Available online at www.scholarsresearchlibrary.com

Scholars Research Library

J. Nat. Prod. Plant Resour., 2011, 1 (1): 91-100
(http://scholarsresearchlibrary.com/archive.html)

Cressa Cretica Linn: An Important Medicinal Plant-A Review on Its Traditional Uses, Phytochemical and Pharmacological Properties

Sangeeta Rani[1*], Sudhir Chaudhary[1], Pradeep Singh[1], Garima Mishra[1], K. K. Jha[1], R. L. Khosa[2]

[1]*Department of Pharmacognosy, Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India, 244001.*
[2]*Deptt. of Pharmacy, Bharat Institute of Technology, Partapur Bypass, Delhi Road, Meerut.*

ABSTRACT

The importance of medicinal plants in traditional health care practices, providing clues to new areas of drug research and biodiversity conservation is now well recognized. Cressa cretica (Linn) belonging to family Convolvulaceae, commonly known as Rudravanti is a erect, small, dwarf shrub, usually grows in sandy or muddy saline habitats. Though almost all of its parts are used in traditional systems of medicines, leaves and roots are the most important parts which are used medicinally. The present article gives an account of updated information on its phytochemical and pharmacological properties. The review reveals that wide numbers of phytochemical constituents have been isolated from the plant which possesses activities like antibacterial, antifungal, antitussive, testicular functions, antifertility activities and various other important medicinal properties. It is known to possess flavonoids, heavy metals, lead, copper, zinc and nickel present in Cressa cretica. It contains terpenic compounds, syringaresinol-β-d-deglucoside, triacontanoic acid, stigmasterol, ursolic acids, β-amyrin and edible fixed oil. It also contains quercetin, n-octacosanol, scopoletin and umbelliferone.

Keywords: *Cressa cretica*, Rudanti, pharmacological properties, scopoletin

---

INTRODUCTION

In the last few years there has been an exponential growth in the field of herbal medicine and these drugs are gaining popularity both in developing and developed countries because of their natural origin and less side effects. Many traditional medicines in use are derived from medicinal plants, minerals and organic matter. [1] A number of medicinal plants, traditionally used for over 1000 years named rasayana are present in herbal preparations of Indian traditional health care systems. [2] In Indian systems of medicine most practitioners formulate and dispense their own recipes. [3]

Plant based drugs have been in use against various diseases since time immemorial. The primitive man used herbs as therapeutic agents and medicament, which they were able to procure

easily. The nature has provided abundant plant wealth for all living creatures, which possess medicinal virtues. [4] The important values of some plants have long been published but a large number of them remain unexplored as yet. So there is a necessity to explore their uses and to conduct pharmacognostic and pharmacological studies to ascertain their therapeutic properties. [5]

Herbal medicines have a strong traditional or conceptual base and the potential to be useful as drugs in terms of safety and effectiveness leads for treating different diseases. World Health Organization has made an attempt to identify all medicinal plants used globally and listed more than 20,000 species. [6] According to the WHO more than 80% of the world's population realise on traditional herbal medicine for their primary health care. [7] Although herbal medicine has existed since the dawn of time, our knowledge of how plants actually affect human physiology remains largely unexplored. Numbers of plants are claiming various medicinal uses and many researches are going on in this view. India is one among the 25 hotspots of the richest and highly endangered eco-regions of the world. [8]

Cressa cretica (Linn) belonging to family Convolvulaceae, commonly known as Rudravanti is a erect, small, dwarf shrub, [9] usually grows in sandy or muddy saline habitats along with the species *Suaeda maritima*, *Salicornia europaea*, *Salsola soda*, *Limonium vulgare* subsp. *Serotinum*, and *Crypsis aculeate*. [10] Variation in *Cressa* has been handled in two ways: extreme lumping into the single species *C. cretica*, or extreme splitting of every morphological variant into 19 species. [11-15] Those in the New World represent *C. nudicaulis* and *C. truxillensis*. [16-18] The two in the Old World, however, are still being placed in a single species, *C. cretica*. [15-21]

