Available on line www.jocpr.com

Journal of Chemical and Pharmaceutical Research

ISSN No: 0975-7384
CODEN(USA): JCPRC5

J. Chem. Pharm. Res., 2011, 3(1):613-620

A review on potential diuretics of Indian medicinal plants

Vivek Kumar Gupta* and Vikrant Arya

Department of Pharmacognosy, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial Post Graduate College of Pharmacy, Bela, Ropar, Punjab, India

ABSTRACT

In the most ancient Indian traditional system of medicine (Ayurveda) diuretics are called as Muttra- virechanya dravya. These agents were widely explored in Indian ancient system of medicine. Diuretics cause increase in the rate of urine flow rate thus employed in numerous disorders like hypertension, anxiety, cardiovascular disorders, diabetes mellitus and liver degeneration diseases. The aim of this review is to highlight the work on diuretics of plant origin. The selection of papers was made using the most relevant databases for the biomedical sciences on the basis of their traditional use. The numerous diuretic plants with their active phytoconstituents have been explored. The present paper also involves various plant drugs and their pharmacological profile which focus on the dose administered, bioactive extract involved in diuretic mechanism. This work may prove a milestone in selection of medicinal plant for carrying their work on the diuretics.

Keywords: Ayurveda, Diuretic, medicinal plants, phytoconstituents.

INTRODUCTION

Ayurvedic system of medicine is widely practiced and accepted by peoples not only in India but also in the developed countries such as USA, Europe, China, Japan, Canada *etc*. According to WHO nearly 80 % of the global population still rely upon the herbal drugs for their primary health care. There has been an increase demand for the pharmaceutical products from the natural origin in all over the world because of their lesser side effects as compare with the modern system of medicine[1]. Ayurveda, literally meaning the "science of life and longevity" in ancient Sanskrit, is the one of the oldest healing system of India, based on lifestyle, diet and herbs[2,3]. Ayurvedic herbal medicines mainly based on plants enjoy a respective position today, especially in the developing countries, where modern health services are limited. Safe effective and inexpensive indigenous remedies are gaining popularity among the people of both urban and rural areas including India and China[1].

Table 1: List of some Indian medicinal Plants as diuretics[9-41]

Sr. No.	Plant name/ family	Geographical distribution	Part used	Ayurvedic Name	Chemical constituents	Other biological activities
1.	*Abutilon indicum*, Malvaceae	Throughout the tropical parts of India	Whole plant	Atibalaa	Mucilage, tannins, asparagines, gallic acid sesquiterpene alkaloids, flavonoids, sterols, triterpenoids, saponins, cardiac glycosides	Febrifuge, anthelmintic, demulcent
2.	*Acacia suma*, Mimosaceae	West Bengal, Bihar, western Peninsula	Wood	Shvetakhadira	Tannins, catechin phlobatannin	Antidiarrhoeal, haemostatic
3.	*Achyranthes bidentata*, Amaranthaceae	Temperate and subtropical Himalayas from Kishtwar to Sikkim	Seeds, roots	Shveta-apaamaarg	Oligosaccharide, Steroids, triterpenoids,alkaloids, coumarins	Antimicrobial
4.	*Aerva lanata*, Amaranthaceae	Tropical parts of India	Entire plant	Paashaanab-heda	Palmitic acid,β-sitosterol, alpha-amyrin, alkaloids	Demulcent, anthelmintic, antidiarrhoeal
5.	*Allium sativum*, Liliaceae	Native to Central Asia and cultivated throughout India	Bulbs	Lashuna	Sulphur containing amino acids known as alliin	Antibiotic, bacteriosta-tic, fungicide, anthelmintic, hypotensive
6.	*Terminalia arjuna*, Combretaceae	Throughout India	Bark, leaves	Arjuna	Arjunolic acid, terminic acid, glycosides (arjunetin, arjunosides I–IV), and strong antioxidants, flavones, tannins, oligomeric proanthocyanidins	Cardiotonic in angina and employed in poor coronary circulation
7.	*Azima tetracantha*, Salvadoraceae	Peninsular India, Orissa, West Bengal	Roots, leaves	Mulchangan	Alkaloids- azimine, azcarpine, carpine	Stimulant, used in rheumatism and expectorant
8.	*Benincasa hispida*, Cucurbitaceae	Cultivated largely in Uttar Pradesh, Punjab, Rajasthan and Bihar	Roots, leaves, fruits	Kuushmaanda	Pentacyclic triterpene	Cooling, treatment of skin bruises
9.	*Boerhaavia diffusa*, Nyctaginaceae	Throughout India as a weed	Roots	Punarnavaa	Xanthone,β-ecdysone, flavonoid, arbinofuranoside	antifibrinolytic
10.	*Capparis spinosa*, Cappariadaceae	Rajasthan, Peninsular India	Bark, flower	Himsraa	Glucosinolates-glucoiberin, glucocapparin, sinigrin, glucocleomin, glucocapangatin	Antiinflammatory, deobstruent to liver and spleen
11.	*Daucus carota*, Umbelliferae	Punjab, Haryana, Uttar Pradesh and Madhya Pradesh	Roots, seeds	Gaajara	Flavones including, apigenin, chypsin, luteolin, flavonols including kaempferol, quercetin, furanocoumarins, methoxypsoralen	Hepatoprotective
12.	*Centella asiatica*,	Marshy places throughout	Leaves	Manduukaparni	Triterpenoid saponins	Sedative, antibiotic,

