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Pharmacological and Phytochemical Extract of Mimosa Pudicalinn (Leikang Ekaithabi) in Manipur

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ABSTRACT
Mimosa pudica Linn. Is a commonly used herb in Ayurvedic medicine, phytochemical and pharmacological activities, traditional uses and scientific approach. The plant extract have been widely used for the treatment of a large number of human ailments. The chemical entities of this plant have been used as an antidiabetic, antibacterial, anti-inflammatory, antifungal, antinociceptive, anti androgenic, anticonvulsant, antioxidant, and anti-tumor, anti ulcer agents. Scientifically proved activities are related with traditional concept. Scientific evidence exists with respect to their major and minor constituents. M. Pudica is the most important controversial and effective natural origin that has a tremendous future for research overcome through modern scientific concept.
Keywords: Phytochemical, Pharmacology, Mimosa Pudica Linn.

I. INTRODUCTION

Mimosa pudica Linn, of the family Fabaceae is a small or middle sized tree, about 1.5 m (5 ft) in height cultivated throughout India. It has been identified as lajjalu in Ayurveda and has been found to have antiasthmatic, aphrodisiac, analgesic, and antidepressant, anti ulcer properties. M. Pudica is known to possess sedative, emetic, and tonic properties, and has been used traditionally in the treatment of various ailments including alopecia, diarrhea, dysentery, insomnia, tumor, and various urogenital infections. Phytochemical studies on M. Pudica have revealed the presence of alkaloids, non-protein amino acid (mimosine), flavonoids C-glycosides, sterols, terpenoids, tannins, and fatty acids [1]. Adrenalin like substance has been identified in the extract of its leaves. Ascorbic acid, crocetin, D-glucuronic acid, linoleic acid, linolenic acid, palmitic and stearic acids, mimosine, D-xylose and b-sitosterols were found in phytochemical analysis of M. Pudica root [2]. Seeds were reported to yield sitosterol [3]. According to the Unani system of medicine, root is resolvent, alternative, useful in diseases arising from blood impurities and bile, bilious fevers, piles, jaundice, leprosy etc. Aqueous extracts of the roots of the plant have shown significant neutralizing effects on the lethality of the venom of the monocled cobra (NajaKaouthia). It appears to inhibit the myotoxicity and enzyme activity of cobra venom. The purpose of this article is to review phytochemical and pharmacological properties of this medicinal plant.

Pharmacological Activity

Antinociceptive Activity

M. pudica is a plant used in traditional medicine for various disorders. The aim of this work was to evaluate the acute toxicity and antinociceptive activity of the aqueous extract of M. Pudica in animal models. In the acute toxicity study, a single dose of aqueous extract of 2000 mg kg-1 body weight p.o. was administered. For 48 h, animals showed no clinical signs and mortality. In the acetic acid-induced writhing model, the extract at a dose of 200 & 400 mg kg-1 body weight showed significant ($p<0.001$) inhibition of writhing response of 46.24 and 56.0 % respectively. In the hot plate test, the extract produced a significant ($p<0.001$) increase in the latency in a dose-related manner. This study established the analgesic properties of M. Pudice (6)

Wound healing activity

The chloroform leaf extract of M. Pudica in albino rats using excision and incision wound models. 200 mg/kg/day of leaf extract of M. Pudica was evaluated for its wound healing activity and compared with Neosporin (Standard). The present investigation may be concluded that the plant M. Pudica is endowed with significantly as followed the 0, 4^{th}, 8^{th}, 12^{th}, 16^{th}, days ie. 232.21 +5.8 (0%), 197.8 ± 4.5 (14.85%), 80.7 + 4.8(65.5%), 15.03 ± 2.9 (91.9%), 2.904(98.8%) wound healing activity due to the presence active constituents, there by justifying its use in the indigenous system of medicine [5].

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Anti-convulsant activity

The decoction of M. Pudica antagonized chemically induced seizures in mice. It significantly protected the mice in PTZ-induced seizures. The result of this study confirms the presence of sedetine and anticonvulsant properties in the decoction of M. Pudica [8].

