

Documentation of Wild Medicinal Plants and Agriculture Crop in the part of Doon Valley, Uttarakhand, India

The present study was conducted to document wild medicinal plants and agriculture crop which are growing in and around Selaqui, district Dehradun, Uttarakhand, India. Number of field trips was undertaken for a period of two years from November, 2016 - October, 2018 to enumerate the wild medicinal plants and agriculture crop. The wild medicinal plants were collected from different parts of Selaqui at regular intervals for plant taxonomy. On the basis of field surveys, a total of 129 plant species have been collected, identified and listed. The list comprises of plants belongs to cereals, millets, legumes, root vegetables, stem vegetables, herbage vegetables, fruit vegetables, fruits, fibers, wood, wild medicinal plants and oil crops. The recorded plant species are divided into two groups namely, agriculture-horticulture crop and wild medicinal plants. The botanical names, families along with English and Hindi names have been updated as per existing flora. It was observed that the agriculture and horticulture crops were represented by a total of 77 representatives whereas wild medicinal plants were represented by 52 species. The results showed that family Leguminosae is dominant with the maximum number of species (19) followed by Poaceae (11) and Amaranthaceae (7). The study reveals that these plant species form minor but important food component for the local people and rural communities. The study also focused on the involvement of natural medicinal flora harvest foodstuff to entire foodstuff and dietary safety measures of inhabitant community has been undervalued.

Key words: Agriculture crops, Doon valley, Documentation, Wild medicinal plants.

Introduction

Agriculture biological diversity refers to the human-managed biological diversity for wide-ranging agriculture purpose (Zimmerer, 2010). It's the synergy and relations among living being, land, technology and community system. Agriculture biological diversity biodiversity is regard as the compartment of biological diversity that include the variety and variability of flora, fauna, microbes and *in-situ* and *ex-situ* conservation of genetic wealth connected with agriculture bionetwork (Borokini *et al.*, 2010). In sustainable and potency of food, sustenance, physical condition and living safe keeping all over the Globe, agriculture biological take part in a most important responsibility. Moreover, raising a few crops, communities habitually accumulate natural medicinal flora and other vegetation from natural habitat to gather their life requirements (Pandey *et al.*, 2016).

Himalayas represent one of the significant mega centres of the biological, distribution more than fifty per cent of the vegetation wealth of the Indian subcontinent (Roy and Kushwaha, 2018). It has been a profound worry and responsiveness about the conservation of the fragile Himalayan ecology (Anon., 2010). The variety, wealth as well as individuality of the vegetation mechanism in various habitat retain reverberation and have maintain the aesthetic surroundings and the substantiality of the Himalayas. However, extreme utilization of forest,

The study is paying attention on documented natural medicinal flora and agriculture crop.

**GANESH DATT BHATT, DEEPALI RANA¹
AND MAHESH SINGH**

School of Agriculture, Galgotias University
Plot No. 2, Yamuna Expressway,
Opposite Buddha International Circuit,
Sector 17A, Greater Noida, Uttar Pradesh-203201
E-mail: ganeshdattbhatt@gmail.com

Received February, 2020
Accepted October, 2020

¹Department of Zoology, Dolphin (P.G.) Institute of Biomedical and Natural Sciences, Manduwala, Dehradun - 248007, Uttarakhand

unintentional land use, natural disaster and numerous developmental processes accelerate decline of biological diversity and synchronization of the Himalayas bionetwork (Bisht and Bhatt, 2012).

Now-a-days, food safekeeping depends on a handful of extensively cultivated therapeutic flora as well as agriculture crop (Bhatt and Parihar, 2020). On the other hand, natural food wealth, Earth in excess of, provides a larger dietetic variety to many inhabitant communities who depend on them (Kwasek, 2012). In Uttarakhand hills of India, the pastoral communities under diverse farming system, agriculture ecologies still gather and consume many natural edible harvest plant resources (Shiva *et al.*, 2005). The utilization of these natural edible medicinal floras is frequently necessary when there is food scarcity during lean period (Manyi-Loh *et al.*, 2018). The wild plant resources are supportive for enhancing livelihoods and sustaining household economy of rural agricultural community (Bisht *et al.*, 2017).

