Published online in http://ijam.co.in
ISSN: 0976-5921
International Journal of Ayurvedic Medicine, 2013, 4(4), 282-289

Review on *Cissampelos Pareira* & *Cyclea Peltata* (Patha Dwaya) Phyto-Pharmacological Perspectives

Review article

Suman Singh[1*], Nishteswar K[2]

1. M.D. 2nd yr scholar, 2. Head of Department,
Dravyaguna dept., I.P.G.T &R.A, G.A.U., Jamnagar.

Abstract

Patha is a widely used drug in Ayurveda. Botanical source of the *Laghupatha* and *Rajpatha* are *Cissampelos pareira* and *Cyclea peltata* respectively, which belong to the Menispermaceae family. They contain many alkaloids like hayatine, hayatinine, hayatidine and other bisbenzylisoquinoline alkaloids, berberines etc. which are found to be responsible for its various activities like anti-inflammatory, analgesic, antihaemorrhagic, gastroprotective, antioxidant, cardioprotective etc. The present review study is an attempt to provide reported information on its phyto-constituents, and pharmacological activites.

Keywords: *Laghupatha, Rajpatha, Cissampelos pareira, Cyclea peltata,* alkaloids, Menispermaceae, *Patha*.

Introduction:

Cissampelos pareira Linn**.** belongs to the Menispermaceae family is a sub-erect or climbing herb, known as *laghupatha* in Indian traditional medicine.(1) There are 37 plant species worldwide distributed under this genus. Only one of them occurs in India.(2) A very variable, lofty, slender, dioecious, perennial climber, commonly distributed throughout tropical and sub-tropical India- Himachal Pradesh, Chota Nagpur, Bihar, West Bengal, Punjab, Rajasthan, particularly in the east of Aravalli, hilly forests of Marathwada, Konkan, Deccan, Tamilnadu.(3) Rootstock woody, perennial; leaves usually peltate or orbicular-reniform or ovate–sub-reniform, with a truncate-cordate base, glabrous or hairy above, 3-12 cm across; flowers greenish yellow, male in axillary, fascicled, pilose cymes or panicles; female flower in 6–15 cm long pendulous racemes; drupes small, ovoid – subglobose or obovoid, compressed, scarlet red, hirsute; seeds horse – shoe shaped. The plant is common in orchards, hedges, parks and gardens on moist soils, either creeping or twining around other plants; also common on hilly tracts along water-courses. (4)

Cyclea peltata (Lam) Hook. F. & Thomas also belongs to Menispermaceae family, which is known as *Rajpatha* in various parts of India. A much-branched, climbing shrub found throughout South and East India and in the Andaman and Nicobar Islands.(5) Roots tuberous; Leaves deltoid or ovate, acute, truncate or slightly sinuate at the base with rounded angles, mucronate, more or less hairy on the nerves and veins, margin often ciliate;

*Corresponding Author:
Suman Singh
M.D. 2nd yr scholar,
Dravyaguna dept.,
I.P.G.T &R.A,G.A.U., Jamnagar
E-mail.address: snghsmn@gmail.com
Contact No.: 09510172204

flowers in axillary panicles. Male flowers subsessile, interruptedly spicate or collected into heads. Female flowers racemose, sepals oblong, glabrous. Petals orbicular, much shorter than the sepal; ovary pilose; berries drupaceous. (6)

Materials & method:

Ayurvedic classics, lexicons and other compilatory treatises are reviewed for documenting the information about *Patha*. The published works on journals and information available on web pages are consulted to review about *Patha* in terms of phyto-pharmacological information.

Phyto- constituents:

(A) *Cissampelos pareira*:

Alkaloids, viz. hayatine (± curine), hayatinine, hayatidine and other bisbenzylisoquinoline alkaloids, some non nitrogenous components, e.g., quercitol and sterol (root); cyclanoline chlorides, a non phenolic tertiary alkaloid (tetra hydroisoquinoline chromophone), alkaloids viz., seepeerine, berberine, cissampeline, pelosine (or berberine), hayatin, hayatinin, l- curine and d-isochondrodendrine along with a saponin, quaternary ammonium bases, d-quercetol and sterol, a base with a dihydroisoquinoline nucleus, cycleamine, hayatinin (4"-0- methyl berberine) and hayatidin (++) -4" - 0 - methyl berberine), three water soluble bases viz., menismin iodine, cissamin chloride and pareirin, cissamine chloride, cissampareine, five unidentified tertiary alkaloids, (++)-4"-0-methyl curine, tetrandrine (an alkaloid), dehydrodicentrine, dicentrine and insularine, bis (benzylisoquinoline), alkaloids viz., tetrandrinemono-N-Z'-oxide, isochondodendrine and chondo curine and an alkaloids DL- curine dimethiodide (daijisong) (root and root bark); cycleanine, 1- berberine, hayatidin, hayatinin, hayatin and d- quercitol (leaves); tropoloisoquinoline alkaloids (plant).(7)

