



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(5): 1648-1653

© 2020 IJCS

Received: 02-07-2020

Accepted: 05-08-2020

Manju Lata

Department of Biosciences
MLSM College Sunder Nagar,
District Mandi, Himachal
Pradesh, India

Nutritional, medicinal and indigenous use of *Nasturtium officinale* in Tehsil Thunag of District Mandi, Himachal Pradesh, North Western Himalayas, India

Manju LataDOI: <https://doi.org/10.22271/chemi.2020.v8.i5w.10535>**Abstract**

Inhabitants of the hilly regions largely depend on wild herbs for medicine and food supplements. The indigenous knowledge and traditional use of these wild herbs are vanishing fast. Thunag Tehsil is the rich repository of wild medicinal herbs. One among them is *Nasturtium officinale* (watercress), of the family Brassicaceae, it has been long used as a home remedy or a medicinal plant, edible herb by the local people. The aim of this study was to investigate the traditional use, nutritional, medicinal use of *N. officinale* in the Tehsil Thunag of District Mandi Himachal Pradesh Western Himalayas. Local inhabitant of valley used to collect this green leafy vegetable from nearby river streams, they used to consume it as (sagg) green leafy vegetable or as a medicine. It is a good source of food, medicine and income for local people in the study area, as this area is surrounded by large number of perennial rivers and streams where this plant is found in abundant. But the young generation is least interested about these traditional herbs and their uses. Its traditional knowledge is declining sharply. So to document this knowledge, the present study was carried in this region.

Keywords: *Nasturtium officinale*, Thunag, North western Himalayas, indigenous, medicinal

Introduction

The Indian Himalayan Region (IHR) covers approximately 4,19,873 km² area and cover 10 states namely, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Meghalaya, Nagaland, Manipur, Mizoram, Tripura, and hill regions of 2 states viz. Assam and West Bengal of Indian Republic. Due to diverse habitats and large altitudinal range (200-8,000), it supports unique and socio-economically important floristic diversity. *N. officinale* is a perennial semi-aquatic, high value, wild herb use for culinary purpose by people almost around the world, native to Western Asia, India, Europe and Africa. However, it is now distributed almost globally. It has attractive dark green leaves, a strong flavour and is rich in vitamins.

Watercress, which is cultivated for its pungent leaves which are used for cooking especially in soups, garnishes and salads, is one of the most important herbal medicines used for the treatment of some diseases like diabetes in traditional treatment (Shahrokhi *et al.*, 2009), oxidative stress (Yazdanparast *et al.*, 2008), Watercress (*N. officinale*) is quick growing perennial herb that is native to Egypt and West Asia, although it is now cultivated in the entire world. Its leaves and arial stem are rich source of proteins, dietary fibre, Vitamins and minerals, other essential nutrients and phytochemicals.

Watercress is generally used as traditional medicine for the treatment of diabetic, bronchitis, abdominal pain, asthma, anti-inflammatory, to purify blood, chest pain, stop Haemorrhages, liver, eliminate of excess bile, gallbladder, stimulant, kidneys, lungs, throat expectorant, skin afflictions, facial scars, iron deficiency and digestion.

The present review deals with traditional uses, nutritional, phytochemical, antioxidant, antimicrobial, and medicinal potential of watercress. It highlights anti-cancer, anti-diabetic, cardioprotective, hepatoprotective and anti-tuberculosis activities of watercress.

Corresponding Author:**Manju Lata**

Department of Biosciences
MLSM College Sunder Nagar,
District Mandi, Himachal
Pradesh, India