Diuretic activity

The diuretic activity of M. Pudica was first observed in methanol fraction of crude extract of the plant. Fractionation of the methanolic extract using column chromatography eluted a diuretically active subfraction. This was found to be nontoxic and increasingly diuretic at increasing dose levels. The median effective (ED50) dose of the isolate was estimated to be approximately 1023.29mg/kg body weight. Then the diuretic activity of subfraction is compared with the following extracts (crude ethanol and water), normal saline solution (negative control) and furosemide (positive control) [7].

Antitumor activities

To study the antitumor activities of six glycosylflavones from M. Pudica. CCK-8 assay was used to observe the inhibitory rate of the six kinds of glycosylflavones on the proliferation of MCF-7, JAR and N-2 A. The results Indicated that at concentrations of 9.375-300.0 μmol L', the inhibitory rate of the six kinds of glycosylflavones on the proliferation of the three tumor cells were well. The effect of N-2A was the best; the inhibitory rate of the cell proliferation was more than 90% at low concentration. The antitumor activities of six glycosylflavones of M. Pudica is obvious, the resource has value of exploitation and application.

Anti-mumps virus activity

The anti-mumps virus activity of M. Pudica was evaluated. Suspected mumps cases were collected to isolate a standard mumps virus by systematic laboratory testing which included IgM antibody assays, virus Isolation, RT-PCR and phylogenetic analysis. The virus was quantified by TCIDso assay and anti-mumps virus property was evaluated by CPE reduction assay and cytotoxicity of the extract was measured by MTT assay and phytochemical analysis was done by gas chromatography-mass spectroscopy. The RT-PCR and phylogenetic tree analysis of the SH gene sequence of the clinical isolate showed it to be mumps virus genotype C. 150 ug/ml concentration of M. Pudica completely inhibited mumps virus and the drug was found to be non- toxic up to 2 mg/ml. M. Pudica was thus found to be a potent inhibitor of MuV.

Antivenom activity

The effectiveness of M. Pudica tannins (MPT) in neutralizing the lethality of Najakaouthia venom was compared with commercially derived tannins. Preincubation of MPT with N, kaouthia venom maintained 100% survival of mice after 24 hours. The mouse group in which there was no preincubation, no protection against the effects of the venom was observed. M. Pudica tannin was found to be more effective in neutralizing the lethality of N. Koouthia venom when compared to commercial tannic acid. Two protein spots were missing in the two-dimensional gel electrophoresis (2-DE) of the MPT treated mouse indicating the down-regulation of venom proteins. The results from this study indicated that tannins obtained from M. Pudica are better than tannic acid in neutralizing the lethality of N. Koouthia venom in vitro. However, further investigations are required to establish that M. Pudica has potential for treating N. Kaouthia snakebites.

Hypolipidemic activity

The hypolipidemic activity of Mt. Pudicu extract was studied on high fat diet induced models of hyperlipidemia in rats. Hyperlipidemia in experimental rats evidenced by an enhancement in the levels of Cholesterols, Triglycerides, LDL and VLDL Ethanol extract showed significant hypolipidemic effect by lowering the serum levels of blochemical parameters such as significant reduction in the level of serum Cholesterol, TG, LDL. VLDL and increase in HDL level which was similar to the standard drug Lovastatin. Preliminary phytochemical analysis revealed the presence of phytoconstituents such as steroids, flavonoids, glycosides alkaloids and phenolic compounds

Anti-depressant

Aqueous extract (6 mg/kg and 8 mg/kg, ip) from dried leaves of M. Pudica showed antidepressant-like effect by reducing the immobility period of rats subjected to FST.

Spermicidal activity

The present study was conducted to evaluate the spermicidal activity of aqueous extract of seed powder of M. Pudica in male albino rats. The aqueous extract of seed powder of M. Pudica have shown some changes in Serum glutamic

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oxaloacetic transaminase (SGOT), Serum glutamic pyruvic transaminase (SGPT) Akaline phosphatase (Ak.PO4), Serum total protein (TP) in group 1 (aqueous-control), 2 (1g/kg bw), 3 (2g/kg bw) and 4 (3g/kg bw).

