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

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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 Himalaya. Local inhabitant of valley used to collect this green leafy vegetable from nearby river streams, they used to consume it as an (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: Nutritional, medicinal, indigenous, Himachal Pradesh

Introduction
Cucumber The Indian Himalayan Region (IHR) covers approximately 4,19,873 km² area (Rodger & Panwar, 1988) 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 in 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 phytocemicals. 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.
Material and Method

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 Naustratium 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 moonson (July to September). Highest temperature is recorded during May and June varying between 30 to 35. 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. (Stastical Department Mandi)

Methodology

For the assessment of nutritional, medicinal and indigenous use of Naustratium officinale surveys were conducted in different villages of Tehsil Thunag, namely Suragi, Chendi, Keuli, Lambatcha, Bakhliwar, Jarol, Kothi, Rod, Chapper, Majakhal, Kutha, Dhanshali, Tungadhar, Bhanvas, Danhyar, Katuru, Sanglwa 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. gahari 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) [10]. 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 Cumbus 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]. The leaves of the plant also are broadly used as a diuretic, expectorant, and anti-diabetic agent. Several studies propose hepatoprotective and beneficial effects of watercress in the management of some types of cancer (Boyd et al. 2014) [5] has reported that water cress supplementation in the diet reduces serum lipids and alters blood antioxidant status in hyper-cholesterolaemic rats (Brahramikia & Yazdanparast 2009) [4]. They also have shown that N. officinale has potent antioxidant properties with in vitro conditions (Brahramikia & Yazdanparast 2009) [4]. To our knowledge, there is no study about the possible anti-inflammatory effects of N. officinale with either in vivo and in vitro conditions. Therefore, the objective of the present work was to investigate the anti-inflammatory effects of a hydro-alcoholic extract from aerial parts of N. officinale in different experimental models of inflammation.

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 chuch 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(finaly 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 (Brahramikia et al.,2009) [10]. Kumari et al., (2015) [14] reported that in Bajinath 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 of excess bile, gallbladder, stimulant, kidneys, lungs, throat, expectorant, dropy, 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 glucosturtin, which has been traditionally used for treatment of diabetes, an endocrinial 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 glucosturtin. 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

Watercress is an abundant source of vital nutrients which contains vitamins and minerals. The presence of different phytochemicals and nutrition make watercress a healthy diet that maintains immunity and good health of the human body. Shahrokhi et al., 2009 mentioned that the 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 (FSA, 2002; Pradhan et al., 2015) are shown in Table 1 and 2, respectively.

<p>| Table 1: Vitamins and phytochemicals in Naustratium officinale. |</p>
<table>
<thead>
<tr>
<th>Phytochemicals</th>
<th>Quantity/80 g edible produce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories (kcal)</td>
<td>18</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>2.4</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>0.8</td>
</tr>
<tr>
<td>Fibre (g)</td>
<td>1.2</td>
</tr>
<tr>
<td>Beta carotene (mcg)</td>
<td>2016</td>
</tr>
<tr>
<td>Vitamin A equivalent (mcg)</td>
<td>336</td>
</tr>
<tr>
<td>Vitamin B1 (mg)</td>
<td>0.13</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>50</td>
</tr>
<tr>
<td>Vitamin E (mg)</td>
<td>1.17</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>50</td>
</tr>
<tr>
<td>Vitamin E (mg)</td>
<td>1.17</td>
</tr>
<tr>
<td>Folate (mcg)</td>
<td>36</td>
</tr>
<tr>
<td>Vitamin K (mcg)</td>
<td>200</td>
</tr>
</tbody>
</table>

| Table 2: Mineral composition of raw watercress (FSA, 2002; Pradhan et al., 2015). |
|-----------------------------|-----------------------------|
| 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/100g)            | 0.58                        |

Conclusion

Traditional use of Naustratium 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 Naustratium 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). 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), (Manju Lata et al., 2020). There is an urgent need to adopt large scale plantation of Naustratium officinale at kitchen garden also as it occupy small space, along with the natural habitat so the inhabitant 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. Naustratium officinale can be planted at home in kitchen garden as it occupy little space and easy to cultivate.
2. Will lift the socioeconomic of the people.

Acknowledgement

Author is thankful to the local inhabitant, vaids, Forest Department, for their kind help and providing valuable information during the field surveys.
Fig 2: *Naustratium officinale* habitat near fresh water bodies (C, D, E, F)

Fig 3: *Naustratium 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


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