(B) *Cyclea peltata*:

The leaves of *C. peltata* are found to contain alkaloids such as cycleanine, berberine, hayatinin, hayatidin and hayatin. Root contains bisbenzylisoquinoline alkaloids, cycleapeltine, cycleadrine, cycleacuine, cycleanorine and cycleahomine chloride.(8)

Table 1: Ayurvedic classics and Nighantus have mentioned the following indications for *Patha :*

Indications	C.S	S.S	A.H	D.N	MP.N	R.N	K.N	B.N
Aruchi (Anorexia)	+	+	-	-	-	-	-	-
Arsha (Piles)	+	-	+	-	-	-	-	-
Atisara (Diarrhoea)	-	+	+	+	+	+	+	+
Apasmara (Epilepsy)	+	+	-	-	-	-	-	-
Chhardi (Vomiting)	-	-	-	+	+	-	-	+
Daha (Feeling of burning sensation)	-	-	-	-	+	+	+	+
Grahani (Malabsorption syndrome)	+	+	+	-	-	-	-	-
Granthi artava	-	-	+	-	-	-	-	-
Gulma(Abdominal tumor)	-	-	-	-	+	-	+	+
Haleemaka (Chlorosis)	+	-	-	-	-	-	-	-
Hridroga (Disease of the heart)	-	+	-	+	+	-	+	+
Jwara (Pyrexia)	+	+	+	+	+	+	+	+
Kamala (Jaundice)	+	+	+	-	-	-	-	-
Kandu (Pruritis)	+	+	-	+	+	-	+	+
Kaphajavyadhi (Disorders of kapha)	-	+	-	-	-	-	+	-

Published online in http://ijam.co.in
ISSN: 0976-5921
International Journal of Ayurvedic Medicine, 2013, 4(4), 282-289

Kasa (Cough)	+	+	+	-	-	-	-	-
Krimi (Diseases due to parasites)	+	+	+	-	+	-	+	+
Kushta (Skin diseases)	+	+	+	+	+	-	+	+
Pandu (Anaemia)	+	+	-	-	-	-	-	-
Pleeha (Splenomegaly)	+	+	-	-	-	-	-	-
Prameha (Diabetes)	+	+	-	-	-	-	+	-
Pravahika (Dysentery)	+	-	+	-	-	-	-	-
Raktapitta (Haemorrhagic diathesis)	+	-	-	-	-	-	-	-
Shoola (Pain disorders)	-	-	-	+	+	+	+	+
Swasa (Dyspnoea)	+	+	+	-	+	-	+	+
Stanya vikar (Disorders of breast milk)	+	+	+	-	-	-	-	-
Switra (Leucoderma)	+	+	+	-	-	-	-	-
Udara (Enlargement of udara)	+	-	-	-	-	-	-	+
Unmada (Insanity)	+	+	-	-	-	-	-	-
Upadamsha (Veneral diseases)	+	+	-	-	-	-	-	-
Visha (Poisons)	+	+	-	+	+	-	+	+
Vrana (Ulcers)	-	+	+	-	+	-	+	+

(C.S- Charak Samhita, S.S-Sushruta Samhita, A.H- Ashtanga Hridya, D.N- Dhanvantri nighantu, MD.N- Madanpal nighantu, R.N- Raj nighantu, K.N- Kaiydev nighantu, B.N- Bhavprakash nighantu)

Research Studies:

(A) *Cissampelos pareira* –

Toxicity:

In the acute and subacute toxicity test, oral administration of *C. pareira* did not produced any changes in behaviour and physiological activities on experimental animals. Biochemical and hematological analysis did not show any changes. (Amresh et al., 2008)

Antinociceptive and anti-arthritic activity:

50% aqueous ethanolic extract of roots of *C. pareira* at the dose levels of 100–400 mg/kg exhibited significant resistance against mechanical pain in analgesymeter induced pain in mice. Study also suggested that dose dependent significant protective effect of plant against complete Freund's adjuvant induced arthritis. (9)