Material and Method

1.1 Study area

Himachal Pradesh (30° 22' 40" to 30° 12' 40" N latitudes and 75° 47' 55" to 79° 04' 20" E longitudes) is a North western Himalayan state of India which is a rich repository of ethnomedicinal flora. Most of these plant species find their use in traditional medicine, folk uses and also in modern industry (Singh and Thakur, 2014). Present study was carried out in the Thunag Tehsil (31.55°N, 77.17°E) at an altitude of 2052m, of district Mandi (31.5892°N, 76.9182°E) Himachal Pradesh. Due to large number of perennial streams flowing in the region *Nasturtium officinale* is present in the abundant in this region. The area is covered by dense forest of conifers and oak trees. This area is rich in medicinal flora. Soil is fertile and rich in humus and nitrogenous compounds but lacks phosphate compounds. The major soil groups are brown hill soil and red loamy soil. Most soil in this region are acidic in nature. Being a hilly valley climate is cool and temperate with three distinct season; the winter (October to March), the summer (April to June), the monsoon (July to September). Highest temperature is recorded during May and June varying between 30 to 35 °C. Lowest temperature is recorded during December and January month. The annual rainfall is around 1240mm. It covers approximately 313.57 Km² areas, and comprises 22 Panchayats, 171 villages with 10,872 households and 50,308 human populations. (Statistical Department Mandi)

1.2. Methodology

For the assessment of nutritional, medicinal and indigenous use of *Nasturtium officinale* surveys were conducted in different villages of Tehsil Thunag, namely Suragi, Chendi, Keuli, Lambatach, Bakhliwar, Jarol, Kothi, Rod, Chapper, Majakhal, Kutah, Dhanshali, Tungadhar, Bhanvas, Danhyar, Kataru, Sanglwara and Dusadhi, Dhrut, Kheladhar, Ropa, Surah, Murag. Local people were interviewed and information on the utilization of watercress was gathered. The interviews were mostly individual. Interviews followed informal method and open ended rather than a strict questionnaire. The language used while interacting with the informants was the local dialect of the study area viz. pahari and in certain cases, hindi also. Information on parts used, habit, habitat, etc. was also collected.

Plant Description

N. officinale is a perennial dicotyledonous herb usually found in close proximity to fresh water bodies. As a member of the Brassicaceae family, it is related to several popular food and spice crops such as broccoli, cabbage, kale, radish, and mustard, as well as the model plant. In particular, watercress has been used as a medicinal and food crop for over many decades. (Howard *et al* 1952) ^[10]. Watercress is usually eaten in fresh form in salads, soups and other recipes. Morphologically, *N. officinale* has small hairs, unbranched unicellular, and smooth sharp apex (Jafari S *et al* 2012) ^[16]. The plant is perennial, growing to 0.5–1 meter at a fast rate. The leaves are 4–12 cm long, compound with many wavy edged, oval- or lance-shaped leaflets growing from central stalk (Franzke A 2011) ^[19]. The stem is 10–60 cm with thin and fibrous roots at the bottom. At the top of stems and short stalks, its flowers, white in color, are 3–5 mm long and have four petals. The fruits are 10–25 mm long and 2 mm wide and found on stalks that are 8–12 mm long. The fruits are thin, slightly curved cylinders and contain four rows of small, round seeds Cumby IP *et al* (1977) ^[22]. The plant begins to

flower from May to October and the seeds ripen from July to October. The flowers are hermaphrodite and are pollinated by bees, flies, etc. According to the concentration of phosphorus present in water, the roots are divided into two types. When the phosphorus concentration is high, the roots are adventitious however, when the concentration is low, the roots are mainly tap roots. It has special spicy taste with food just like strong pepper Meriem T *et al.* (2017) ^[25].

Traditional uses

Watercress is one of the most important mountainous medicinal herb mainly used by the rural healers as nutritive, anti-inflammatory and antioxidant agent. In Tehsil Thunag this herb is present in abundant nearby perennial streams. Popularly known as rayata and chucch in valley. This plant is consumed as a green leafy vegetable (saag), cooked along with potato, *Brassica campestris* sarson or consumed raw as salads, soups and other recipes. Patrode (Chopped tender leaves mixed with gram flour and spices, wrapped with in the leaf of *Bergenia ciliata*, steamed.), sosre (finally chopped watercress mixed with gram flour, rice flour and spices.) are also made from this herb. It is also used to cure abdominal pain in traditional medicine (Ozen, 2009) and for treatment of diseases like diabetes and bronchitis as reported by (Bahramikia *et al.*, 2009) ^[10]. Kumari *et al.*, (2015) ^[34] reported that in Baijnath region of Himachal Pradesh traditionally watercress leaves are cooked for making saag, leaves juice applied externally for growth of thick hairs, poultices of leaves help in treating lymphatic swelling. Watercress is used as traditional medicine to purify blood, chest, stop haemorrhages, liver, eliminate excess bile, gallbladder, stimulant, kidneys, lungs, throat, expectorant, dropsy, skin afflictions, facial scars, iron deficiency and digestion (Graf *et al.*, 2016) ^[31].