	Umbelliferae	India				detoxifier, blood-purifier, laxative
13.	*Centratherum anthelminticum*, Asteraceae	Himalayas and Khasi Hills	Seeds	Aranya-Jiraka	Avenasterol	Hypotensive activity
14.	*Cichorium intybus*, Compositae	North West India, Tamil Nadu and parts of Andhra Pradesh	Entire herb	Kaasani	Citric and tartaric acids, acetic, lactic, pyruvic, pyromucic, palmitic and tartaric acids	Laxative, cholagogue, mild hepatic
15.	*Cocos nucifera*, Palmae	Kerala, Tamil Nadu and Karnataka	Fruit, husk	Naarikela	Reducing sugars	Stomachic, laxative
16.	*Cordia rothii*, Boraginaceae	Rajasthan, Gujarat, Deccan and Karnataka	Fruits	Laghu-shleshmaataka	Alkaloids	Astringent
17.	*Erythrina indica*, Papilionaceae	Ornamental plant throughout India	Bark, leaves	Paaribhadra	Tetracyclic alkaloids	Neuromuscular blocking, smooth muscle relaxant, CNS depressant
18.	*Euphorbia thymifolia*, Euphorbiaceae	Found in tropical plains and lower hills of India	Leaves, seeds	Dudhi	Epitaraxerol, *n*-hexacosanol, euphorbol	Antispasmodic, bronchodilator antiasthmatic
19.	*Ipomoea aquatic*, Convolvulaceae	Throughout the greater part of India	Leaves, stem	Kalambi	Taraxanthin, hentriacontane, β-sitosterol and its glucoside	Emetic, purgative
20.	*Jasminum auriculatum*, Oleaceae	Cultivated throughout India, especially in Uttar Pradesh, Tamil Nadu	Flowers	Yuuthikaa	Indole and methyl anthranilate	Stomachic
21.	*Lagenaria siceraria*, Cucurbitaceae	Throughout India	Fruits, leaves	Katu-tumbi	Lacticin, lactucopicrin (sesquiterpene lactones), flavonoids, coumarins	Purgative, emetic
22.	*Mimusops elengi*, Sapotaceae	Cultivated in North India Western Peninsula and South India	Fruits, leaves, flowers, bark	Bakula	Tannins, steroidal saponins	Antimicrobial, astringent
23.	*Moringa oleifera*, Moringaceae	Punjab	--do--	Shigru	Nitrile glycosides, niazirin niazirinin	Cholagogue, stimulant
24.	*Opuntia ficus indica*, Cactaceae	Throughout India	Fruits, flower, stem	Nagphana	Glycosides of isorhamnetin and quercetin, flavonols	Hypoglycaemic
25.	*Cuscuta reflexa*, Convolvulaceae	A parasitic climber common throughout India	Entire plant	Amarvalli	Amarbelin and Kaempferol, stem gave cuscutin, cuscutatin, β-sitosterol, luteolin, bergenin kaempferol, alkaloids	Carminative
26.	*Camellia sinensis*,	Cultivated in Assam,	Leaves	Chashakam	Xanthines (theophylline and	Stimulant