Anti-inflammatory activity:

Ethanolic extract of *C. pareira* aerial parts exhibited significant and dose dependent anti-inflammatory activity in the carrageenan test, which has been confirmed by the arachidonic acid test (Amresh *et al*., 2007). Ethanolic extract (50%) of *Cissampelos pareira* roots (CPE) in acute, subacute and chronic models of inflammation exhibited significant anti-inflammatory activity (10). The methanolic extract showed significant anti-inflammatory activity similar to ibuprofen and indomethacin. (11)

Anti-fertility activity:

Oral administration of *C. pareira* leaf extract altered the estrous cycle pattern, prolonged the length of estrous cycle with significant increase in the duration of diestrus stage and reduced significantly the number of litters in female albino mice. Plant extracts altered release of gonadotropin (LH, FSH and prolactin) and estradiol secretion. The results indicated the antifertility effect of *C. pareira* leaf extract in female albino mice. (12) Hydro-alcoholic extract showed significant anti-fertility activity on male Albino–Rats. (13)

Antioxidant activity:

Ethanolic extract of *C. pareira* roots showed significant antioxidant activity in the 1,1-diphenyl-2-picrylhydrazyl assay. It was found to significantly scavenge superoxide, hydrogen peroxide, hydroxyl radicals, and nitric oxide at a dose regimen of 50 to 400 µg/kg in vitro. *C. pareira* extract exhibit a potent protective activity in an acute oxidative tissue injury animal model: benzo (a) pyrene induced gastric toxicity in mice in vivo. (14)

Chemo-preventive effects:

With administration of *C. pareira* root's extract protective effect against benzo (a) pyrene [B(a)P]-induced gastric cancer was found in mice, and the tumor incidence was reduced. The modulatory effect was also found on carcinogen metabolizing phase I and phase II enzymes, antioxidant enzymes, glutathione content, lactate dehydrogenase, and lipid peroxidation in liver study. (15)

Anti-hemorrhagic effects:

Aqueous extract of *C. pareira* leaves and venom were injected in the skin of mice, and it was found that aqueous extract produced anti-hemorrhagic activity. On the other hand, experiments regarding the anti-proteolytic activity were conducted observing the effect on casein in a test tube or on biotinylated casein in a microplate. None of the two procedures was able to show any inhibitory activity. (16)

Gastroprotective effects:

Ethanolic extract of roots showed a dose-dependent, ulcer-protective effect in various acute and chronic ulcers. *C. pareira* significantly improved the defense factors as total hexose and sialic acid while significantly reducing the ulcer index in the lipid peroxidase product malondialdehyde in ethanol-induced ulcers. (17)

Cardioprotective effect:

Ethanolic extract of *C. pareira roots* attenuated isoproterenol-induced cardiac dysfunction, and it might be due to ameliorates calcineurin activity and free radical formation, and by augmentation of antioxidant enzymatic activities. (18)

Anti-diarrhoeal activity:

The hydro-ethanolic extract of *C. pareira* exhibited a dose dependent decrease in the total number of faecal droppings and 29.2-60.0% inhibition in castor oil-induced diarrhoea. It reduced intestinal fluid accumulation (26.0-59.0%) and gastrointestinal transit. (19)

Hepato-protective effect:

Hydro alcoholic extract showed protective action against hepatotoxicity caused by anti-tuberculosis drugs on wistar albino rats (20). Hydro-alcoholic extract of roots exhibited significant hepatoprotective action against CCl4 induced hepatotoxicity. (21)

Memory enhancing activity:

Elevated plus maze and passive avoidance paradigm study conducted in mice exhibited memory enhancing activity of *C.pariera.* (22)

Anti-hyperglycemic activity:

The methanolic extract of root showed dose dependent significant anti-hyperglycemic activity in streptozotocin-induced diabetic rats. (23)

Antioxidant and immunomodulatory activity:

Roots alkaloidal fraction possesses strong antioxidant activity by scavenging the stable free radical DPPH, superoxide ion and inhibiting lipid peroxidation in rat liver homogenate induced by iron/ADP/Ascorbate complex.