Hepatoprotective activity

Hepatoprotective activity of methanolic extract of M. Pudico was inducing hepatotoxicity against carbon tetrachloride in rats at the dose of 200mg/kg body weight per oral. Methanolic extract showed significant ($p<0.05$) hepatoprotective effect by lowering the serum levels of various biochemical parameters such as serum glutamic Oxaloacetate transaminase (SGOT), serum glutamic pyruvates transaminase (SGPT). Alkaline phospatase (ALP), total bilirubin (TBL), total cholesterol (CHL) and by increasing the levels of total protein (TPTN) and albumin (ALB), in the selected model. These blochemical observations were confirmed by histopathological examinations of liver sections and are comparable with the standard hepatoprotective drug Silymarin (100mg/kg body weight i.p.). Methanolic extract of plant M. Pudico, may be responsible for the significant hepatoprotective activity and the results justify the use of M. Pudico as a hepatoprotective agent.

Hypolipidemic Activity

The chloroform extract of M. Pudica leaves has been screened for its hypolipidemic activity. Hypolipidemic activity is screened by inducing hyperlipidemia with the help of atherogenic diet in wistar albino rats and serum levels of various biochemical parameters such as total cholesterol, triglycerides, LDL, VLDL and HDL cholesterol were determined. Atherogenic index shows the measure of the atherogenic potential of the drugs. Chloroform extract showed significant ($p < 0.05$) hypolipidemic effect by lowering the serum levels of biochemical parameters such as significant reduction in the level of serum cholesterol, triglyceride, LDL, VLDL and increase in HDL level which was similar to the standard drug Atorvastatin. Chloroform extract exhibited significant atherogenic index and percentage protection against hyperlipidemia. These biochemical observations were in turn confirmed by histopathological examinations of aorta, liver and kidney sections and are comparable with the standard hypolipidemic drug Atorvastatin. The overall experimental results suggests that the biologically active phytoconstituents such as flavonoids, glycosides alkaloids present in the chloroform extract of M. Pudico, may be responsible for the significant hypolipidemic activity and the results justify the use of M. Pudico as a significant hypolipidemic agent.

Estrogenic and anti-estrogenic activity

The oestrogenic and anti-oestrogenic activities of M. Pudica root powder were studied using immature female rats. Oestrogenic effect was assessed by the uterotrophic activity and anti-oestrogenic activity studied by assessing its ability to inhibit uterotrophic activity caused by estradiolmonobenzoate. It was observed that the root powder did not possess oestrogenic activity, as it did not cause an increase in uterine weight of immature female rats. M. Pudica root powder showed anti-oestrogenic activity by blocking the increase in uterine weight caused by administration of estradiolmonobenzoate.

Anti-Microbial Activity

Ethanolic extracts of M. Pudica leaves were screened for phytochemical constituents and antimicrobial activity towards pathogens Le. Bacteria and fungl. The activity was tested against Bacillus subtilis, Pseudomonas eruginosa, Klebsiella pneumonia, Aspergillusflavus and Trycophytonrubrum at different concentrations of 25, 50, 75 and 100 µl/ disc and the results have been illustrated. Phytochemical analysis of the extract revealed that the antimicrobial activity of the plant materials is due to the presence of active constituents like alkaloids or tannins.

