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Original Article**Watercress (*Nasturtium officinale*): A Nutrient-Rich Aquatic Vegetable with Functional Food and Production Potential****Armaan¹ and Vandana Thakur^{1*}**¹Department of Horticulture, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India*Corresponding Author: beniwalarmaan2929@gmail.com

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ABSTRACT

Watercress (*Nasturtium officinale*) is a perennial, semi-aquatic leafy vegetable belonging to the Brassicaceae. Unlike most commonly cultivated vegetables, it is naturally associated with cool, clean, and flowing water, although modern production can also use controlled beds and soilless systems. Watercress is valued both as a culinary vegetable and as a source of biologically active compounds. Its leaves contain Vitamin K, folates, carotenoids, minerals, phenolic compounds, flavonoids, and glucosinolates; of particular interest is gluconastutiin, which can yield phenethyl isothiocyanate (PEITC), a compound extensively studied for antioxidant, anti-inflammatory, and chemopreventive properties. Recent literature has expanded the discussion of watercress from a traditional salad crop to a potential functional food associated with prevention-oriented nutrition. However, evidence from cell, animal, and human studies should not be treated as proof that watercress cures disease. From a vegetable science perspective, the crop is a potential functional food associated with prevention-oriented nutrition.

Keywords: Watercress, *Nasturtium officinale*, Leafy vegetable, Brassicaceae, semi-aquatic vegetable, functional food

INTRODUCTION

Watercress, botanically known as *Nasturtium officinale*, is an edible leafy member of the Brassicaceae family; the order is Brassicales. It is taxonomically accepted under the genus *Nasturtium*. Its geographical origin is known to be from Europe to Central Asia and the Arabian Peninsula, Macronesia, and northern and Northeastern Africa, where it historically thrived along natural springs, chalk streams, and slow-moving, mineral-rich waterways. It has subsequently been cultivated and naturalized in many temperate and montane regions of the world. It is a distinctive vegetable because its natural growth habit is closely linked to water. The plant develops soft, rooting stems that may float, trail, or remain partially submerged, producing tender green leaves that are commonly eaten fresh. It is a perennial, succulent aquatic or semi-aquatic herb adapted to wet environments. It has succulent, hollow, and branched stems that can grow prostrate or ascending,

with rooting possible at the lower nodes. It is relatively delicate and forms roots at nodes that remain in contact with water. Leaves are pinnately divided, green, tender, and peppery in flavour. Small white, four-petaled flowers arranged in terminal racemes are produced above the vegetative canopy, followed by siliques containing two rows of seeds.



Fig 1: Cultivation of watercress and vegetable crop

As a vegetable, watercress is valued mainly for its tender leaves and young shoots, which have a characteristic peppery or slightly pungent flavor. It may be consumed fresh in salads, sandwiches, and soups or used for its slightly pungent flavor. Because of its distinctive flavor and high concentration of phytochemicals, watercress has attracted considerable interest as a nutrient-rich leafy vegetable and functional food.

Propagation and species/cultivars of watercress

Watercress is propagated both sexually by seed and vegetatively by stem cuttings. Stem cuttings about 10-20 cm are commonly used; the succulent stems readily produce adventitious roots at their nodes under mist or aquatic conditions. Seed propagation is also practiced, particularly where healthy planting material is required. The principal cultivated species is *Nasturtium officinale* W.T. Aiton, while closely related taxa include *N. microphyllum*, *N. floridanum*, *N. gambelii*, and the hybrid *Nasturtium* x sterile. Commercial watercress has fewer standardized cultivars than major vegetable crops, and mainly describes named selections or types rather than formally registered cultivars.



Fig. 2: Overview of the edible part and root of watercress.

Cultivars and Germplasm

The cultivated watercress species is *Nasturtium officinale* W.T. Aiton. Unlike major vegetable crops, watercress has historically had few formally developed cultivars, and commercial production has relied largely on grower-maintained material and selected germplasm. Research conducted on global watercress collections has demonstrated considerable genetic and phenotypic diversity, providing a basis for modern breeding. Among the named material, Boldrewood is a well-documented dwarf cultivar characterized by short stems, increased leaf production, and distinctive nutritional traits. Large Leaf is another commercial cultivar documented in horticultural research. Additional materials such as WX033, WX038, WX001, WXVITA and several mapping population-derived lines have been used in recent breeding and physiological studies, but these should generally be described as breeding lines, accessions or germplasm rather than released cultivars.

Nutritional and Medicinal Value

Watercress is a nutrient-rich leafy vegetable containing vitamin C and K, provitamin A carotenoids, minerals such as calcium, potassium, iron and magnesium, and diverse phytochemicals including glucosinolates, phenolics and flavonoids. Its characteristic glucosinolate, gluconasturtiin, yields phenethyl isothiocyanate (PEITC), a bioactive compound extensively investigated for antioxidant and chemo-preventive properties. Watercress exhibits promising antioxidant, anti-inflammatory, antimicrobial, and metabolic health-related activities, supporting its potential as a functional food. Although traditional medicine has used watercress for respiratory, digestive, and diuretic purposes, clinical evidence for therapeutic application remains limited. Its rich phytochemical profile therefore provides opportunities for functional foods, nutraceutical development, and health-oriented vegetable production, while further human studies are needed to establish specific health benefits.

Future Scope/Prospects

Watercress (*Nasturtium officinale*) has considerable future potential as a nutrient-dense, functional, and sustainably produced leafy vegetable. Recent advances in germplasm characterization have revealed substantial genetic variation for yield, sensory attributes, glucosinolates, vitamin C,

carotenoids, and antioxidant capacity, providing opportunities for breeding nutritionally enhanced cultivars. Controlled environment and hydroponic production can facilitate year round cultivation, while manipulation of LED light, particularly blue light, offers possibilities for modifying nutritional and sensory year-round traits. Sustainable production is another important research direction, with phosphate-use-efficient genotypes offering opportunities to reduce fertilizer inputs and nutrient losses from aquatic production systems. Furthermore, the high concentration of glucosinolates, isothiocyanates, phenolics, vitamins, and minerals supports opportunities for functional foods, nutraceuticals, and value-added products. However, health-related applications require larger and longer-term human studies, standardized extracts, and improved understanding of bioavailability and metabolism. Thus, integrating breeding, controlled-environment agriculture, biofortification, sustainable nutrient management, postharvest, and functional food research could substantially expand watercress's commercial and nutritional potential.

CONCLUSIONS

Watercress (*Nasturtium officinale*) is more than peppery salad green. It is a distinctive aquatic vegetable combining nutritional value with a complex phytochemical profile and an unusual production ecology. Its glucosinolates and isothiocyanates, particularly the gluconasturtiin- PEITC system, have made it an important subject of functional food research. Phenolics, flavonoids, Carotenoids, vitamins and minerals further contribute to its nutritional interest. For vegetable science, the crop offers opportunities in protected cultivation, soilless production, repeated harvesting, phytochemical enhancement, and value-added food systems. At the same time, water quality and food safety must be central to every production model.

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