Published online in http://ijam.co.in
ISSN: 0976-5921
International Journal of Ayurvedic Medicine, 2013, 4(4), 282-289

Fraction also had significant immunosuppressive activity at lower doses. (24)

(B) *Cyclea peltata*:

Anti oxidant activity:

C. peltata roots are reported to contain tetrandrine, a bisbenzylisoquinoline dioxine alkaloid is well known for its antioxidant activity (Rastogi & Mehrotra, 1999; Ng et al., 2006). The protective effect of leaf on cisplatin-induced nephrotoxicity and oxidative damage has been reported by ameliorate the oxidative stress parameters. (25) (26)

Anti-Lithiasis effects:

The root extract reduced the lithiasis confirmed by the reduced level of urinary oxalate and calcium in ethylene glycol induced lithiasis in rats. (27)

Anti-hyperlipidemic effects:

The ethanolic extract reduced the total cholesterol, LDL cholesterol and triglycerides and increased the HDL cholesterol in hypercholesterolemia induced rats. (28)

Anti-diabetic effect:

Aqueous extract significantly decreased both the fasting and postprandial blood glucose of type 2 diabetic rats and enhanced insulin levels in the diabetic rats. (29)

Hepatoprotective effects:

Pre-treatment with *C. peltata* (250, 500mg/kg) caused significant reduction of liver transaminases in the hepatotoxin treated rats, almost comparable to the Silymarin (100mg/kg) treated groups. The study showed that drug significantly inhibited the liver MDA levels and attenuated the liver GSH levels of ethyl alcohol treated rats. (30)

Gastric anti-secretory and anti-ulcer activities:

The ethanolic extract of *Cyclea peltata* roots showed significant antisecretory activity by decreasing pepsin secretion, gastric juice volume and acid output in pylorus-ligated rats. Further, it showed significant gastroprotective effects on the stomach wall of ethanol or ethanol and indomethacin treated rats by decreasing malondialdehyde level, increasing the gastric wall mucus and non-protein sulfahydryl groups. (31)

Anti-bacterial activity:

Methanolic extract of whole plant of *C. peltata* had higher inhibitory action against *Staphylococcus aureus, Streptococcus haemolyticus, Klebsiella pneumonia* and *Proteus vulgaris* while Acetone extract of plant showed maximum inhibitory action against *Klebsiella pneumonia* and *Streptococcus haemolyticus*. (32)

Another research work has been carried out to explore the potential of *C.peltata* against the bacteria.(33) Studies have reported that the methnolic extract of *C.peltata* exhibited significant antibacterial activity against S. pyogenes, P. vulgaris and E. coli and the hexane extract of this plant exhibited the same potential against P. vulgaris and P. mirabilis. (34)

Anti-diuretic activity*:*

The ethanolic and petroleum ether extracts of *C. peltata* were studied for diuretic activity in wistar rats using Lipschitz et al. method. (35)(36) The diuretic effect of ethanolic extract was significantly higher than that of petroleum extract. (37)

Table 2: Research studies carried out on *C.pareira* and *C.peltata* can be summarized as given under

Name of the plant	Activities	Extract	Part used
1. *C. pareira*	a. Antioxidant	Ethanolic	Root
	b. Antifertility	Hydro-alcoholic	Leaves
	c. Chemopreventive	Hydro-alcoholic	Root
	d. Anti-haemorrhagic	Aqueous	Leaves
	e.Antinociceptive & Antiarthritic	Ethanolic	Root
	f. Anti-inflammatory	Ethanolic	Aerial part
	g. Gastroprotective	Ethanolic	Root
	h. Cardioprotective	Ethanolic	Root
	i. Anti-diarrhoeal	Ethanolic	Root
	j. Hepatoprotective	Hydro-alcoholic	Root
	k. Memory enhancing	Hydro-alcoholic	Root
	l. Anti-hyperglycemic	Methanol	Root
2. *C. peltata*	a. Antioxidant	-	Leaf
	b. Anti-lithiasis	-	Root
	c. Anti-hyperlipidemic	Ethanolic extract	-
	d. Anti-diabetic	Aqueous extract	Root
	e. Hepatoprotective	-	-
	f .Gastric antisecretory & anti-ulcer	Ethanolic	Root
	g. Anti-bacterial	Ethanolic	Whole plant
	h. Anti-diuretic	Ethanolic & petroleum	Leaves

Conclusion:

Patha is a well reputed drug quoted in the most of the ancient ayurvedic classics like *Charak samhita* (1000BC), *Sushruta samhita* (1000BC) and *Ashtangahridya* (6AD). The most of the ayurvedic compendia documented during medieval India have quoted several single and compound formulations consisting of *Patha*. While going through Samhitas and nighantus most of common indications found are for patha are jwara, *atisara, kandu, kustha, shoola, swasa, vrana, visha, daha, hridroga.* Research studies provided scientific validation for certain activities like anti-inflammatory, antinociceptive, antiarthritic, antidiarrhoeal, gastroprotective, hepatoprotective, memory-enhancing, antihyperglycemic, antifertility, antiseptic, anti-haemorrhagic, anti-oxidant, immunomodulatory, chemo-protective, etc. The review made from various perspectives clearly indicates that *Patha* is an indispensible drug of Ayurvedic physician's armamentarium.