	Theaceae	Darjeeling, Travancore, Nilgiris, Malabar, Bengal, Dehra Dun, Kumaon			theobromine), tannins, flavonoids, quercetin, kaempferol	
27.	*Zea mays*, Gramineae	Grown as a food crop mainly in Uttar Pradesh, Punjab, Madhya Pradesh, Bihar, Andhra Pradesh Jammu and Kashmir	Leaves, fruit	Mahaa-Kaaya	Saponins, alantoin, β-sitosterol, glycoprotein	Antiviral
28.	*Tribulus terrestris*, Zygophyllaceae	Throughout India up to 5400 m	Fruits	Gokshura	Sapogenins, diosgenin, gitogenin, chlorogenin, ruscogenin	Demulcent, anabolic anti-inflammatory
29.	*Taraxacum officinale*, Compositae	Temperate Himalayas, Khasi Hills, Mishmi Hills, Gujarat, hills of South India	Leaves, roots	Dugdh-pheni	Sesquiterpene lactones, triterpene, sterols	Urinary antiseptic
30.	*Asparagus racemosus*, Asparagaceae	Found wild in tropical and subtropical parts of India	Roots, leaves	Shataavari	Saponins (shatavarins I–IV)	Sexual debility for spermatog-enesis

India has been identified as one of the top twelve mega bio-diversity centre of the world. This is because India has a vast area with wide variation in climate, soil, altitude and latitude. India with its biggest repository of medicinal plants in the world may maintain an important position in the production of raw materials either directly for crude drugs or as the bioactive compounds in the formulation of pharmaceuticals and cosmetics *etc*[4]. Diuretics are drugs that increase the rate of urine flow, sodium excretion and are used to adjust the volume and composition of body fluids in a variety of clinical situations[5,6]. *Muttra virechanya dravya* is the ayurvedic equivalent to diuretics[7]. Diuretic agents have very wide application in the treatment of various chronical diseases associated with edema. They are generally prescribed for the treatment of hypertension, congestive heart failure, glaucoma, diabetes insipidus and liver aliments[8]. There are large number of Indian medicinal plants exhibiting diuretic activity, the list of some with their habitat, part used, phytoconstituents [Fig. 1] and other biological activities apart from diuretic activity have been discussed in Table 1.