The distribution of wild medicinal plants and agriculture crops depends on their genetic makeup, various environmental factors such as temperature, rainfall and other edaphic factors (Curtis and Cottom, 1956; Phillips, 1959; Misra, 1968). The policy to encourage the domestication and farming of curative vegetation has met by very limited success (Alam and Lucian, 2008). These policies has two main components which are regulation of the collection of medicinal plants from wild to protect biodiversity as well as promotion of commercial cultivation to full fill demand of rural and urban peoples. It will also provide an opportunity to farmers with a new income opportunity (Government of Uttaranchal, 2002). The purpose of policies to promote domestication and cultivation of medicinal plants has met with very limited success. It has been report that the agriculture and hunter community at 36 locations in 22 countries of Asia and Africa make use of a usual of 90-100 natural species (Bharucha and Pretty, 2010).

The access and availability of wild food resources is now declining due to habitat degradation, developmental activities, agricultural expansion and other social and ecological drivers reducing wild food use. However, with increasing pressure on enhanced agriculture productivity, the importance of wild food use has been reported to be set to grow (Shrestha and Dhillon, 2006). Hence, the present study focused towards documenting the wild medicinal plants and agricultural crops in the foot hills of Doon Valley as these are very important food component for the rural communities and also owe importance from biodiversity point of view.

Material and Methods

Study area

The state Uttarakhand is famous for its natural attractiveness of the Himalayas. The study area is located in and around Selaqui of district Dehradun Uttarakhand. The district Dehradun is situated at a

height above sea level of 640 m. The study area is full of industries and known for pharmaceuticals, so that it is also called pharma city of Dehradun (TERI, 2015). It is located towards west of the main township of Dehradun along the Chakrata road and it is about 19 km from the heart of city *i.e.*, Clock tower. The area is situated between latitude 30°21'40" N and longitude 77°50'44.8"E at an altitude of 635 m (msl). Industrialization is taking place very fast in this region. The district Dehradun comprises of six blocks which are: Chakrata, Kalsi, Vikasnagar, Sahaspur, Raipur and Doiwala. The study area is located in the Sahaspur block. The Sahaspur block is bordered by Vikasnagar Tehsil towards North, Kalsi Tehsil towards North, Poanta Sahib Tehsil towards west, Dehradun Tehsil towards East. The temperature in Selaqui average range from 14 to 38 °C and humidity levels are around 61 per cent (Sharma *et al.*, 2017; Times and Date, 2020).

The present study is based on extensive field work to document wild medicinal plants as well as agriculture crops which are growing in the study area (Fig. 1). The study was conducted for a period of two years from November, 2016 to October, 2018 to document wild medicinal plants as well as agriculture crops which are growing in and around the Selaqui. The secondary sources of information are published research articles; floras, scientific reports and books were taken for interpretation of data. The composed plant specimen were identified with the help of current and important floras and definite after identical with the reliable specimen. The identification was also done based on existing literature (Hooker, 1875; Duthie *et al.*, 1912; Babu, 1997; Bedi, 2000; Bennet, 1979; Bentley and Trimen, 2000; Blater, 1994; Brands, 1971; Colder *et al.*, 1978; Drury, 1991; Kanjilal, 1980; Raizada and Saxena, 1978; Bisht and Pundir, 2008; Pundir and Singh, 2002). The accepted name of plants along with families was updated using The Plant List (<http://www.theplantlist.org/>) has been updated. Although conduct the survey on biological diversity includes natural medicinal flora of Himalayan province, information was also gather from local people in relation to medicinal properties of the natural medicinal flora. The meetings were conduct in and around the area of Selaqui and collect the information associated to local names, hindi names, native uses and medicinal properties.