References:

1. Vaidya GB, Adarsha Nighantu, 2nd ed., vol. 1. Chaukhambha Bharti Academy Publications,1998:153
2. Singh AP, Gupta A, Dravyaguna Vijnana, New Delhi, Chaukhambha orientalia, 2005:29-30
3. Anonymous, Database on Medicinal Plants used in Ayurveda , vol 2, New Delhi, CCRAS, Dept of HFW, Reprint 2005: 438
4. Anonymous, The Wealth of India, Raw Materials vol.-3., New Delhi, Council of scientific & Industrial Research publication, 1992: 591

5. Anonymous, The Wealth of India(First supplement series), Raw Materials vol.-2., New Delhi, Council of scientific & Industrial Research publication, 2004: 319
6. Theodore cooke, The Flora of the presidency of Bombay, vol 1, Dehradun, M/S Bishen singh mahendra pal singh, pg no. 24
7. Anonymous, Database on Medicinal Plants used in Ayurveda , vol 2, New Delhi, CCRAS, Dept of HFW, Reprint 2005: 438
8. Kupchan SM, Liepa AJ , Baxter RL, Hintz HP. New and related artifacts from *Cyclea peltata*. J Org Chem. 1978;38:1846-7.
9. G Amresh, PN Singh, CV Rao, Antinociceptive and antiarthritic activity of *Cissampelos pareira* roots - Journal of ethnopharmacology, 2007, 111: 531-536
10. G. Amresh, G.D. Reddy, Ch.V. Rao, P.N. Singh, Evaluation of anti-inflammatory activity of *Cissampelos pareira* root in rats, J Ethnopharmacol.2007 Apr 4;110(3):526-31.
11. Gourab Saha, Pankaja Senapati, Narahari Sahu**,** Anti-inflammatory activity of Methanolic extract of Root of Cissampelos pareira on Carragenin induced rat paw edema, PHARMATUTOR-ART-1324
12. Ganguly M, Borthakur M, Devi N, Mahanta R. Antifertility activity of the methanolic leaf extract of Cissampelos pareira in female albino rats. J. Ethnopharmacol 2007;111:688-91.
13. Harisha B, Antifertility activity of Hydro – alcoholic extract of *Cissampelos pareira* Linn. On male Albino rats, IJPRD 2011; vol 3(12): 2012 (83-97)
14. Amresh G, Rao CV, Singh PN. Antioxidant activity of *Cissampelos pareira* on benzo (a) pyrene-induced mucosal injury in mice. Nut. Res.2007;27:625-32.
15. Amresh G, Rao Ch V, and Singh PN. Evaluation of Cissampelos pareira against gastric cancer and enzymes associated with carcinogen metabolism. *Pharm. Biol.,* 2007;45:595-603
16. Badilla B, Chaves F, Jimenez S. Effects of an extract of *Cissampelos pareira* on the hemorrhagic and proteolytic activities from Bothrops asper venom. Pharmacog. Mag 2008; 4:27-31.
17. G. Amresh, Hussain Zeashan, Ram Ji Gupta, Ravi Kant, Chandana Venkateswara Rao, Paras Nath Singh. Gastroprotective effects of ethanolic extract from *Cissampelos pareira* in experimental animals. Journal of natural medicines, 2007: vol-61, Issue 3: 323-328
18. Singh BK, Pillai KK, Kohli K, Haque SE. Effect of *Cissampelos pareira* root extract on isoproterenol-induced cardiac dysfunction, J Nat Med. 2013 Jan;67(1):51-60.
19. SM Kupchan, AC Patel, Tumor inhibitors VI. Cissampareine, new cytotoxic alkaloid from *Cissampelos pareira*. Cytotoxicity of bisbenzylisoquinoline alkaloids -J Pharm Sci. 1965 Apr; 54(4):580-3.
20. Sangameswaran Balakrishnan., Baljeet Singh Khurana**.** Hepatoprotective effect of hydroalcoholic extract of *cissampelos pareira* against rifampicin and isoniazid induced hepatotoxicity**,** Continental J. Pharmaceutical Sciences: 2012: 6 (1): 30 - 35,.
21. Surendran S, Eswaran MB, Vijayakumar M, Rao CV. In vitro and in vivo hepatoprotective activity of *Cissampelos pareira* against carbon-tetrachloride induced hepatic damage, Indian J Exp Biol. 2011 Dec;49(12):939-45
22. Pramodinee d. kulkarni. Memory enhancing activity of *Cissampelos pariera* in mice, International Journal

