

In this study, chloroform and methanolic extract showed antimicrobial activity against tested organisms. Among them, methanolic extract showed the most significant antimicrobial activity against tested organisms. Ethyl acetate, ethanol, petroleum ether and aqueous extracts did not show antimicrobial activity against *Bacillus subtilis*. Acetone, ethyl acetate, ethanol and petroleum ether extracts did not show antimicrobial activity against *Staphylococcus aureus*. So, *Jussiaea repens* L. is effective on human health and may be safely used.

Conclusion

The perennial herb scientifically known as *Jussiaea repens* L. which belongs to family Onagraceae and it is commonly known as Ye-ka-nyut. It contains alkaloids, α -amino acid, flavonoids, glycosides, phenolic compounds, proteins, reducing sugar, saponins, steroids, tannins and terpenoids. In the physicochemical characterization, powdered samples of the plant *Jussiaea repens* L. were more soluble in polar solvents. According to this experiment, different solvent extracts of *Jussiaea repens* L. indicated antimicrobial activity against *Aspergillus flavus*, *Candida albicans*, *Escherichia coli* and *Pseudomonas aeruginosa*. Among them, methanolic extract showed the most significant antimicrobial activity against tested organisms. Therefore, it is effective in protecting against bronchitis caused by *Aspergillus flavus*, alimentary tract infection, cardiac infection, sores and inflammation by *Candida albicans*, diarrhoea, dysentery by *Escherichia coli*, urinary-tract infections, respiratory system infection caused by *Pseudomonas aeruginosa*. Therefore, *Jussiaea repens* L. is effective on protection of diseases which caused by microorganisms.

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