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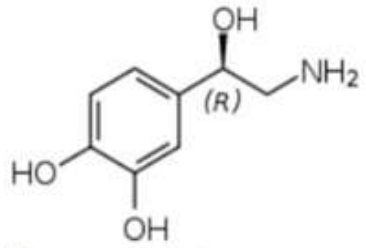
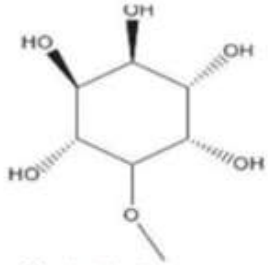
Table 1: Chemical constituents of *M. pudica*

Sr. No.	Parts	Chemical constituents
1	Leaves	nor-epinephrine(1), d-pinitol (2), b-sitosterol [19] (3), alkaloids- mimosine [20] (4), terpenoids, flavonoids, glycosides, alkaloids, quinines, phenols, tannins, saponins, and coumarins.[3,25], polyunsaturated fatty acid , sphingosine [23] (5), adrenalin, 5-MeO-DMT[2] (6), 5,7,3´,4´-tetrahydroxy-6-C-[β-D-apiose-(1→4)]-β-D-glycopyranosyl flavone (7) , isorientin (8) , orientin (9) , isovitexin (10), vitexin (11) , tyrosin [36] (12).
2	Seed	D-xylose (13), D-glucoronic acid 4-*O*-(3, 5-dihydroxybenzoic acid)-b-D-glucoronide [21] (14), Tubulin [28], C-glycosylflavones [29], phenolic ketone [30], buffadienolide [31] (15).
3	Root	flavonoids, phytosterol, alkaloids, amino acids, tannins, glycoside, and fatty acids [26],ascorbic acid (16), crocetin (17), D-glucoronic acid, linoleic acid (18), linolenic acid (19), palmitic acid (20), stearic acids (21), mimosine, D-xylose and β-sitosterols [2].
4	Plant	crocetin, dimethyl ester [33] , 7,8,3',4'-tetrahydroxyl-6-C-[alpha-l-rhamnopyranosyl-(1→2)]-b-D-glucopyranosyl flavones (22), 5,7,4'-trihydroxyl-8-C-[a-l-rhamnopyranosyl-(1→2)]-b-D-glucopyranosyl flavones , 5,7,3',4'-tetrahydroxyl-6-C-[a-l-rhamnopyranosyl-(1→2)]- b-D-glucopyranosyl flavone , mmimosinamine (23), mimosinicacid (24), tyrosin [22], jasmonic acid (25), abscisic acid [24](26), mimosine, , d-xylose, d-glucuronic acid [32],tubulin, gallic acid (27), phytoharmones-turgorines, c-cosylflavones [34],Norepinephrine, thiamin [2] (28), L-Noradrenaline, , 2"-O-alpha-L-Rhamnosyl-6-C-fucosyl-luteolin, cassiaoccidentalin B, mimopudine [2].
5	Stem	mimosine, β-[N-(3-hydroxypyridone-4)]-α-aminopropionic acid [27], 5-MeO-DMT [2].
6	Arial part	*O*-glycosyl flavonoids named isoquercitrin (29), avicularin and apigenin-7-*O*-D-glucoside, and also four C-glycosyl flavonoids, cassiaoccidentalin B, orientin and isoorientin from the aerial part of the plant [35].

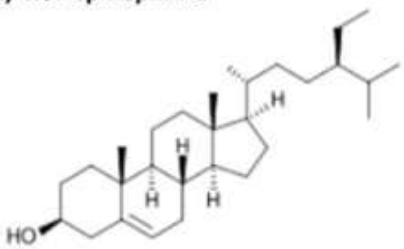
Figures 1: Chemical structures of various phytoconstituents from *M. pudica*