Taxonomic classification

Kingdom	–	Plantae
Phyllum	-	Angiosperms
Class	-	Magnoliatae
Subclass	-	Asteridae
Order	-	Polemoniales
Family	-	Convolvulaceae
Genus	-	*Cressa*
Species	-	*Cretica*

Synonyms

Sanskrit	-	Rudanti
Hindi	-	Rudravanti
Oriya	-	Dahna
Bengali	–	Rudravanti
Tamil	-	Uppusanaga
Telugu	-	Uppugaddi, Uppusenaga
Kannada	-	Mullumaddugida
Konkani	-	Chaval
Malayalam	-	Azhukanni
Marathi	-	Lona, Rudravanti

Geographical Source

C. cretica is a remarkable salt tolerant plant, common in coastal areas [22] usually occurring in mono specific stands along the landward edge of marshes. [23] This plant is distributed throughout India, Timor, and Australia (Western Australia, Northern Territory, Southern Australia, Queensland, New South Wales, Victoria).

Morphology

C. cretica L. is an erect, small, dwarf shrub [24] upto 38cm height. Roots are horizontal, geminate, with lateral branches leading upward to produce above-ground parts. It is a perennial sub shrub or herb, usually much-branched. Stems are at first erect and then become decumbent, apparently short-lived, gray appressed pilose to sericeous. Leaves on main branches are often larger than those on branchlets, the blade 1-12 mm long, lanceolate, ovate or elliptic- to scale-like, sessile, Peduncle lengths, stamen lengths, filament pubescence and ranges distinguish. [25-28] Flowers are solitary, white or pink, axillary, 5-8 mm long, sessile or on short peduncles, bracteates, in spicate to head-like clusters at tips of branchlets, bracteoles unequal in length. Sepals ovate to obovate imbricate. Corolla salver form, the limb 5-lobed, the lobes mostly ovate, imbricate, spreading to reflexed. Stamens exserted; filaments filiform; styles exserted. Ovary 2-locular, 4-ovulate; styles 2, distinct to the base; stigmas capitate. Fruit is capsular, ovoid, unilocular, 2-4-valved, and usually one-seeded. Seeds are 3-4 mm long, glabrous and smooth, and shining to reticulate, dark brown. [26,27,28]

Fig. Leaves & Flowers of *Cressa cretica*

Traditional Uses

Traditionally, the plant is used in diabetes and asthma. It is used as an expectorant, stomachic, antibilious and altenative. [29] The plant has anthelmintic, stomachic, tonic and aphrodisiac purposes, enriches the blood and is useful in constipation, leprosy, asthma and urinary discharges. [30] It is reported to be antibilious, antitubercular and expectorant. [31, 32] The plant is traditionally used in Bahrain as expectorant and antibilious agent. [32] Dry leaves of *C. cretica* crushed with sugar are used as emetic in Sudan. [33]

Phytochemistry

Bahar Ahmed (1998) reported the alc. ext. of fruits of *Cressa cretica* Linn. has afforded a new coumaranochromone glycoside, designated as cresoside. It has been characterized as 7,4'-dihydroxy-5-methoxycoumaranochromone-7-O-β-D-glucoside on the basis of spectral and chem. methods. [34]

Ramidi Ramachandran *et al* (2003) isolated eight acyclic terpenic compounds namely cressanyl

ester A, B, C, D, E, F and G, and cressatriterpenic acid were isolated from the air-dried and coarsely powdered aerial part extracts of *C. cretica* using silica gel column chromatography. The chemical structures of the compounds were elucidated using nuclear magnetic resonance. [35]
A.A. Shahat *et al* (2004) reported 1H-NMR and revised 13C-NMR assignment of syringaresinol-β-d-glucoside from *Cressa cretica*. [36]

A.A. Shahat *et al* (2004) revealed five flavonoids from the aerial parts of *Cressa cretica* L. which were identified as quercetin, quercetin-3-O-glucoside, kampferol-3-O- glucoside, kampferol-3-O-rhamnoglucoside and rutin. All of the isolated flavonoids were identified by spectroscopic methods (UV, FAB-MS, 1H NMR and 13C NMR). The isolated flavonoids, except quercetin, are reported here for the first time from *Cressa cretica* L. [37]