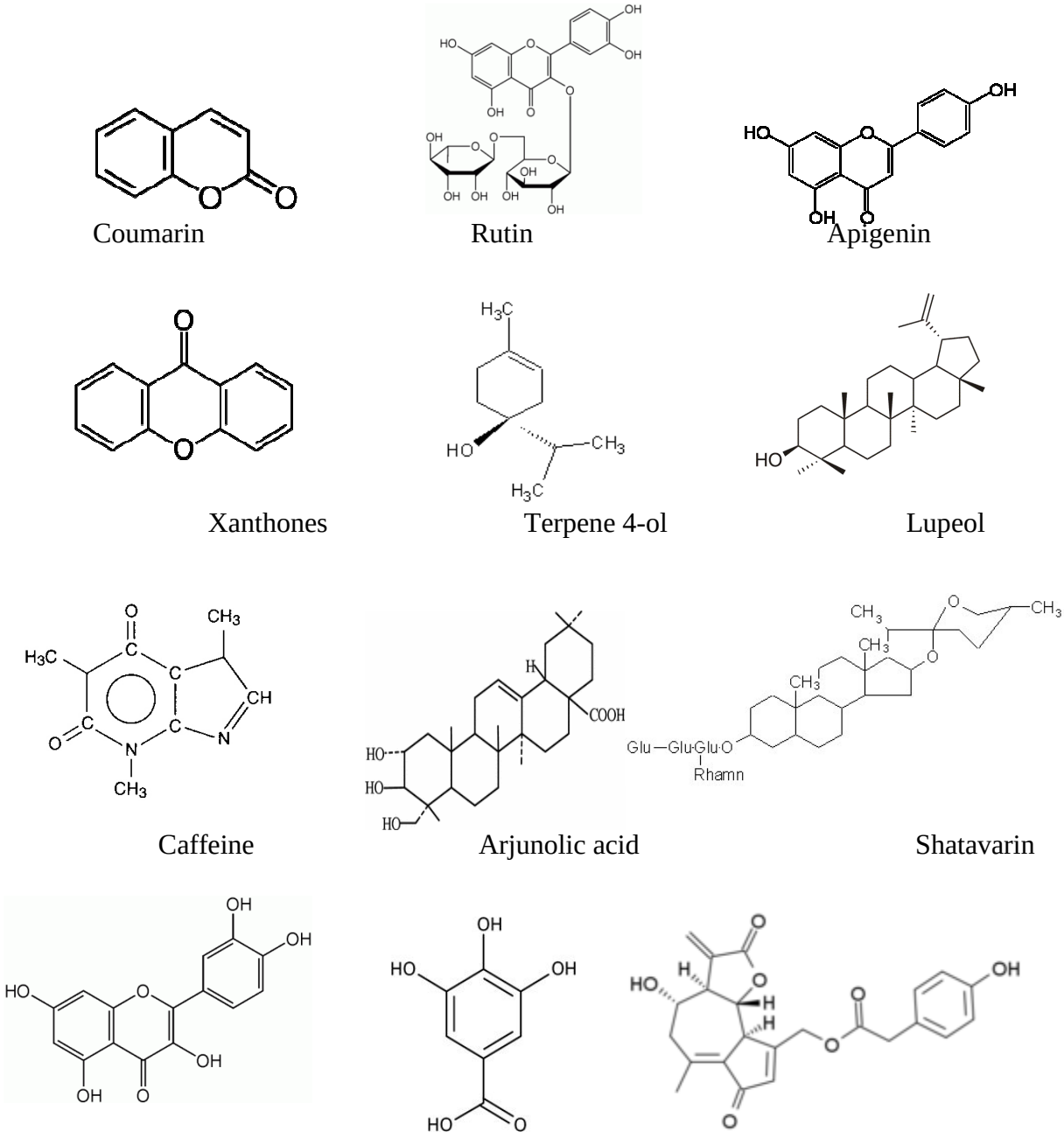

Fig. 1: Chemical structures of various phytoconstituents

Chemistry of plant diuretics

Wide ranges of phytoconstituents were responsible for diuretic activity includes alkaloids, glycosides, tannins, phenolics coumarins, triterpenoids *etc*. These phytoconstituents present in plant exert desired pharmacological effect on body and thus act as natural diuretic. Phenolics (flavanoids and tannins) of *Terminalia arjuna*, *Acacia suma*, *Camellia sinensis*, *Cuscuta reflexa*, *Mimusops elengi*; alkaloids of *Aerva lanata*, *Erythrina indica*, *Cordia rothii*, *Azima tetracantha*; coumarins of *Daucus carota*; triterpenes of *Taraxacum officinale*, *Abutilon indicum*; saponins of *Asparagus racemosus, Tribulus terrestris*; sesquiterpenes lactones of *Taraxacum officinale*; glycosides of *Opuntia ficus indica*, *Moringa oleifera* might be involved in the mechanism of diuretic activity[9-41].

Pharmacological activities:

Natural Diuretics acts by increasing the urine output as well as urinary electrolyte concentration. *Lepidium sativum*, *Costus speciosus*, *Phyla nodiflora*, *Withania coagulans*, *Tylophora indica*, *Thespesia populnea*, *Phyllanthus fraternus*, *Mimosa pudica* increases the sodium and potassium ion concentration in urine. *Spilanthes acmella*, *Tribulus alatus* acts as loop diuretics and *Rungia repens* might causes risk of hypokalemia due to increase in potassium level in urine[42-52]. There are many Indian medicinal plants reported for their remarkable diuretic activity, details have been provided in Table 2.

Table 2: List of some Indian medicinal Plants reported for their diuretic activity[42-52]

Sr. No.	Plant/family name	Extract	Dose (mg/kg)	Diuretic action
1.	*Lepidium sativum*, Curciferace	Aqueous, alcoholic	50, 100	Excretion of sodium was increased, potassium excretion was only increased by the aqueous extract
2.	*Costus speciosus*, Zingiberaceae	Aqueous, alcoholic	250	Significantly increases the urine output as well as urinary electrolyte concentration
3.	*Phyla nodiflora*, Verbenaceae	Aqueous, alcoholic	500	Urine volume, excretion of sodium and potassium ions were significantly increased
4.	*Withania coagulans* Solanaceae	Aqueous	750	Increased in the urine volume and electrolyte concentrations
5.	*Tylophora indica*, Asclepiadaceae	Aqueous, alcoholic	100	Urine volume, cation, anion concentrations significantly increased
6.	*Tribulus alatus*, Zygophyllaceae	Alcoholic	100	Loop diuretics increased urinary water and electrolytes excretion
7.	*Thespesia populnea*, Malvaceae	Aqueous, ethanol, chloroform	400	Na^+ and K^+ ion excretion was significantly elevated. But Chlorine ion excretion was not elevated significantly
8.	*Rungia repens*, Acanthaceae	Alcohol (50%)	400-800	Elevated levels of K^+ in urine, may increase risk of hypokalemia
9.	*Phyllanthus fraternus*, Euphorbiaceae	Methanol	100 200	Increase in volume of urine and urinary Na^+, K^+ and Cl^- ionic concentrations
10.	*Spilanthes acmella*, Compositae	Aqueous	500 1000 1500	Marked increase in urinary Na^+ and K^+ levels and a reduction in the osmolarity of urine suggested that it is mainly acting as a loop diuretic
11.	*Mimosa pudica*, Mimosaceae	Aqueous	100 200 400	Extract showed significant diuretic activity with increased electrolytes excretion