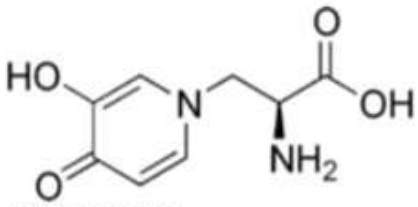
(1) nor-epinephrine



(2) d-pinitol



(3) b-sitosterol



(4) L-mimosine

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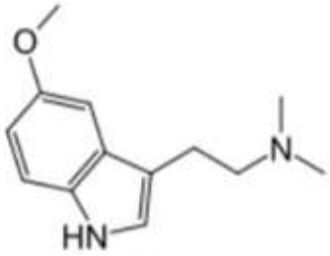
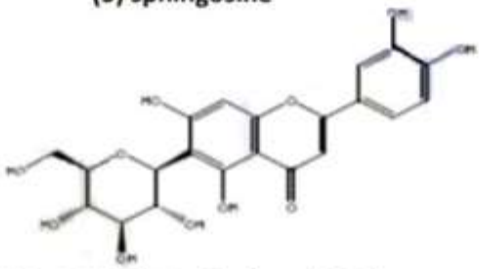
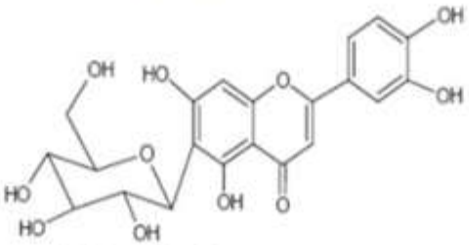
(5) sphingosine



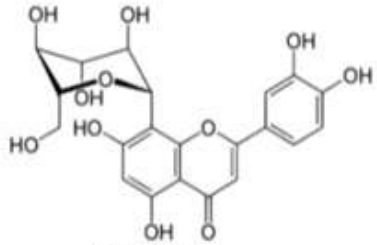
(6) 5-MeO-DMT



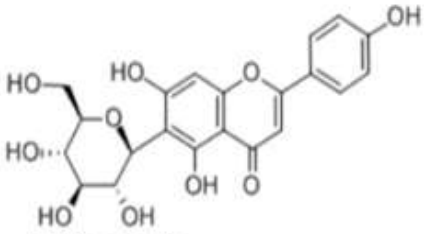
(7) 5, 7, 3', 4'-tetrahydroxyl-6-C-beta -D-glucopyranosyl flavones



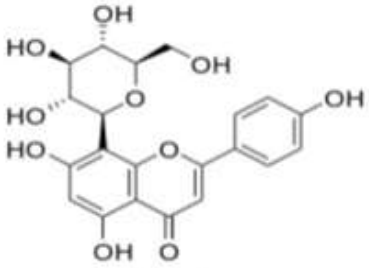
(8) isoorientin



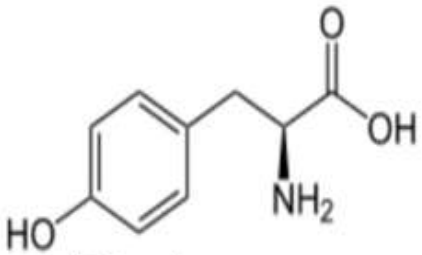
(9) orientin



(10) isovitexin



(11) vitexin



(12) tyrosin

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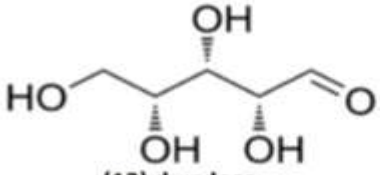
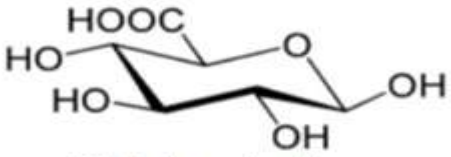
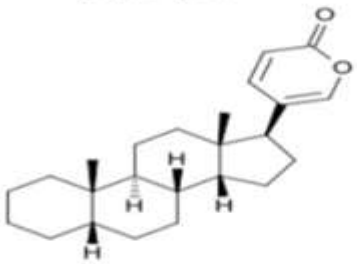