S. Hussain *et al* (2005) isolated seven compounds from *Cressa cretica* namely triacontanoic acid, 24-hydroxy-4-octacosanone, 24-nor-12-ursene, β-amyrin, stigmasterol, ursolic acid, and stigmasterol 3-O-β-D-glucoside, respectively. Their structures have been elucidated by EIMS, HREIMS, FAB, HRFABMS, 1H and 13C NMR spectroscopic data. [38]

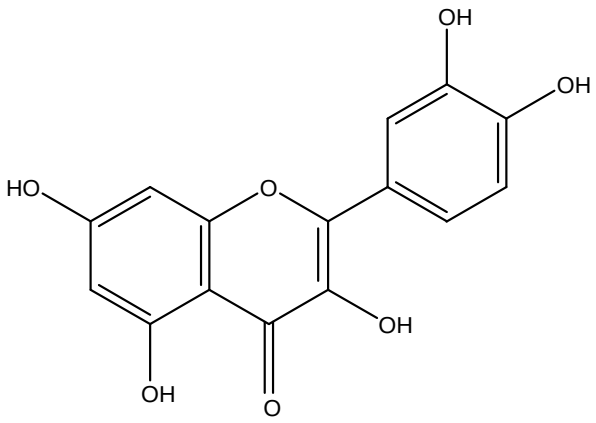
S. Raje *et al* (2006) analysed four common heavy metals lead, zinc, copper and nickel by Atomic Absorption Spectroscopy (AAS). AAS is one of the analytical techniques used for quantitative determination of trace elements. [39]

D.J. Weber (2007) reported that seeds of *Cressa cretica* were analyzed to determine their potential to be used as source of edible oil. The quantity of oil present varied from 22% to 25%. The lipids in the seeds were found to contain 12 unsaturated fatty acids and four saturated fatty acids. The ash content also ranged from 2%-39%. [40]

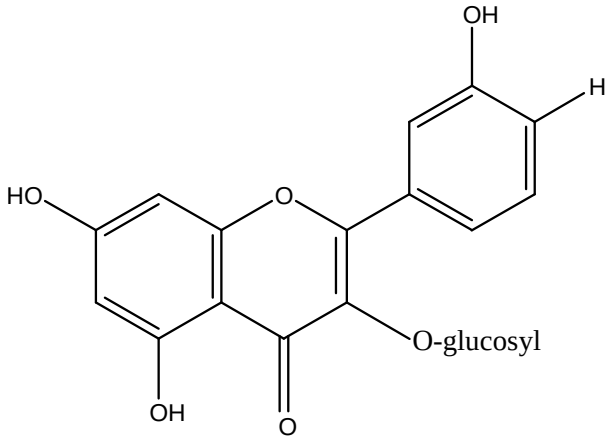
I. I. Mohamad (2007) investigated the fixed oil extracted from *C. cretica* for fatty acid, sterols, hydrocarbons and tocopherol contents. The total lipids were 10 g/kg (dry weight basis). Majority of fatty acids were of the unsaturated type (50.4 of the total), while the saturated, mainly palmitic acid was 43.2%. Oleic acid was the most abundant followed by palmitic and lioleic acid. Sterols were obtained at high amounts in the oil, and the main component was β -sitosterol. Other phytosterols (stigmasterol, δ^{7}-avenasterol and δ^{5}-avenasterol) were detected at approximately equal amounts (6.9% of the total). The main hydrocarbons identified were C21, C26 and C32, comprising approximately 61.2% of the total hydrocarbons. Lower C12, C18 and C22 were also detected. Tocopherol levels were high in the oil (3.36 g/kg). β-Tocopherol was the main component followed by α-isomer. Both tocopherol components comprised more than 87% of the total vitamin E content in the oil. γ- and ζ-Tocopherol were detected in small amounts in the oil, accounting for 14-16% of the total vitamin E content. [41]

