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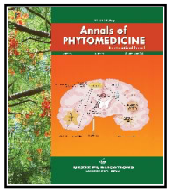

Invited Commentary : Open Access

Pharmacological and phytochemical potential of wild fruits

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Abstract

Wild fruits act as rich source of nutrients with concentrated source of bioactive components and act as healthy therapeutic alternative. The wild fruits like *Carissa spinarum*, *Opuntia* sp., *Syzygium cumunii, Aegle marmelos, Artocarpus laucha, Physalis peruviana, Diospyros* sp., *Punica granatum, Ficus palmata, Pinus gerardiana* Wall*, Elaeagnus umbellata, Aesculus indica* Colebr., *Morus alba*, *Myrica nagi*, *Phyllanthus emblica*, *Ziziphus mauritiana etc*., have functional components which are responsible for positive pharmacological effects and have the potential to cure a number of diseases. The bioactive compounds like polyphenolics, flavonoids, tannins, phytosterols, vitamins, minerals, *etc*., present in above mentioned wild fruits can be utilized to have health benefits.

1. Introduction

Wild plant resources like wild edible fruits can play a crucial role in meeting food and nutritional security because of their regional specific diversity and adaptability. India occupies nearly 2 per cent of earth surface consisting of 5 per cent world's diversity and known as a hotspot for biodiversity. There are many wild fruits species available in various geographical areas of India containing appreciable concentration of bioactive compounds and nutritional components with huge pharmacological and phytochemical potential. Indian Himalayan Region is known for its rich biodiversity which supports more than 670 wild edible plant species and many of them are commercially utilized for nutritional supplements and health-beneficial products (Bhatt *et al.,* 2017). The various studies have shown that wild fruits possess various bioactivities with potential health benefits like free radical scavenging, antioxidant, anti-inflammatory, antimicrobial, and anticancer activity. Therefore, wild fruits with potential health benefits can be utilized for the development of functional foods or pharmaceuticals to prevent and treat several chronic diseases (Li *et al*., 2016). The great possibilities of bioactive compounds from fruits and their by-products to maintain or improve health, is increasing the interest in finding new products with positive pharmacological effects (Hamid *et al*., 2020).

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2. Wild fruit species available in India

India is the natural habitat of many species of fruits with therapeutic and medicinal properties and there is wide scope of their utilization in curing many diseases which needs to be explored (Bhatt *et al*., 2021). The fruit species like *Carissa spinarum*, *Opuntia* sp., *Syzygium cumunii*, *Aegle marmelos* and many other are available in central parts of India throughout the year, whereas, *Artocarpus laucha*, *Physalis peruviana*, *Diospyros* sp. are prevalent in western and northern sides. North and South parts of India are known for wild fruit species like *Punica granatum* L., *Ficus palmata*, *Pinus gerardiana* Wall , *Elaeagnus umbellata*, *Aesculus indica* Colebr., *Morus alba*, *Myrica nagi, Phyllanthus emblica*, *Ziziphus mauritiana*, *Opuntia* sp., *etc*.

3. Pharmacological and phytochemical potential of wild fruits

The commercial fruits contain various nutrients but wild fruits have been reported to be more nutritious with respect to some of the essential nutrients including some phytochemicals which have pharmacological activities (Bhatt *et al*., 2021). The wild fruits have been found to contain higher amount of polyphenols or phytochemicals with strong antioxidant and free radical scavenging abilities which are largely recognized as anti-inflammatory, antiviral, antimicrobial and antioxidant agents (Thakur *et al.,* 2019). These constituents are essential for normal physiological well-being of human being and help in maintaining healthy state by preventing various disorders and diseases.

The fruits of aonla are used in Indian as well as Unani medicine system due to abundance of phytochemicals like geraniin and isocorilagin which have immunostimulatory effects and helps in boosting the immune system. Its fruits have been reported to be hepatoprotective and possesses expectorant, purgative, spasmolytic, antibacterial, hypoglycemic and hypolipidemic activities which is helpful in curing many diseases like diabetes, cough, asthma, bronchitis, headache, ophthalmic disorders, dyspepsia, colic, flatulence, skin diseases, leprosy, jaundice, scurvy, diarrhoea, greyness of hair etc. Bael fruits are known to effectively reduce various diseases due to the presence of marmele/marmelide compound which act as virucidal and chemotherapeutic agent. The higher concentration of vitamin C helps in lowering the effect of various flu and viruses responsible for respiratory illness.