Medicinal Value

Engelen *et al.*, (2006) ^[29] reported that watercress contains a substance glucosinolates named as gluconasturtin, which has been traditionally used for treatment of diabetes, an endocrinal chronic disease which is caused by altered carbohydrate metabolism and characterized by elevated blood glucose levels. *N. officinale* a vital source of medicine and economically important herb. They are widely and very popularly used as vegetables and salad. Also, their potentialities against certain disease are proved experimentally during past years. The herb shows powerful anticancer activity with biologically active compounds like gluconasturtine. More than the anticancer it also possess anti-diabetic, anti-tuberculosis, anti-inflammatory, antimicrobial, cardioprotective, etc. thus we can suggest that *N. officinale* can be viewed and used as a source of nutraceuticals and nutrient supplements. The leaves are antiscorbutic, depurative, diuretic, expectorant, purgative, hypoglycaemic, odontalgic, stimulant and stomachic the plant has been used as a specific in the treatment of TB. The freshly pressed juice has been used internally and externally in the treatment of chest and kidney complaints, chronic irritations and inflammations of the skin etc. Applied externally, it has a long-standing reputation as an effective hair tonic, helping to promote the growth of thick hair. A poultice of the leaves is said to be an effective treatment for healing glandular tumours or lymphatic swellings some caution is advised, excessive use of the plant can lead to stomach upsets. The leaves can be harvested almost throughout the year and are used fresh.

Nutritional Constituent

Table 1: Vitamins and phytochemicals in *Nasturtium officinale*

Phytochemicals	Quantity/80 g edible produce
Calories (kcal)	18
Protein (g)	2.4
Fat (g)	0.8
Fibre (g)	1.2
Beta carotene (mcg)	2016
Vitamin A equivalent (mcg)	336
Vitamin B1 (mg)	0.13
Vitamin C (mg)	50
Vitamin E (mg)	1.17
Vitamin C (mg)	50
Vitamin E (mg)	1.17
Folate (mcg)	36
Vitamin K (mcg)	200

Table 2: Mineral composition of raw watercress; Pradhan *et al.*, (2015) [40].

Mineral composition	Quantity/80g edible produce
Calcium (mg)	136
Iodine (mcg)	12
Iron (mg)	1.8
Magnesium (mg)	12
Manganese (mg)	0.5
Phosphorus (mg)	42
Potassium (mg)	184
Zinc (mg)	0.6
Selenium (mcg)	1.6
Sodium (mg/100g)	68.8
Copper (mg/100 g)	0.58

Watercress is an abundant source of vital nutrients which contains vitamins and minerals. The presence of different phyto-chemicals and nutrition make watercress a healthy diet that maintains immunity and good health of the human body.

Watercress is important source of vitamins and a good detoxifying herb. Its high content of vitamin C and minerals makes it a remedy that is particularly significant for chronic illness. The Vitamins and mineral constituent of watercress according to different sources (Pradhan *et al.*, 2015) [40] are shown in Table 1 and 2, respectively.