A.J. Pirzada *et al* (2009) determined some basic elements, Al, Ca, Cu, Fe, Mg, Mn, P, S and Zn from the medicinal plant *Cressa cretica*, by using atomic absorption spectrophotometry and U V spectrophotometry. The plant contains considerable amount of elements which have therapeutic effects in skin diseases. [42]

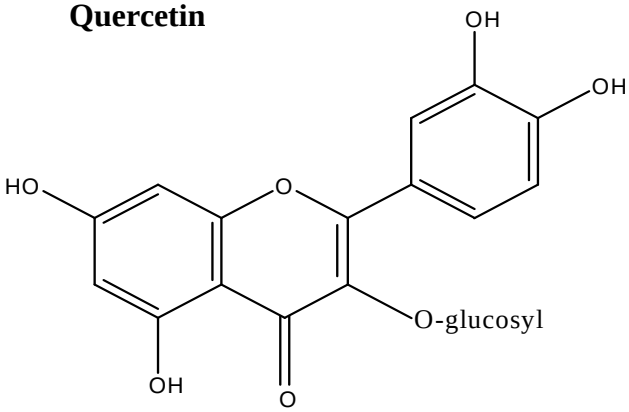
Chemical analysis of minerals present in aqueous extractive of shrub and analysis of ash was performed. [43] A quercetin glycoside was detected from *Cressa cretica* L. [44] B-sitosterol, its glycoside, n-octacosanol, umbelliferone, scopoletin, isopimpinellin and quercetin were also isolated. [45] *Cressa cretica* contained moderate amount of terpenes and tannins and small amount of saponins and flavonoids. [46]



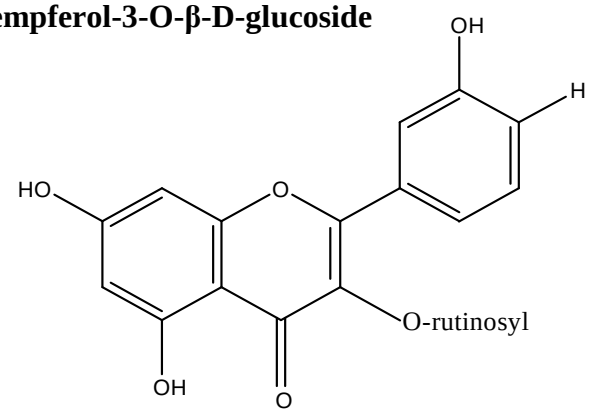
Quercetin



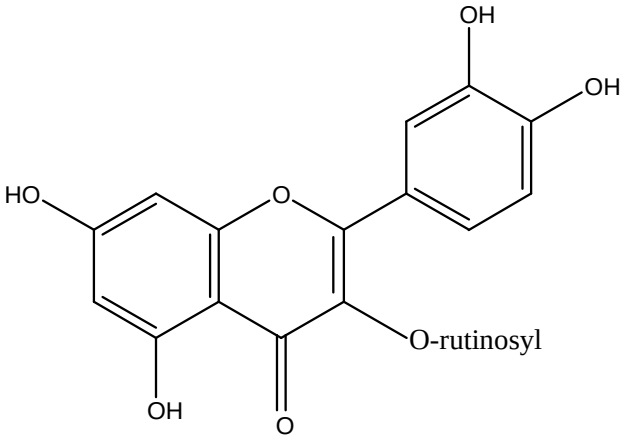
Kaempferol-3-O-β-D-glucoside



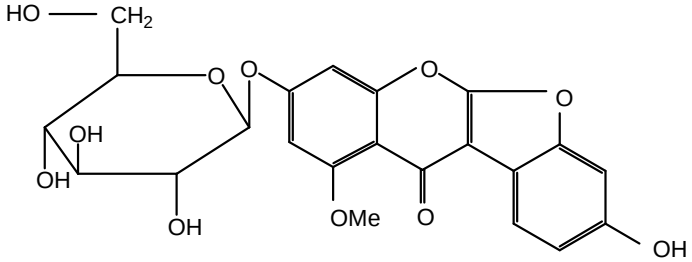
Quercetin-3-O-β-D-glucoside



Kaempferol-3-O-α-L-rhamnosyl (1→6)-O-β-D-glucoside



Quercetin-3-O-α-L-rhamno-(1→6)-β-D-glucoside (rutin)



