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Review Article

PHYTOCHEMICAL AND PHARMACOLOGICAL STATUS OF INDIAN MEDICINAL PLANT *NARINGI CRENULATE* (Roxb.) NICOLSON-MINIREVIEW

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ABSTRACT

Naringi crenulate is extensively used as traditional medicine for the treatment of numerous diseases in India. It is reported to have antimicrobial activity, wound healing property, larvicidal and anticancer and hepatoprotective activity. Chemical investigations of this plant have revealed the presence of alkaloids, amino acids, phenolics and fatty acids etc., *Naringi crenulate* has shown promise as an effective bio-control agent. The present Mini review includes the detailed exploration of traditional uses, phytochemical and pharmacological properties and actions of whole plant extract reported so far.

Keywords: *Naringi crenulate,* Medicinal plant, Phytochemistry, Traditional medicine, Biological activity.

INTRODUCTION

One of the barebones for the triumph of head medical services is the openness and utilization of pertinent medications. Conventional medication, since the early development of human progress, has been the most reasonable and moderate wellspring of treatment in the medical services framework, which is the reason individuals keep on depending on plants for numerous issues (Mukherjee *et al*., 2010; Sarkar *et al*., 2021). Therapeutic plants are utilized as a solution for different sicknesses in their everyday practice. Plants are normally gifted for their capacity to integrate different restorative and bioactive mixtures. Plant based medications have been utilized worldwide in customary prescriptions for the treatment of various illnesses and India is the biggest maker of therapeutic spices universally (Ahmedulla and Nayar, 1999). Around 70,000 plant species were utilized for various helpful purposes all through the world. Especially in India, in excess of 2500 plant species have therapeutic worth; Sri Lanka around 1400 and Nepal around 700 plant species are demonstrated to have restorative worth (Prajapati, 2003). As indicated by a review in 1993, World Wellbeing Association (WHO) uncovered that 80% of the populace living in the non-industrial nations utilizes restorative plants as conventional medication for their essential medical care needs (WHO, 1993; Vallinayagam *et al*., 2018). Medicinal plants contain various constituents such as alkaloids, flavonoids, tannins, phenols, saponins, and glycosides, with notable biological activities such as antimicrobial, analgesic, antipyretic, antitumor, wound healing, and cardioprotective, among others that can be useful against diverse human diseases (Salehi *et al*., 2020).

Naringi crenulata Roxb (or) *Limonia crenulata* (Synonym: *Hesperethusa crenulata* (Roxb.) M. Roem.) Is a Rutaceae family, spinous glabrous small tree, grows tropical Africa and Asia. It is commonly known as "Mahavilvam" in Tamil. Leaves are given with milk to youngsters to fix the stomach related issues, solution for epilepsy. The leaves are fragrant very much like some other citrus leaves (Latha *et al*., 2005). It is circulated all through India, particularly in the southern Western Ghats, South and Focal Sahyadris and Indomalysia (Sampathkumar and Ramakrishnan, 2011). *Naringi crenulata* plant from the group of Rutaceae is one of the biggest spread species. The

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root concentrate of *N. crenulate* has generally been utilized in injury recuperating, and the organic product remove is used as n insect poison. Effective injury can be treated by applying bark squeeze remotely (Sarada *et al*., 2011) and the methanolic extract of this plant has been anthelmintic (Ramani *et al*., 2010). The ethanolic extract of leaf and bark of the plant possesses several properties like anticancer (Sarada *et al*., 2014), hepatoprotectives (Sarada *et al*., 2014), aphrodisiac activity, anti-inflammatory activities. The phytochemical study of the plant shows the presence of phenolic compounds, which are chemopreventive in action. This review aims to show the current scenario on the ethnomedicinal, phytochemical, and pharmacological profiles of *Naringi crenulata*.

Plant Taxonomy

The taxonomic hierarchy of *Naringi crenulata* is the following (Sarada *et al*., 2014).