CONCLUSION

Many studies have been performed to identify diuretic compounds with pharmacologically activity and a limited toxicity. In this context, ethnopharmacology represents the most important way possible of finding interesting and therapeutically helpful molecules. From the above review

it should be evident that there are many Medicinal Plants which exerts diuretic activity at a particular dose. This review makes an attempt to give scientific account of use of Indian medicinal plants extracts in diuretics.

REFERENCES

[1] Meena AK, *Asian Journal of Traditional Medicines*, **2009**, 4 (4), 152-170.
[2] Shah VK; Zalavadiya V I; Sheth NR; Raval MK; Dudhrejiya AV; Golwala DK, *International Journal of Pharmaceutical Sciences and Drug Research*, **2010**, 2(1), 58-62.
[3] Gupta M; Shaw BP, *Indian Journal of traditional knowledge*, **2009**, 8 (3), 372-378.
[4] Tiwari S, *Journal of Natural Products*, **2008**, 1, 27-35.
[5] R Laxman; Acharya A; Jain V; Bhardwaj S; Sudhir B; Jain D, *Indian Journal of research in Ayurveda and Pharmacy,* **2010**, 1(2), 458-467.
[6] Sharma UK; Sharma UM; Singh A; Agarwal V, *Journal of Pharmacology Research,* **2010**, 1(2), 17-20.
[7] Premila MS. Ayurvedic herbs: A clinical guide to the healing plants of traditional Indian medicine, New York, The hawthorn press, **2006,** 151.
[8] Hussain MS; Ahmed KN; Ansari ZH, *International Journal of Health Research,* **2009**, 2(1), 59-64.
[9] Khare CP. Indian Medicinal Plants. 1st Edn., Berlin/Heidlburg, Springer verlang, **2007**.
[10] Nadkarni KM, Nadkarni AK. Indian Materia Medica 3rd Ed., Popular Prakashan Mumbai, **2005.**
[11] Kiritikar, K.R, Basu, B.D, Indian Medicinal Plants Vol. 8., International Book Distributors Dehradun, **1999**.
[12] Balamurugan G; Selvarajan S; Balakrishnan D; Muralidharan P, *Journal of Herbal Medicine and Toxicology*, **2010**, 4(1), 49-52.
[13] Sumanta M; Rabinarayan P; Suresh P; Kumar DG, *Indian Journal of research in Ayurveda and pharmacy*, **2010**, 1 (2), 510-514.
[14] Vetrichelvan T; Jegadeesan M, *Indian Journal of Pharmacology,* **2002**, 34, 115-118.
[15] Soundararajan P; Mahesh R; Ramesh T; Begum VH, *Indian Journal of Experimental Biology*, **2006**, 44, 981-986.
[16] Benjamin HSL; Moses AA; Sanchez A, *Journal of Ethnopharmacology,* **1991**, 31(3), 401-404.
[17] Jain S; Yadav PP; Gill V; Yasudeva N; Singla N, *Phytochem rev*., **2009**, 8, 491-502.
[18] Senthamarai R; Kavimani S; Jayakar B; Jayalakshami A; Jayasakti S; Sethuramani A, *Indian Drugs*, **1996**, 33, 478.
[19] Dong MY; Lumz Yin QH; Feng WM; Xu JX; Xu WM, *Jiangsu J Agricultural Sciences,* **1995**, 1(3), 46-55.
[20] Singh RP; Shokala KP; Pandey BL; Singh; RG Usha; Singh R, *J Ind Med Res,* **1992**, 11, 29-36.
[21] Ali ZN; Eddouks M; Michel JB; Sulpice T; Hajji L, *American Journal of Pharmacology and Toxicology*, **2007**, 2(3), 111-115.
[22] Mahran GH; Kadry HA; Isaac ZG; Thabet CK; Al-Azizi MM; El-Olemy MM, *Phytotherapy Research,* **1991**, 5 (4), 169–172.
[23] James JT; Dubery IA, *Molecules,* **2009**, 14, 3922-3941.
[24] Koti BC; Purnima A, *International Journal of Green Pharmacy,* **2008**, 21, 228-231.
[25] Iqbal S; Ahmed R; Muhammad F, *International journal of agriculture and biology,* **1999**, 1(3), 136-137.
[26] Rathi BS; Baheti AM; Khandelwal KR; Parakh SR; Bodhankar SL, *Indian Journal of traditional knowledge*, **2006**, 5(4), 471-473.