7, 4'-dihydroxy-5-methoxycoumaranochromone-7-O-β-D-glucoside

Structures of some phytoconstituents isolated from *Cressa cretica*

Pharmacological activity

Antifungal activity

Qaher Mandeel *et al* (2005) reported the highest ethanol extract activity was exhibited by *Cressa cretica* L. against *Penicillium citrinum* Thom (32.2 mm) followed by *Candida albicans* (C. P. Robin) Berkhout (25.7 mm). The diffusable metabolites of *Heliotropium curassavicum* also demonstrated marked inhibitory effect against the same microorganisms. [47]

A.J. Pirzada *et al* (2009) reported antifungal activity of crude solvent extract of *Cressa cretica* have been investigated against Dermatophytic fungi, *Aspergillus niger*, *Aspergillus flavus*, *Paecilomyces varioti*, *Microsporum gypseum* and *Trichophyton rubrum*. The various crude solvent extracts were found to be effective against test organism but the chloroform and the aqueous extracts appeared to be most effective antifungal agents as compared to ethanol, methanol and ethyl acetate extract. More over in present study some basic elements, Al, Ca, Cu, Fe, Mg, Mn, P, S and Zn have been determined from the medicinal plant *Cressa cretica*, by using atomic absorption spectrophotometry and UV spectrophotometry. The medicinal plant *Cressa cretica* contains considerable amount of elements which have therapeutic effects in skin diseases. [48]

Antifertility activity

MJ Shah *et al* (1997) reported the preliminary studies which identified *Cressa cretica's* male contraception properties. [49]

Testicular function

Gupta, R.S. *et al* (2006) reported the oral administration of a methanolic extract of *Cressa cretica* at a dose level of 100 mg/kg/day for a period of 60 days led to a significant decrease in the weight of testis, epididymis, seminal vesicle and ventral prostate. *Cressa cretica* reduced the fertility of male rats by 100%. There was a marked reduction in the number of primary spermatocytes, secondary spermatocytes and spermatids. Sertoli cell counts as well as the cross-sectional surface area were significantly decreased. Leydig cell nuclear area and the number of mature Leydig cells were also significantly decreased. The protein, sialic acid, glycogen and cholesterol content of the testis, the fructose in the seminal vesicle and protein and sialic acid in the epididymis were significantly decreased. Serum testosterone levels were also reduced after *Cressa cretica* treatment. The RBC and WBC counts, haemoglobin, hematocrit, blood sugar, serum cholesterol, phospholipids, triglyceride and HDL-cholesterol were within the normal range. The methanol extract of *Cressa cretica* produced intrusion in testosterone production and affected spermatogenesis in male albino rats. [50]

Antibacterial activity

S. Chanda *et al* (2007) investigated the *in vitro* screening of antibacterial activity of aqueous and alcoholic extracts of various Indian plant species against selected pathogens from enterobacteriaceae. They have taken 34 medicinal plants, belonging to 28 different families; they were screened for potential antibacterial activity against six bacterial strains belonging to Enterobacteriaceae, viz. *Enterobacter aerogenes*, *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *P. vulgaris* and *Salmonella typhimurium.* Antibacterial activity of aqueous and alcoholic extracts was tested by the agar disc diffusion and agar well diffusion methods. The ethanol/methanol extracts were more active than aqueous extracts for all the plants studied. The most susceptible bacterium was *K. pneumoniae*, while the most resistant bacteria were *S. typhimurium* and *E.coli*. [51]

J. Parekh *et al* (2008) have also investigated 34 Indian medicinal plants belonging to 28 different families; they were screened for potential antibacterial activity against three *Staphylococcus* species, namely *Staphylococcus aureus, S. epidermidis and S. subflava.* Antibacterial activity of aqueous and alcoholic extracts was performed by agar disc diffusion method and agar well diffusion method. The alcoholic extracts were more active than aqueous extracts for all the plants studied. The most susceptible bacterium was *S. aureus*. The *in vitro* susceptibility testing of the studied *Staphylococcus* strains was done against standard antibiotics (chloramphenicol, ciprofloxacin, gentamycin, piperacillin, imipenem). [52]