Division	: Angiosperms
Class	: Dicotyledons
Sub Class	: Polypetalae
Series	: Disciflorae
Order	: Sapindales
Family	: Rutaceae
Genus	: *Naringi*
Species	: *crenulata* (Roxb.)

Trees, grows up to 10 m, equipped with sharp lone or matched axillary spines; bark yellowish-dim, smooth, corky; blast yellow; branch let's calculated, glabrous. Leaves imparipinnate, substitute, estipulate; rachis 2.5-10 cm since quite a while ago, winged, wings obovate-oval, glabrous, punctate; pamphlets 3-7, inverse, sessile, estipellate; lamina 1-6 x 0.7-2.4 cm, elliptic or elliptic-obovate, base intense or sideways intense, peak inhumane to emarginate, edge crenate, glabrous, plentifully translucent organ dabbed; organs dimorphic; coriaceous; sidelong nerves 4-10 sets, pinnate, thin, faint, intercostae reticulate, faint. Blossoms sexually open, white, in hardly any bloomed axillary racemes; pedicel 8-10 mm long; sepals 4, free or joined at base, applaud orbicular, glandular; petals 4, free, elliptic or oval, white, glandular, glabrous; stamens 8, subequal, free, embedded round the plate; fibers subulate; anthers yellow, apiculate, circle meager, glandular; ovary predominant, globose, 4-celled, glabrous, glandular, ovule 1 in every cell.; style bold; shame capitate; Natural product a berry, 6-8 mm across, subglobose, pale blue dark, glandular; seeds 1-4, dull yellow, smooth (Rambabu *et al*., 2019).

MATERIALS AND METHODS

The literature search was performed using the databases: Google, Google Scholar, Scopus, Springer Link, Web of Science, Science Direct, Pub-Med. The scientific databases were chosen based on the topic covered (i.e., ethnobotany, ethnomedicinal uses, ethnopharmacology, pharmacology, phytochemistry, and therapeutic value) and geographical coverage (i.e., Asia and Africa). The common keyword "*Naringi crenulata*" was used to search published materials, which was then paired with "traditional uses," "ethnopharmacology," "phytochemistry," "pharmacology," and "toxicity." Other literature sources included papers published in international journals; reports from international, regional, and national organizations; conference papers; and related books. Chemical structures were drawn using the software Chem Sketch.

Vernacular Names (Manjula *et al*., 2017)

Tamil	**:** Mahavilvam or Vellai vilvam
Malayalam	: Kattunarakam, Malanarakam
Sanskrit	: Vilvaparni, Surasi and Bilvaparni
Telugu	: Ekadasa Bilvarm or Kukka velaga

Traditional and Folk Values

The root extract is utilized for heaving, diarrhea and colic issues. Organic product decoction is utilized as an antitoxin to bug poison. The bark juice is applied remotely for getting expedient alleviation in sprain (Kuppusamy *et al*., 2014). Stem powder forestalls skin break out and has against maturing property. Bark is utilized as a solution for puerperal fever; pitta and bark juice is applied remotely for getting expedient help in sprain. Generally, leaves are utilized for relieving mental problems, diarrhea, stomach related issues, fever (Subramanian, S., & Ramakrishnan, 2011).

Phytochamical Constituents

Allayie *et al.,* (2016) Reported on Qualitative phytochemical analysis of aqueous, acetone and chloroform solvent leaves extracts confirm the presence of Alkaloids, Saponins, Flavonoids and Phenolic compounds. Quantitative analysis were done by TLC method used various solvent systems, Butanol: acetic acid: water (9: 0.9: 0.1 v/v/v) shows maximum resolution and number of spots. TLC chromatograms constituted different coloured phytochemical compounds with different Rf values. Preliminary phytochemical profiling of Methanolic extract of callus showed the presence of bioactive components like terpenoids, flavonoids, steroids, glycosides, sugars, alkaloids, phenols, tannin and coumarin. At the same time, GC-MS examines reported presence of various bioactive compounds. The most peak value on 16.31 was obtained by 1, 3, 4, 5- Tetrahydroxycyclo hexanecarboxylic acid (Retention time 17.709) and the lowest peak area (%) of 0.20 was obtained by Tetradecane (Retention time 14.809) (Singh, *et al*., 2014). Bark extracted with petroleum ether, benzene, chloroform, methanol, ethanol and water. Particularly, methanol and ethanol extracts of bark of *N. crenulata* shows the presence of alkaloids, coumarins, flavonoids, saponins, steroids, tannins, glycosides, phenols quinines, terpenoids and xanthoproteins (Kuppusamy *et al*., 2014; Kanlayavattanakul *et al*., 2009). Petroleum ether,