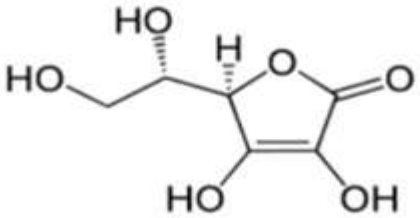
(13) d- xylose



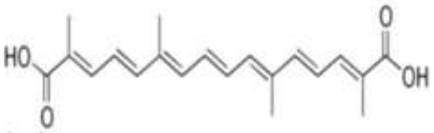
(14) d-glucoronic acid



(15) bufadienolide



(16) ascorbic acid



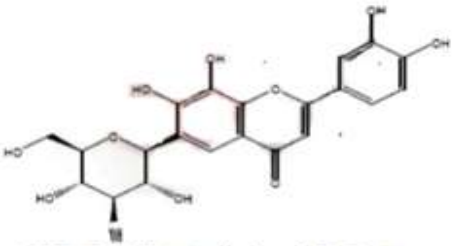
(17) crocetin

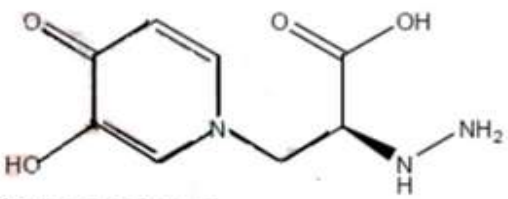
(18) linoleic acid

(19) linolenic acid

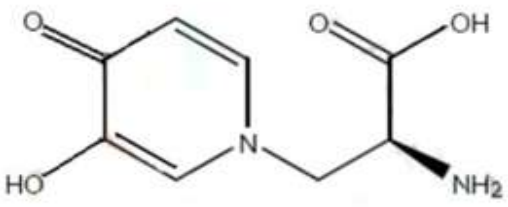
(20) palmitic acid

(21) stearic acids


(22) 7,8,3',4'- tetrahydroxyl-6-C-beta -D-glucopyrano-sylflavones



(23) mmimosinamin



(24) mimosinic acid

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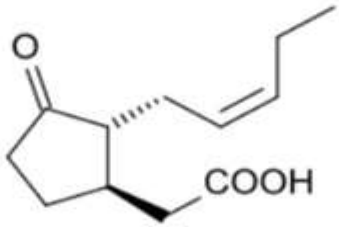
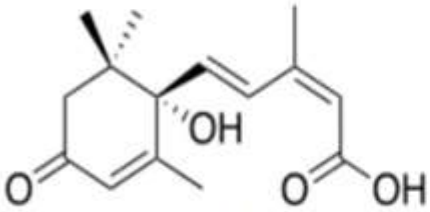
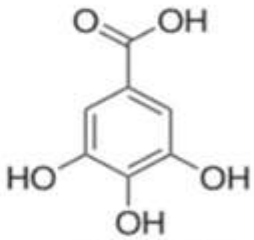


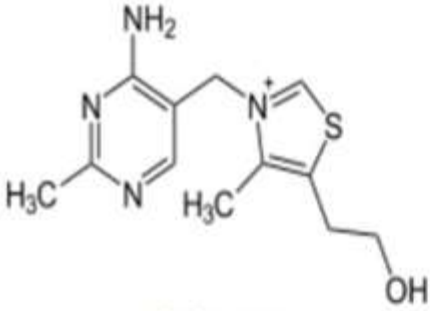
(25) jasmonic acid



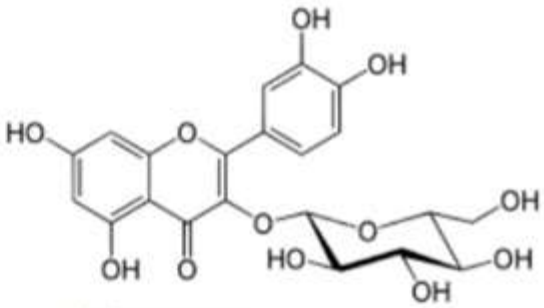
(26) abscisic acid



(27) galic acid



(28) thiamin



(29) isoquercitrin

II. CONCLUSION

M. pudica is traditionally very important herb having many important pharmacological activities like analgesic, antidiabetic, anti-inflammatory hypolipidemic activity, antimicrobial, hepatoprotective activity, antiasthmatic, anti ulcer and antioxidant property. Many important phytoconstituents responsible for the activity were isolated. This proves therapeutic importance of the plant. Such type of systematic information about the plant is useful for the researchers. M. pudica is hopeful induce the advance research about the benefit of this plant for human life.

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