Conclusion

Traditional use of *Nasturtium officinale* is declining sharply among young generation they hardly know its benefits and uses. It is quite necessary to educate the young generation regarding health benefits and uses of *Nasturtium officinale*. Inhabitant of the mountainous region dependant on forest produce for their requirement of fruits, vegetables and medicines. The continuation of traditional knowledge is risking as the transmission between the younger and older generations no longer exists (Kapoor, 2017) [9]. Therefore, proper documentation of the traditional information through ethnobotanical studies is significant for the utilization of biological resources and their conservation (Bagga *et al.*, 2018) [7], (Manju Lata *et al.*, 2020) [27]. There is an urgent need to adopt large scale plantation of *Nasturtium officinale* at kitchen garden also as it occupy small space, along with the natural habitat so the inhabitants are profited. It can be concluded that documentation of this traditional knowledge is novel information from the area of Thunag subdivision district Mandi, Himachal Pradesh.

Recommendation

1. *Nasturtium officinale* can be planted at home in kitchen garden as it occupy little space and easy to cultivate.
2. Will lift the socioeconomy of the people.

Acknowledgement

Author is thankful to the local inhabitant, vairs, Forest Department, for their kind help and providing valuable information.



A



B

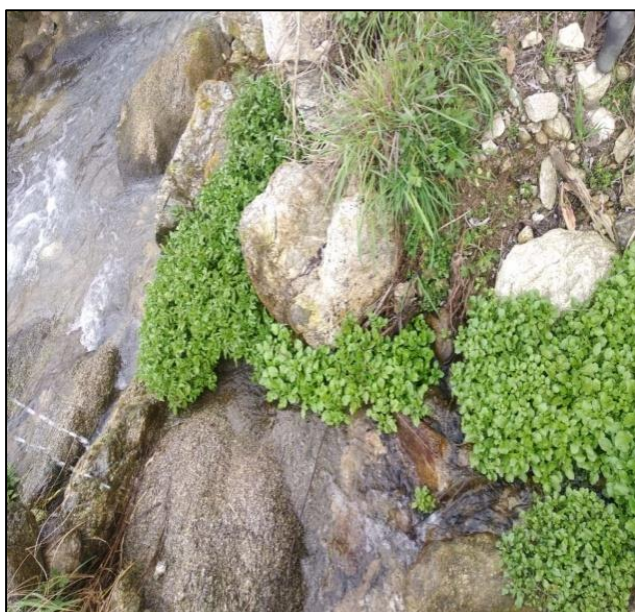
Fig 1: *Nasturtium officinale* being collected by women for sag. (Green Leafy Vegetable) (A, B.)