benzene, chloroform, methanol, ethanol and aqueous extracts of leaf of *N. crenulata* are qualitatively analysed for the presence of different phytoconstituents. Methanol and ethanol extracts of leaf of *N. crenulata* shows the presence of alkaloids, coumarins, flavonoids, saponins, steroids, tannins, glycosides, phenols and xanthoprotein (Sarada *et al*., 2014). Alkaloids and tannin are higher in methanolic leaf extracts. Fixed oils and fats are higher in petroleum ether leaf extracts; tannin and phenol content are higher in methanolic leaf extracts. These three extract do not contain flavanoid, steroid and saponin (Latha *et al*., 2005).

Pharmacological Activities

Various solvent extracts of the plant various parts (e.g., root, stem, leaf,etc.) *N. crenulata* have been investigated to validate the folk value, and the results showed diverse biological effects on *In-vitro* and *In-vivo*, which are described in the present section.

Anticancer activity

Cytotoxicity assay was performed to select effective solvent extraction different polar solvents (distilled water, absolute ethanol and hexane). Extracted compounds showed lower toxicity on normal breast cells and significant cytotoxicity on human HER2+ breast cancer cells (SK-BR3) with an IC_{50} value 24.59 lg/mL. *Naringi crenulata* extract exhibited anticancer potential via stimulating the cellular death of cancerous cells (Vallinayagam *et al*., 2021). Antitumor effect of ethanol extracts leaf and bark Ehrlich Ascites Carcinoma (EAC) model in swiss albino mice. Researcher used on parameters tumor volume, viable and non viable cell count and life span of the host. Decrease in tumor volume, cell viability. Hematological reports also Hb content decreased in Ehrlich Ascites Carcinoma treated mice, it increase in Hb near to normal levels. Extracts of leaf and bark of *Naringi crenulata* exhibited significant antitumor activity on EAC bearing mice (Sarada *et al*., 2012).

Antidiabetic Activity

N. crenulata leaf showed various degree of antihyperglycaemic effect via *in-vitro* and *in-vivo*. Among which methanol extract and fractions of methanol extract especially NCMF-3 showed potent antihyperglycaemic activity in streptozotocin induced multi dose treated diabetic animals for presence of various phytochemcials (Suman Kumar Mekap et al., 2016).

Hepatoprotective activity

Liver function marker enzymes are SGOT, SGPT, ALP, total protein, albumin, globulin, total, conjugated and unconjugated bilirubins. It also exhibited antioxidant activity by showing the increased activity of SOD, CAT, GPx and GRD and decreased in TBARS compared to CCl4 treated groups the ethanol extracts of leaf and bark extracts were effective in protecting liver against injury induced by CCl4 in rats. Compared, with silymarin treated groups (Sarada *et al*., 2012).

Anti-Inflammatory Activity

Ethanolic extract leaf and bark had potent and significant anti-inflammatory activity. Compared with reference drug indomethacin (Sarada *et al*., 2012).

Larvicidal Activity

N. crenulata extracts and 9th fraction have strong larvicidal properties these botanical derived molecules offered alternative to synthetic chemical insecticides (Pratheeba *et al*., 2019).

Anti- helmintic Activity

This plant significant possessed anti- helmintic effects (Ramani *et al*., 2010).