Ber fruits are used in Persian, Chinese and Korean system of medicine since ancient time. The components like triterpenic and betulinic

acid are the active ingredient responsible for immune boosting property, whereas, betulinic acid and jujuboside B are responsible for curing the various cardiovascular diseases. The fruit extracts of *Ficus palmate* has been used to cure respiratory diseases like sore throats, cough, bronchial problems, etc., and used as demulcent, emollient, laxative and poultice agent since the ancient times. Its fruits are very effective against lung diseases, hypoglycemia, gastrointestinal disorders, ulcer, tumour, hyperlipidemia, diabetes and fungal infections.

The fruits of jamun contain various phytoconstituents like flavonoids, phenols, carotenoids and vitamins which are well known for its use in curing diabetes, malaria, cough, cold, bronchitis, etc. Its fruit has antibacterial, antiviral, antifungal, antioxidant properties as well as antidiabetic properties due to the presence of glycoside, jamboline and ellagic acid which controls blood glucose level. *Morus alba* fruits are known for its high nutrition and traditional medicine with essential fatty acids, vitamins, polyphenols, carbohydrates, fibre, minerals, riboflavin, ascorbic acid, carotene and nicotinic acid which posses a wide spectrum of biochemical activities such as antioxidant, antimutagenic and anticarcinogenic activities.

Myrica nagi fruits are rich source of anti-oxidants and myricitrin which is a glycosylated analog of myricetin has been found effective in the control of various diseases. The fruits of prickly pear (*Opuntia dillenii* Haw.) contain various antioxidant compounds like ascorbic acid, phenolics, betalains, flavonoids, lactones, terpenoids, alkaloids along with unsaturated alcohols and unsaturated aldehydes. These fruits have been used in traditional folk medicine because of its role in treating a number of diseases have diuretic effect, analgesics, anti-inflammatory effects, hypoglycemic effects, anti-allergic activity, inhibition of stomach ulcerations, neuroprotective effects and to alleviate alcohol hangover symptoms.

Seedling mango have beneficial effect against nutritional disorders such as beri-beri, bronchial disorders, kidney stones, insomnia, brain fatigue, mental depression, and have good laxative, depurative and diuretic properties. Wild pomegranate and its different parts such as arils, peel, membrane and seeds contain different bioactive compounds such as ascorbic acid, anthocyanins, gallic acid, ellagic acid, punicalagin, quercetin, etc., which have higher bioactivity due to potential to reduce free radical generation and ability to prevent generation of various diseases.

Wild fruits are valuable source of food and medicines for domestic and commercial purposes which have got significant cultural and socio-economic value in rural areas. These fruits have been considered as important source of food for mankind before the dawn of civilization and the domestication of the present day fruits. At present, only a fraction of total potential is being tapped by local inhabitants without knowing their nutritional importance. These species are needed to be domesticated for further utilization in nutraceutical preparations and development of antioxidant rich products. In order to achieve the goals to improve the living conditions, more regions needs to be brought under this type of study and more research work related to nutritional and phytochemicals composition should be initiated in wild edible fruits so that they can be recognized for their various health benefits.

I am convinced that **'Annals of Phytomedicine: An International Journal'** with dedicated scientific editorial team will continue to serve society for a long time. The journal publishes major and noteworthy breakthroughs in all stages of pharmacognosy, life sciences along with clinical studies. Publishing twice a year and also special issues in between channelize researches and enlighten scientific community with each and every work in world. Managing time bound publication is a challenging undertaking, but the journal officials have been doing it for many years. This also acts as a source of motivation and inspiration for scientists and young researchers. This journal is flying high and garnering well-deserved fame, and it has received great praise from its peers. I wish it many more victories and a milestone in future endeavors.

Conflict of interest

The author declares no conflicts of interest relevant to this article.

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Biography

Dr. N.S. Thakur is currently serving as Professor and Head in the Department of Food Science and Technology at Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan and involved in research besides teaching and extension for last 26 years. He has worked as Horticultural lecturer in Govt Senior Secondary School for one year during 1988-89 followed by Quality Control Officer during 1995 to 1997 in a reputed Food Processing Industry (Co Packer of Nestle India Ltd) at Amritsar, Punjab. In 1997, he joined Dr YS Parmar University and worked in the different capacities in the university stations as well as in the main campus till date.