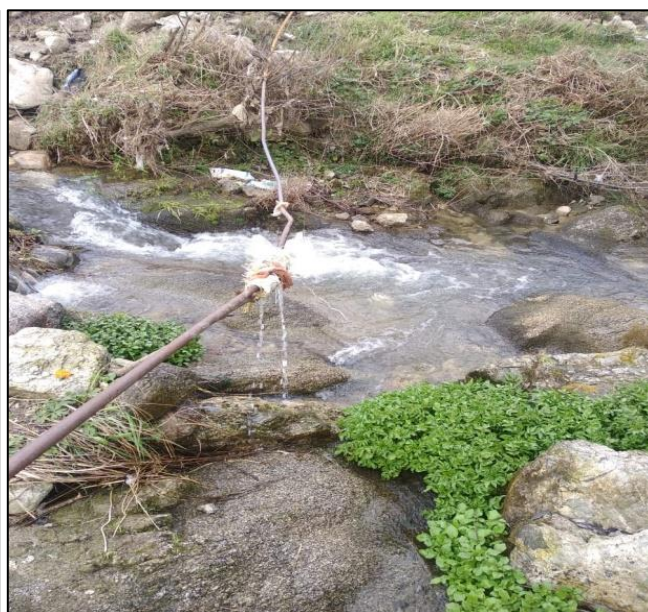
C



D



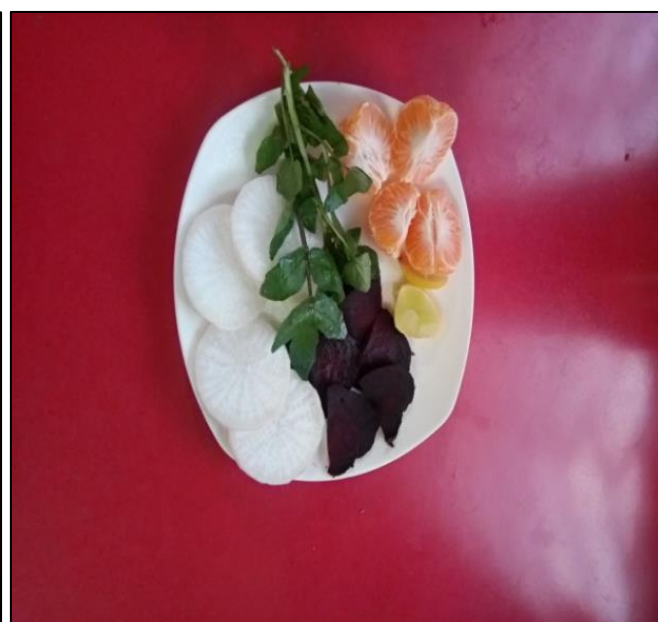
E



F

Fig 2: *Nasturtium officinale* habitat near fresh water bodies (C, D, E, F)

G



H

Fig 3: *Nasturtium officinale* being used as a raw in the form of salad (G, H)



Fig 4: Women in study area going to collect *Nasturtium officinale* nearby fresh water bodies.