Antimicrobial Activity

N. crenulata Aqeous, Methanol and Petroleum ether extracts of leaves presence Bioactive compounds such as alkaloids flavonoids, tannins, saponins, steroids and terpenoids. These phytochemicals are possessed strong antimicrobial effect (Rambabu and Basha 2021). Antibacterial and antifungal activities of ethanolic extract of *Naringi crenulata* leaves showed significant activity against all the bacterial and fungal pathogens (Latha *et al*., 2005).

CONCLUSION

We finish up from the writing study and exploratory outcomes examination that *Naringi crenulata* is a conventional cure a significant ailment in the current world. They have the pharmacological exercises like enemy of microbial, hepatoprotective, hostile to disease exercises. The plant is as yet utilized in their local spots without knowing their genuine component of its impact. Thus, this survey would be valuable to the scientists and other clinical people to comprehend its fundamental system of activity.

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REFERENCES

Mukherjee, P. K., Venkatesh, P., Ponnusankar, S. (2010). Ethno pharmacology and integrative medicine let the history tell the future. *Journal of Ayurveda and Integrative Medicine*, 1(2), 100.

Sarkar, C., Mondal, M., Khanom, B., Hossain, M., Sureda, A., Islam, M. T., Al-Rawahi, A. (2021). *Heliotropium indicum* L. From Farm to a Source of Bioactive

Compounds with Therapeutic Activity. *Evidence-Based Complementary and Alternative Medicine*, Article ID 9965481, 21 pages.

Ahmedulla M, Nayar MP. (1999). Red Data Book of Indian Plants, Calcutta: Botanical Survey of India, p. 4.

Prajapati ND, Purohit SS., Sharma AK, Kumar T. Handbook of Medicinal Plants, Jodhpur, India: Agarbios (2003).

WHO survey, I. Haq (Ed.), In Medicinal Plants, Hamdard Foundation Press, Karachi, (1993), p. 13.

Vallinayagam S, Rajendran K, Sekar V. (2018). Phytochemical and pharmacological status of indigenous medicinal plant *Pedalium murex* L. A review. *Biomedicine & Pharmacotherapy*, 103, 1456-1463.

Salehi, B., Calina, D., Docea, A. O., Koirala, N., Aryal, S., Lombardo, D., Sharifi-Rad, J. (2020). Curcumin's nanomedicine formulations for therapeutic application in neurological diseases. *Journal of Clinical Medicine*, *9*(2), 430.

Latha KV, Arumugasamy K, Manonmani K. (2005). Preliminary Phytochemical and Antimicrobial Activites on the leaves of *Naringi crenulata* roxb. *Anc Sci Life*, 25(2), 53-6.

Sampathkumar, S, Ramakrishnan, N. (2011). GC-MS analysis of *Naringi crenulata* (ROXB.) Nicols. leaves. *Asian Journal of Pharmaceutical and Clinical Research*, *4*(4), 146-148.

Sarada, K., Margret, RJ., Mohan, VR. (2011). GC-MS Determination of bioactive components of *Naringi crenulata* (Roxb) Nicolson. *International Journal of Chem Tech Research*, *3*(3), 1548-1555.

Ramani, R., Karra, HB, Boddupalli, BM., Anisetti, RN., Banji, D. (2010). Pharmacognostical, phytochemical and anthelmintic evaluation of *Naringi crenulata* Roxb. *International Journal of Pharmacology Research Development*, *2*(2), 10-14.

Sarada, K., Mohan, V. R., Sakthidevi, G. (2014). Pharmacognostic and Phytochemical Studies of Leaves of *Naringi crenulata* (Roxb.) Nicolson.). *International Journal of Pharmacognosy and Phytochemical Research*, 6(2); 156-163.

Merinal, S. (2011). Biological Activities of *Limonia crenulata* (Roxb.). Ph. D Thesis. Department of Botany, Kunthavai Naacchiyaar Government Arts College for Women, Thanjavur.