Dr Thakur has worked on various aspects of processing of fruits and vegetables in the past and presently working on the processing and value addition of edible/non-edible wild plant sources. He has worked on the value addition of various fruits and nuts like chilgoza nut, wild pomegranate, Indian horse chestnut, wild mulberry, box myrtle, wild aonla, seedling mango, prickly pear, wild jamun, rhododendron flowers, sand pear etc. and development of instant products from commercial Asian carrot with following significant research achievements.

- Developed a complete package of drying technology of chilgoza nuts including BIS standards of chilgoza nut which are being followed at national level marketing of chilgoza nuts.
- Developed a complete technology package for development of anardana from wild pomegranate. Developed BIS quality standards of wild pomegranate (*anardana*) last month.
- Developed technology package for the development of edible flour from non-edible horse chestnut which can be used for the preparation of halwa and other instant products.
- Developed various technology packages for the development of beverages from various wild fruits as well as of commercial fruits.

Dr. Thakur has guided 22 M.Sc. and 4 Ph.D. students so far and guiding 5 Ph.D. students who are working on various aspects of processing of wild fruits including antioxidants extraction and their utilization in commercial processed products. He has handled 3 ad hoc projects as PI and 7 projects as Co-PI and published 105 research papers, 3 edited books,15 technology brochures, 20 book chapters, 4 technology video DVDs, 25 pamphlets/folders, 38 general articles. He is also member of various Scientific Societies (International and National) like Association of Food Scientists and Technologist, Mysore; Society for the Advancement of Human and Nature (SADHNA), UHF Nauni-Solan; Society for Advancement of Research on Pomegranate, ICAR-National Research Centre on Pomegranate, Solapur, Maharashtra and Indian Ecological Society, PAU, Ludhiana.

- He has received Uma Datt Mamgain Memorial Best Research Award for best thesis Research (M.Sc. level)-2019 on topic, "Development of value-added products from mulberry (*Morus alba* L) by Mr Hamid under the guidance of Dr. N.S. Thakur submitted to Dr YS Parmar University of Horticulture and Forestry, Nauni-Solan, HP, India conferred by Society for Advancement of Human and Nature (SADHNA), Solan, HP.
- Dr Thakur has received Uma Datt Mamgain Memorial Best Research Award for best thesis Research (M.Sc. level -2019 on topic "Development and storage of granular powder from wild pomegranate (*Punica granatum* L)" by Ms Chetna Sharma under the guidance of Dr. N.S. Thakur submitted to Dr YS Parmar University of Horticulture and Forestry, Nauni-Solan, HP conferred by Society for Advancement of Human and Nature (SADHNA, Solan, HP.
- He has been awarded as C Parmar All India Distinguished Publication Award in Wild Fruits for Best Thesis Research (Ph.D. level)-2018 on topic, "Evaluation of wild pomegranate for the development of *anardana* in Himachal Pradesh" and Best Thesis Research (M.Sc. level)-2014 on topic, "Development of value added products from box myrtle (Myrica nagi)" by Mr. Abhimanyu Thakur under the guidance of Dr. N.S. Thakur, submitted to YSP University of Horticulture and Forestry, Nauni, Solan conferred by Society for Advancement of Human and Nature (SADHNA), Solan, HP
- Recipient of C Parmar All India Distinguished Publication Award in Wild Fruits-2016 for the publication entitled "Influence of active packaging on quality attributes of dried wild pomegranate arils during storage" in Journal of Applied and Natural Science, 8(1):398-404.

- Best paper (Poster) award on topic "Standardization of technology for the development of anardana from wild pomegranate". In: National seminar cum exhibition on pomegranate for nutrition, livelihood security and entrepreneurship development held at NRC on pomegranate, Solapur, Maharashtra on 5th to 7th Dec, 2014.
- Dr Thakur received 3rd best paper (Poster) award on topic "Drying and storage of wild pomegranate arils". In: National seminar on Indian Agriculture: present situation, challenges, remedies and road map held at CSK HPKV Palampur, HP on 4th and 5th Aug, 2012.