KA Laghari *et al* (2009) reported that antifungal activity of crude solvent extract of *Cressa cretica* have been investigated against Dermatophytic fungi, *Aspergillus niger, Aspergillus flavus, Paecilomyces varioti, Microsporum gypseum, and Trichophyton rubrum*. The various crude solvent extracts were found to be effective against test organism but the chloroform and the aqueous extracts appeared to be most effective antifungal agents as compared to ethanol, methanol and ethyl acetate extract. More over in present study some basic elements Al, Ca, Cu, Fe, Mg, Mn, P, S and Zn have been determined from the medicinal plant *Cressa cretica* by using atomic absorption spectrophotometry and UV spectrophotometry. The medicinal plant *Cressa cretica* contains considerable amount of elements which have therapeutic effects in skin diseases. [53]

P. Sunita *et al* (2009) reported *Cressa cretica* Linn. Voigt. (Convolulaceae) has also been extensively used to get relief from asthma and cough by the indigenous people of India. In the present study the antitussive effect of the plant was evaluated in two different experimental models. The antitussive effect of aerosols of two different concentrations (2.5% w/v, 5% w/v) of methanolic extract of *Cressa cretica* Linn. (CME), codeine(0.03g/ml) and normal saline were tested by counting the numbers of coughs produced due to aerosols of citric acid 10 min after exposing the male guinea pigs to aerosols of different solutions (n=6). In another set of experiment CME was investigated for its therapeutic efficacy on a cough model induced by sulfur dioxide gas in mice. The results showed significant reduction of cough number obtained in the presence of both concentrations of CME and codeine. The antitussive effect on guinea pigs of higher concentration of CME was significantly ($p<0.01$) greater than those of lower concentration and the prototype antitussive agent codeine phosphate ($p<0.01$). It exhibited significant antitussive activity as that of codeine phosphate, when compared with control in a dose dependent manner in sulfur dioxide gas induced cough model. The extract at 100, 200 and 400 mg/kg, p.o. showed inhibition of cough by 22.1, 34.35 and 55.44 % within 90 min of performing the experiment. [54]

CONCLUSION

Medicinal plants, which form the backbone of traditional medicine, have in the last few decades been the subject for very intense pharmacological studies; this has been brought about by the acknowledgement of the value of medicinal plants as potential sources of new compounds of therapeutic value. It is quite obvious that *Cressa cretica* is known to possess antibacterial, antifungal, antitussive, testicular functions and antifertility activities. It is known as a rich source of flavonoids, heavy metals, lead, copper, zinc and nickel present in *Cressa sp.* might be medicinally important and/or nutritionally valuable. It contains terpenic compounds, syringaresinol-β-d-deglucoside, triacontanoic acid, stigmasterol, ursolic acids, β-amyrin and edible fixed oil. It also contains quercetin, n-octacosanol, scopoletin and umbelliferone. The present review summarizes some important pharmacological studies on *Cressa cretica* and phytochemical investigations and isolated principles from them, which can be investigated

further to achieve lead molecules in the search of novel herbal drugs.

Acknowledgement
The authors are thankful to Hon'ble Chancellor, Teerthanker Mahaveer University, Moradabad for providing literature survey facility to carry out the work.