Rambabu, M., Basha, SKM. Antimicrobial activity of leaf extracts of *Naringi crenulata*. *International Journal of Latest Trends in Engineering and Technology* 8 (2), 072-076.

Manjula, V., Norman, T S J., Senthilnathan, S. (2017). *Naringi crenulata* (Roxb.) A potential drug for the future. *The Pharma Innovation Journal*, *6*(10), 261-263.

Kuppusamy, S., Ramasamy, M. V., Gurusamy, S., Unit, E. (2014). Pharmacognostic and Phytochemical evaluation of the bark of *Naringi crenulata* (Roxb.) Nicolson. *Journal of Advanced Pharmacy Education & Research*, *4*(1), 93-100.

Allayie, SA., Parray, MA., Bhat, BA., Hemalatha, S. (2016). Phytochemical evaluation of leaf extracts of *Naringi crenulata* (roxb.) Nicolson. *International Journal of Bioassays*, *5*(11), 5110-5117.

Singh, N., Meena, MK., Patni, V. (2014). Phytochemical profiling and GC-MS analysis of bioactive constituents of callus of *Naringi crenulata* (Roxb.) Nicolson. *International Journal of Pharmaceutical Science Review Research*, *24*(1), 29-34.

Subramanian, S., & Ramakrishnan, N. (2011). Chromatographic finger print analysis of *Naringi crenulata* by HPTLC technique. *Asian Pacific Journal of Tropical Biomedicine*, *1*(2), S195-S198.

Vallinayagam, S., Rajendran, K., Sekar, V. (2021). Pro-apoptotic property of phytocompounds from *Naringi crenulata* in HER2+ breast cancer cells in vitro. *Biotechnology & Biotechnological Equipment*, *35*(1), 311-322.

Sarada. K, Jothibai Margret. R, Mohan VR. (2012). Anticancer activity of ethanol extracts of leaf and bark of *Naringi crenulata* (roxb) Nicolson against Ehrlich Ascites carcinoma. *International Journal of Research in Pharmacy and Chemistry*, 2(2), 267-272.

Suman Kumar Mekap , Sabuj Sahoo , Kunja Bihari Satapathy , Sagar Kumar Mishra. (2016). Antidiabetic Evaluation of Leaf Extracts of *Naringi crenulata* (Roxb.) Nicolson. *International Journal for Pharmaceutical Research Scholars*, 5 (2), 218- 232.

Sarada, K., Margret, R. J., & Mohan, V. R. (2012). Hepatoprotective and antioxidant activity of ethanol extracts of *Naringi crenulata* (roxb) Nicolson against CCl4 Induced hepatotoxicity in rats. *International Journal of Pharmaceutical Sciences and Research*, *3*(3), 874.

Sarada K, Jothibai Margret R, Mohan VR. (2012). Anti-inflammatory activity of ethanol extracts of leaf and bark of Naringi renulata (Roxb.) Nicolson. *International Journal of Pharmaceutical Sciences and Research*, 3, 4540-4544.

Pratheeba, T., Vivekanandhan, P., Faeza, A. N., & Natarajan, D. (2019). Chemical constituents and larvicidal efficacy of *Naringi crenulata* (Rutaceae) plant extracts and bioassay guided fractions against *Culex quinquefasciatus* mosquito (Diptera: Culicidae). *Biocatalysis and Agricultural Biotechnology*, 19, 101137.

Ramani, R., Bindukarra, H., Madhavi, B., Ravinder, B., Anisetti, N., Banji, D., (2010). Pharmacognostical phytochemical and anthelmintic evaluation of *Naringi crenulata* (Roxb). *International Journal of Pharmaceutical. Research Development*, 2, 1-8.

Kanlayavattanakul, M., Phrutivorapongkul, A., Lourith, N., Ruangrungsi, N. (2009). Pharmacognostic specification of *Naringi crenulata* stems wood. *Journal of Health Research*, 23(2), 65-69.