References

- Aires A, Carvalho R, Rosa EAS, Saavedra MJ. Phytochemical characterization and antioxidant properties of baby-leaf watercress produced under organic production system. *CyTA-Journal of Food*. 2013;11(4):343-351.
- Alam Z. Phenolic profile and antioxidant potential of wild watercress (*N. officinale* L.). *Zeb Springer Plus*. 2015;4:714
- Bahramikia S, Yazdanparast R. Antioxidant efficacy of *Nasturtium officinale* extracts using various *in vitro* assay systems. *Journal of Acupuncture and Meridian Studies*. 2010;3:283-90.
- Bahramikia S, Ardestani A, Yazdanparast R. Protective effects of four Iranian, medicinal plants against free radical-mediated protein oxidation. *Food Chemistry*. 2009;115(1):37-42.
- Boyd LA, McCann MJ, Hashim Y, Bennett RN, Gill CI, Rowland IR. Assessment of the anti-genotoxic, anti-proliferative, and anti-metastatic potential of crude watercress extract in human colon cancer cells. *Nutrition and Cancer*. 2006;55:232-241.
- Biswas MP, Rao MRM. Socioeconomic status of Gaddi tribes in Himachal Pradesh: a Study. *International Journal of Advance Research*. 2016;4(8):159-167.
- Bagga J; Umakant B, Deshmukh. *Acmella radicans* (Jacquin) R.K. Jansen (Asteraceae)—A new distributional plant record for Jharkhand State (India). *Journal on New Biological Report*. 2018;7(1):24-27.
- Callaway EC, Zhang Y, Chew W, Chow HHS. Cellular accumulation of dietary anticarcinogenic isothiocyanates is followed by transporter-mediated export as dithiocarbamates. *Cancer Letters*. 2004;204:23-31.
- Kapoor G. Conservation and Development in Great Himalayan National Park-Western Himalaya. *Journal on Biological Report*. 2017;6(3):142-147.
- Howard AH, Lyon AG. *Nasturtium officinale* R. Br. (*Rorippa Nasturtium aquaticum* (L.) Hayek). *J Ecol*. 1952;40:228-45.
- Verhoeven DT, Goldbohm RA, Van Poppel G, Verhagen H, Van den Brandt PA. Epidemiological studies on brassica vegetables and cancer risk. *Cancer Epidemiol Biomarkers Prev*. 1996;5:733-48.
- Manchali S, Murthy KN, Patil BS. Crucial facts about health benefits of popular cruciferous vegetables. *J Funct Foods*. 2012;4:94-106.
- Wagner AE, Terschluessen AM, Rimbach G. Health promoting effects of brassica-derived phytochemicals: From chemopreventive and anti-inflammatory activities to epigenetic regulation. *Oxid Med Cell Longev*. 2013;2013:964539.
- Manton I. The cytological history of Watercress (*Nasturtium officinale* R. Br.). *Z Indukt Abstamm Vererbungsl*. 1935;69:132-57.
- Camacho-Corona Mdel R, Ramírez-Cabrera MA, Santiago OG, Garza-González E, Palacios Ide P, Luna-Herrera J *et al*. Activity against drug resistant-tuberculosis strains of plants used in Mexican traditional medicine to treat tuberculosis and other respiratory diseases. *Phytother Res*. 2008;22:82-5.
- Jafari S, Hassandokht M. Evaluation of some Iranian watercress (*Nasturtium officinale* L.) populations using agro-morphological traits. *Int J For Soil Erosion*. 2012;2:119-23.
- Albermani SS, Albermani A, Altameme HJ. Systematic study of the genus *nasturtium* R. Br (Brassicaceae) in Iraq. *J Chem Pharm Sci*. 2017;10:352-8.
- Bleeker W, Huthmann M, Hurka H. Evolution of hybrid taxa in *nasturtium* R. Br. (Brassicaceae). *Folia Geobot*. 1999;34:421-33.
- Franzke A, Lysak MA, Al-Shehbaz IA, Koch MA, Mummenhoff K. Cabbage family affairs: The evolutionary history of Brassicaceae. *Trends Plant Sci*. 2011;16:108-16.
- Goncalves EM, Cruz RM, Abreu M, Brandao TR, Silva CL. Biochemical and colour changes of watercress (*Nasturtium officinale* R. Br.) during freezing and frozen storage. *J Food Eng*. 2009;93:32-21. Khalik KA. Morphological studies on trichomes of Brassicaceae in Egypt and taxonomic significance. *Acta Bot Croat*. 2005;64:57-73.
- Bleasdale JK. The flowering and growth of watercress (*Nasturtium officinale* R. Br.). *J Horticult Sci*. 1964;39:277-83.
- Cumbus IP, Robinson LW. The function of root systems in mineral nutrition of watercress (*Rorippa Nasturtium aquaticum* (L.) Hayek). *Plant Soil*. 1977;47:395-406.
- Voutsina N, Payne AC, Clarkson GJ, Rothwell SD, Chapman MA, Taylor G *et al*. Characterization of watercress (*Nasturtium officinale* R. Br.; Brassicaceae) transcriptome using RNASeq and identification of candidate genes for important phytonutrient traits linked to human health. *BMC Genomics*. 2016;17:1-15.
- Boligon AA, Janovik V, Pivetta CR, Pereira, Da Rocha JB, Athayde ML *et al*. HPLC analysis of polyphenolic compounds and antioxidant activity in *Nasturtium officinale*. *Int J Food Prop*. 2013;16:61-9.
- Meriem T, Soumia K, Fairouz S. Oral acute toxicity and antioxidant activity of the watercress ethanolic extract: *Nasturtium officinale* R. Br (Brassicaceae). *Res Rev: J Bot Sci*. 2017;6:14-8.
- Manju Lata, Vijay Kumar. Ethnobotanical study of Wild edible plants of Janjehli Valley, Mandi District of Himachal Pradesh, North Western Himalaya, India. *The Journal of Ethnobiology and Traditional Medicine*. Photon. 2020;131:1525-1537.