of Pharmacy and Pharmaceutical Sciences, 2011; 3(2): 206.
23. K.Atchut Kumar. Antihyperglycemic activity of methanolic extract of *Cissampelos pareira* Linn roots on blood glucose levels of Streptozotocin-Induced Diabetic rats, Journal of Pharmacy Research 2011,4(10),3399-3401
24. Bafna A, Mishra S. Antioxidant and immunomodulatory activity of the alkaloidal fraction of *Cissampelos pareira* Linn., Sci Pharm. 2010;78(1):21-31.
25. Vijayan FP, Rani VK, Vineesh VR, Sudha KS, Michael MM, Padikkala J. Protective effect of *Cyclea peltata* on Cisplatin induced nephrotoxicity and oxidative damage., J Basic Clin Physiol Pharmacol. 2007;50:812–4
26. K. K. Hullatti, U. V. Gopikrishna, and I. J. Kuppast, Phytochemical investigation and diuretic activity of *Cyclea peltata* leaf extracts, J Adv Pharm Technol Res. 2011; 2(4): 241–244.
27. Christina AJM, Packialakshmi M., Nagarajan M, Kurian S., Modulatory effect of *Cyclea peltata* Lam on stone formation induced by Ethylene Glycol Treatment in rats., Methods Find Exp Clin Pharmacol. 2002; 24: 77-79.
28. Christina A, Christapher V, Packialakshmi M, Tobin GC, Preethi J, John C, Murugesh N. Effect of ethanolic extract of *Cyclea peltata* Lam on a hypercholesterolemic rat Model. Phcog Mag.2005; 1: 59-62.
29. Uysal KT, Wiesbrock SM, Marino MW, Hotamisligil GS., Protection from obesity-induced insulin resistance in mice lacking TNF alpha function., Nature 1997; 9: 610-614.
30. VJ Shine, PG Latha and S Shyamal., Hepatoprotective effects of *Cyclea peltata* (poir.) hook. f. & thoms., in alcohol intoxicate rats, 20 Kerala Science Congress, Thiruvananthapuram, pp. 628 - 630.
31. Shine VJ, Latha PG, Shyamal S, Suja SR, Anuja GI, Sini S, Pradeep S, Rajasekharan S., Gastric antisecretory and antiulcer activities of *Cyclea peltata* (Lam.) Hook. f. & Thoms. in rats, J ethnopharmacol. 2009 Sep 7;125(2):350-5.
32. Jyothi Abraham and T. Dennis Thomas, Antibacterial activity of medicinal plant *Cyclea peltata* (Lam) Hooks & Thoms. Asian Pacific Journal of Tropical Disease (2012)S280-S284
33. Hullatti KK, Sharada M.S., Antimicrobial activity of *Cissampelos pareira*, Cyclea peltata and Stephania japonica methanolic root extracts., Adv Pharmacol Toxicol 2007; 8:105–108.
34. Rajendra DAR, Solomon J, Juststella WP, Johnson MA, Varaprasadham I. Antibacterial activity of selected ethnomedicinal plants from South India. Asian Pacific Journal of Tropical Medicine 2011; 4: 375- 378.
35. Mukharjee PK., Pharmacological screening of herbal drugs. In: Quality control of herbal drugs, 1st ed. New Delhi: Business Horizon Pharmaceutical Publisher, 2002:537.
36. Vogel HG. Drug discovery and evaluation; Pharmacological assays, 2nd ed. New York; Springer-Verlag.
37. Hullatti KK, Gopikrishna UV, Kuppast IJ. Phytochemical investigation and diuretic activity of *Cyclea peltata* leaf extracts. Journal of Advanced Pharmaceutical Technology & Research 2011; 2: 241-244

*****