REFERENCES

[1] J.K. Grover, S.Yadav, V. Vats. *Journal of Ethnopharmacology*, **2002,** 81, 81–100.
[2] P. Scartezzini, E. Sproni. *Journal of Ethnopharmacology*, **2000,** 71, 23–43.
[3] S.D. Seth, B. Sharma, *J. Med. Res*, **2004**, 120, 9–11.
[4] G.R. Bhatti, R. Qureshi, M. Shah. *Scientific Sindh*, **1998**, 5, 13-22.
[5] S.R. Baquar. *Medicinal and poisonous plants of Pakistan* Karachi. **1989**, 95-96, 184-185, 248-249, 337-440.
[6] M.M. Pandey, S. Rastogi, A.K. Rawat. *The Internet Journal of Alternative Medicine*, **2008,** 6(1), 1-10.
[7] Vijayan Arun, V.B. Liju, John J.V. Reena, B. Parthipan, C. Renuka. *Indian Journal of Traditional Knowledge*, **2007,** 6(4), 589-594.
[8] N. Myers, RA Mittermeier, CG Mittermeier, GA Fonsec, Kent J. Biodiversity hotspots for conservation priorities. Nature. **2000**, 403, 853-8.
[9] V. Tackholm. *Student flora of Egypt*, second edition. **1974.**
[10] M. Milovi, L. Markovi. *Cressa cretica L.* (convolvulaceae) in the flora of Croatia. *Nat Croat.* **2000**, 13, 9-18.
[11] LN Goodding. Southwestern plants *Bot Gaz.* **1904**, 37, 53-9.
[12] HD House. *Bull Torrey Bot Club*. **1906**, 33, 313-318.
[13] PA Rydberg. *Bull Torrey Bot Club* **1913**, 40, 461-85.
[14] JD Choisy. Convolvulaceae. In: De Candolle A, editor. Prodromus. **1845**, 9, 323-465.
[15] B. Verdcourt *Convolvulaceae. Flora of Tropical East Africa*. London: Crown Agents for Oversea Governments and Administrations. **1963**, 1-161.
[16] CA O'Donell. Convolvula´ceas Argentinas. Lilloa Plant systematics and evolution.**1959**, 29, 87-343.
[17] LH Shinners Manual of the vascular plants of Texas. In: DS Correll, MC Johnston, editors. Convolvulaceae. Renner: Texas Research Foundation. **1970**, 1241-61.
[18] DF. Austin. *A Revised Handbook of the Flora of Ceylon. In: MD Dassanayake, FR Fosberg, editors.* Convolvulaceae. New Delhi: Amerind Publishing Corporation, **1980**.288-363.
[19] SJ Ooststroom. *Flora Malesiana. Addenda corrigenda emendata*. Groningen: Wolters-Noordhoff, **1972**, 940-941.
[20] RW Johnson. *Flora of Central Australia. In: Jessop J, editor.* Convolvulaceae. Sydney: Reed Books Pvt Ltd. **1981**, 284-289.
[21] RW Johnson. *Flora of New South Wales. In: Harden G J, editor* Convolvulaceae. Sydney, Australia: New South Wales University Press, **1992**, 3, 373-84.
[22] A. A. Shahat, N. M. Nazif, A.S. Nahla, P. Luc, V. J. Arnold. *Qatar Uni. Sci. J.* **2005**, 25, 72-77.
[23] Weber D.J., Ansari R., Gul B., Khan M. Ajmal. *Journal of Arid Environments*, **2007**, 315-321.
[24] S. Chaudhary, R.L. Khosa, K.K.Jha, N. Verma. *Pharmacologyonline.* **2010,** 3, 181-188.
[25] F. Daniel, A. Austin. *Botanical Journal of the Linnean Society*. **2000,** 133(1), 27-39.
[26] KN Ganeshaiah, R Vasudeva, R Uma Shaanker. *Curr Sci.* **2009**, 97, 484-489.
[27] Saxena HO, Brahmam M. *The Flora of Orissa*. Bhubaneswar: Capital Business services and consultancy; **1995**, 3, 1563.