[27] Chauhan MG; Chavan SS, *Indian Journal of traditional knowledge,* **2009**, 8(4), 598-601.
[28] Jesupillai M; Jasemine S; Palanivelu M, *International Journal of Green Pharmacy,* **2008**, 218-219.
[29] Kane SR; Apte VA; Todkar SS; Mohite SK, *International Journal of ChemTech Research,* **2009**, 1(2), 149-152.
[30] Mamun MM; Billah MM; Ashek MA; Ahasan MM; Hossain MJ; Sultana T, *J. Med. Sci*., **2003**, 3(5-6).
[31] Bahuguna Y; Rawat MSM; Juyal V; Gupta V, *International Journal of Green Pharmacy,* **2009**, 155-158.
[32] Ghule BV; Ghante MH; Yeole PG; Saoji N, *Indian Journal of Pharmaceutical sciences,* **2007**, 69(6), 817-819.
[33] Ashok P; Koti BC; Vishwanathswamy AHM, *Indian Journal of Pharmacy*, **2010**, 42(6), 380-383.
[34] Caceres A; Saravia A; Rizzo S; Zabala L; Leon ED; Federico N, *Journal of Ethnopharmacology*, **1992**, 36(3), 233-237.
[35] Galati EM; Tripodo MM; Trovato A; Miceli N; Monforte MT, *Journal of Ethnopharmacology,* **2002**, 79, 17-21.
[36] Sharma S; Hullatti KK; Prasanna SM; Kuppast IJ; Sharma Paras, *Pharmacognosy Network Worldwide,* **2009**, 1(5), 327-330.
[37] Ahmed M, *Pharmacognosy Network Worldwide,* **2009**, 1(1).
[38] Grases F; March JG; Ramis M; Costa-Bauza, *Phytotherapy Research,* **1993**, 7(2), 146-149.
[39] Ali AM; Wahbi S; Twaij H; Al-Badr A, *Journal of Ethnopharmacology*, **2003**, 85(2-3), 257-260.
[40] Schutz K; Carle R; Schieber A, *Journal of Ethnopharmacology*, **2006**, 107 (3-11), 313-323.
[41] Goyal RK; Singh J; Lal H, *Indian Journal of Medical Sciences,* **2003**, 57(9), 408-414.
[42] Patel U; Kulkarni M; Undale V; Bhosale A, *Tropical Journal of Pharmaceutical Research,* **2009**, 8 (3), 215-219.
[43] Dubey S; Verma VK; Sahu AK; Jain AK; Tiwari K, *International journal of Research in Ayurveda and pharmacy*, **2010**, 1(2), 648-652.
[44] Shukla S; Patel R; Kukkar R, *International Journal of Pharmacy and Pharmaceutical sciences*, **2009**, 1(1), 85-91.
[45] Dabheliya J; Khan SA; Joshipura M; Vasoya M; Patel S; Vijaya S, *International Journal of Pharmacy and Pharmaceutical sciences*, **2010**, 2(4), 51-53.
[46] Meera R; Devi P; Muthumani P; Kameswari B; Eswarapriya B, J. *Pharm. Sci. and Res*., **2009**, 1(3), 112-116.
[47] Kadry HA; Abou Basha LI; Gindi OEI; Temraz A, *Journal of Pharmacy Research,* **2009**, 2(5), 792-794.
[48] Parthasarathy R; Ilavarasan R; Nandanwar R, *International Journal of Pharmaceutical Sciences and Research*, **2010**, 1(2), 72-77.
[49] Swain SR; Sinha BN; Murthy PN, *Indian Journal of Pharmaceutical Sciences*, **2008**, 70 (5), 679-683.
[50] Kalyani B; Khavane K; Payghan S; Setty RS, *International Journal of Pharmaceutical and Biological Archives*, **2010**, 1(4), 389-392.
[51] Ratnasooriya WD; Pieris KPP; Samaratunga U; Jayakody JRAC, *Journal of Ethnopharmacology*, **2004**, 91(2-3), 317-320.
[52] Sangma TK; Meitei UD; Sanjenbam R; Khumbongmayum S, *Journal of Natural Products,* **2010**, 3, 172-178.