27. Manju Lata. An ethnobotanical survey of medicinal plants used by tribal migratory shepherds in hills of Tungasigarh of Thunag Subdivision of district Mandi Himachal Pradesh International Journal of Chemical Studies. 2020;8(3):1071-1078.
28. Corona MDRC, Monica A, Cabrera R, Santiago OG, González EG, Palacios IDP *et al.* Activity against Drug Resistant-Tuberculosis Strains of Plants used in Mexican Traditional Medicine to treat Tuberculosis and Other Respiratory Diseases. *Phytotherapeutic Research*. 2008;22:82-85.
29. Engelen EG, Holden G, Cohen JD, Gardner. The effect of temperature, photoperiod, and light quality on gluconasturtiin concentration in watercress (*Nasturtium officinale* R. Br.). *Journal of Agriculture and Food Chemistry*. 2006;54:328-334.
30. Antibacterial activity and synergistic effect between watercress extracts, 2-phenylethyl isothiocyanate and antibiotics against 11 isolates of *Escherichia coli* from clinical and animal source. *Letters in Applied Microbiology*. 57(4):266-73.
31. Graf BL, Silva PR, Baldeon ME. Discovering the Pharmacological Potential of Ecuadorian Market Plants using a Screens-to-Nature Participatory Approach. *Journal of Biodiversity, Bioprospecting and Development*. 2016;3(1):1-9.
32. Guarrera PM, Salerna G, Caneva G. Folk phytotherapeutic plants from Maratea area (Basilicata, Italy). *Journal of Ethnopharmacology*. 2005;99(3):367-378.
33. Hecht S, Chung F, Richie J, Akerkar S, Borukhova A, Skowronski L *et al.* Effects of watercress consumption on metabolism of a tobacco-specific lung carcinogen in smokers. *Cancer Epidemiology Biomarkers and Prevention*. 1995;4:877-884.
34. Kumari S, Sharma S, Dutt B. Traditional uses of common herbs of Baijnath region of Himachal Pradesh, India. *World Journal of Pharmacy and Pharmaceutical Science*. 2015;4(10):916-922.
35. Matsushima K, Nemoto K, Nakashima N, Dema D, Thapa L, Watanabe A *et al.* Report of investigation for wild edible plants and their *Journal of Faculty of Agriculture Shinshu University*. 2006;42(1-2):37-46.
36. Natanzi ARE, MH, Monsef Esfehiani HR, Menaei MB, Nazarian H, Sabzevari O. Antihepatotoxic effect of watercress extract and its fractions in leaves. *International Journal of Pharmacology*. 2010;6(6):896-992.
37. Natanzi ARE, Ghahremani MH, Monsef Esfehiani HR, Menaei MB, Nazarian H, Sabzevari O *et al.* An experimental model for study of the hepatoprotective activity of *Nasturtium officinale* (Watercress) against acetaminophen toxicity using in situ rat liver system. *European Journal of Scientific Research*. 2009;38(4):556-564.
38. Ozen T. Investigation of antioxidant properties of *N. officinale* (watercress) leaf extracts', *Acta Poloniae Pharmaceutica Drug Res*. 2009;66(2):187-193.
39. Palaniswamy, Usha R, Richard J, McAvoy Bernard, B Bible, James D Stuart *et al.* Ontogenic variations of ascorbic acid and phenethyl isothiocyanate *Int. J. Curr. Microbiol. App. Sci.* 2003; 2018;7(2):2685-2691
40. Pradhan S, S Manivannan, JP Tamang. Proximate, mineral composition and anti-oxidant properties of some wild leafy vegetables. *Journal of Scientific and Industrial Research*. 2015;74:155-159.
41. Rose P, Q Huang, CN Ong, M Whiteman. Broccoli and Watercress suppress matrix metalloproteinase-9 activity and invasiveness of human MDA-MB-231 breast cancer cells. *Toxicology and applied pharmacology*. 2005;209:105-113.
42. Sadeghi B. Synthesis of silver nanoparticles using leaves aqueous extract of *Nasturtium officinale* and its antibacterial activity. *International Journal of Molecular and Clinical Microbiology*. 2014;2:428-434.
43. Yamuna Pandey, Siddharth S. Bhatt and Nadia Debbarma. Watercress (*Nasturtium officinale*): A Potential Source of Nutraceuticals. *Int. J. Curr. Microbiol. App. Sci.* 2018;7(02):2685-2691.
44. Zafar R, Zahoor M, Shah AB, Majid F. Determination of antioxidant and antibacterial activities, total phenolic, polyphenol and pigment contents in *Nasturtium officinale*. *Pharm Online*. 2017;1:11-8.