[28] PK Warrier, VP Nambier, C. Ramankutty. *Indian medicinal plants a compendium of 500 species*, New Delhi India, CSIR, Vol. 1, **1990**, 219.
[29] C.P. Khare, *Indian medicinal plants*, Springer (India) Private Limited, **2007**, 177-178
[30] RN Chopra, SL Nayar, IC Chopra. *Glossary of Indian Medicinal Plants*. National Institute of science communication and information resources, New Delhi, **2006**, 80.
[31] S Satakopan , GK Karandikar. *J Sci Ind Res, C Biol Sci*. **1961**, 20,156.
[32] AM Rizk, GA El-Ghazaly. *Medicinal and Poisonous Plants of Qatar*. University of Qatar. Scientific and Applied Research Centre. **1995**,101.
[33] Hocking Macdonald G. A Dictionary of Natural Products. Medford, N.J.7 Plexus Publishing,**1997**.
[34] Bahar Ahmed. Cresoside: a new coumaranochromone glycoside from fruits of Cressa cretica Linn Indian Journal of Natural Products **1998**, 14(2), 29-32.
[35] Ramidi Ramachandran Mohd. Ali. Isolation and characterization of acyclic terpenic constituents from *Cressa cretica* aerial parts. Journal of Medicinal and Aromatic Plant Sciences. **2003,** 25(1), 81-90.
[36] A.A Shahat, N.S. Abdel-Azim, L. Pieters, A.J. Vlietinck. *Fitoterapia*. **2004**, 75(7-8), 771-773.
[37] A.A Shahat, N.S. Abdel-Azim, L. Pieters, A.J. Vlietinck. *Pharmaceutical Biology*.**2004**, 42(4-5), 349-352.
[38] S. Hussain, E. Ahmed, A. Malik, A Jabbar, M. Arshad, *Journal of the Chemical Society of Pakistan*. **2005**, 27(3), 296-298.
[39] S. Raje, R.T. Sane, K. Mangaonkar, S. Shailajan, G. Pathak, N. Jariwala, D. Kasar, *Journal of the Indian Chemical Society*.**2006** , 83(6), 611-612.
[40] D. J. Weber, R. Ansari, B. Gul, M. Ajmal Khan, *Journal of Arid Environments* **2007**, 68 (2), 315-321.
[41] Mohamed, I. I. *Bulletin of Faculty of Agriculture, Cairo University*. **2007**, 58(4), 251-255.
[42] Pirzada, A. J. Shaikh, W. Ghani, K. U. Laghari, K. A. *Sindh University Research Journal (Science Series)*. **2009**, 41(2), 15-20.
[43] Ram P. Rastogi, B.N. Mehrotra. *Compendium of Indian Medicinal plants*. Central Drug Research Institute, Lucknow and National institute of science communication and information resources, New Delhi, Vol.I, **2004,** 126.
[44] Ram P. Rastogi, B.N. Mehrotra. *Compendium of Indian Medicinal plants*. Central Drug Research Institute, Lucknow and National institute of science communication and information resources, New Delhi, Vol. II, **2006**, 217.
[45] Ram P. Rastogi, B.N. Mehrotra. *Compendium of Indian Medicinal plants*. Central Drug Research Institute, Lucknow and National institute of science communication and information resources, New Delhi, Vol. III, **2005**, 254.
[46] Anonymous *The Wealth of India* - Second supplement series (raw materials), National institute of science communication and information resources, CSIR, Dr K S Krishnan Marg, New Delhi, **2007**, Vol.I (A-F), 243.
[47] Qaher Mandeel Ahmed Taha. *Pharmaceutical Biology*. **2005**, 43(4), 340-348.
[48] A. J. Pirzada, W. Shaikh, K. U. Ghani, K. A. Laghari, *Sindh University Research Journal (Science Series)*, **2009**, 41(2), 15-20.
[49] M. J Shah, S. Fazil, T. Faheem, A. Waheed. *Hamdard Medicus*. **1997**. 40(2), 34-36.
[50] R.S. Gupta, J.B.S. V. Khushalani, K. Tanwar, Y.C Joshi. *Pharmaceutical Biology*. **2006**, 44 (5), 382-388.
[51] J. Parekh, S. Chanda. *African Journal of Microbiology Research*. **2007**, 1(6), 92-99.
[52] J. Parekh, S. Chanda. *Turk J Biol*. **2008**, 32, 63-71.
[53] K.A. Laghari A. J. Pirzada, W. Shaikh, K. U. Ghani. *Sindh Univ. Res. Jour. (Sci. Ser.)*. **2009**, 41 (2), 15-20.

[54] P. Sunita, S. Jha S.P. Pattanayak. *Pharmacognosy Research.* **2009**. 1(3), 157-161.