Results

On the source of extensive ground surveys, a total of 129 plant species has been collected, identified and listed. The list comprises of cereals, millets, legumes, root vegetables, stem vegetables, herbage vegetables, fruit vegetables, fruits, fibers, wood, medicinal plants and oil crops. The recorded plant species are divided in two groups: agriculture and horticulture crops (Table 1) and wild medicinal plants (Table 2) growing in the foothills of Himalayas. The botanical names, families along with English and Hindi names have also been recorded. It was observed that

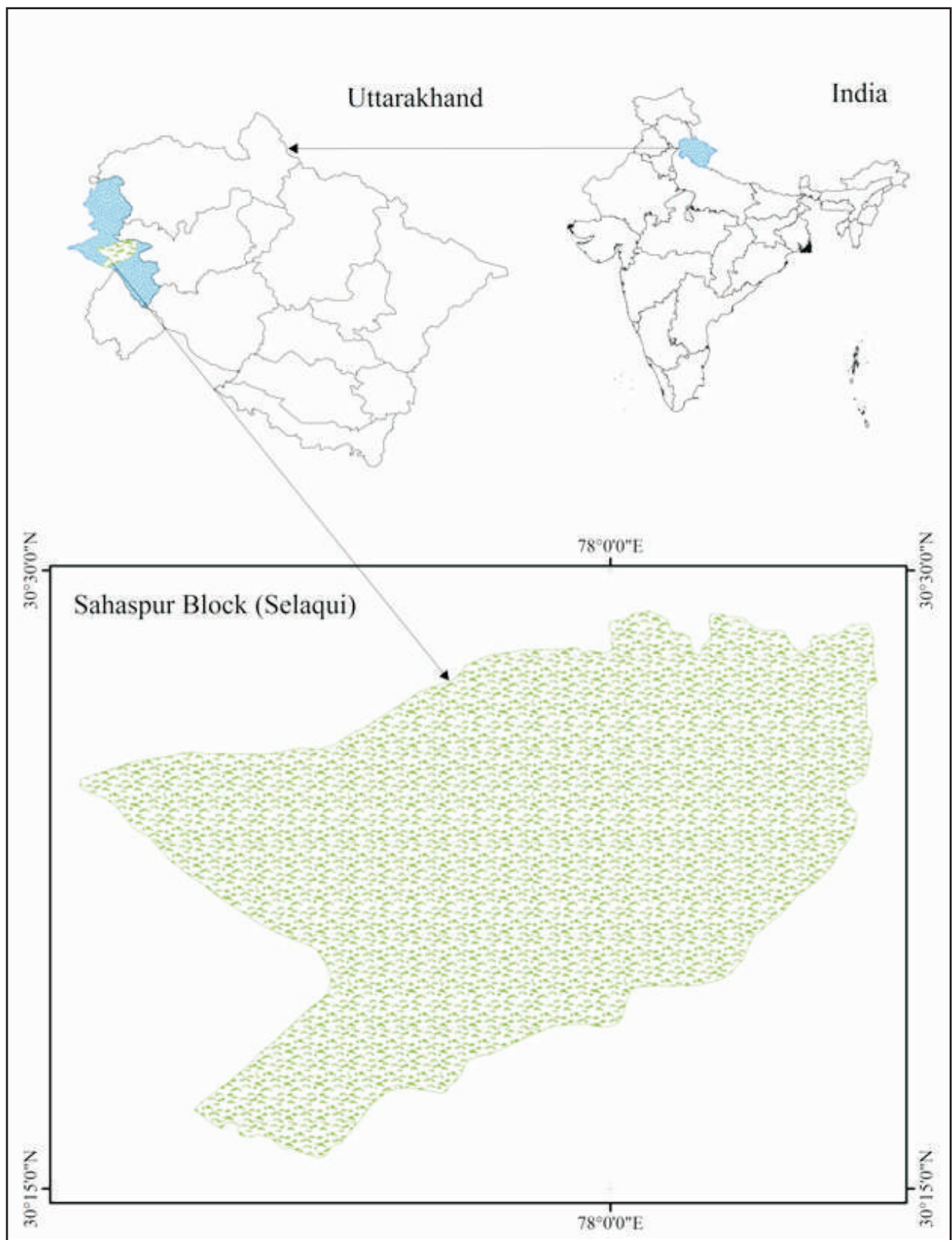


Fig. 1: Location of the study area

Table 1: A consolidated list of agriculture and horticulture crops.

S. No.	Botanical name	Family	English name	Hindi name
1.	<i>Abelmoschus esculentus</i> (L.) Moench	Malvaceae	Lady Finger	भिन्डी
2.	<i>Aegle marmelos</i> (L.) Corrêa	Rutaceae	Bail	बैल
3.	<i>Allium cepa</i> L.	Amaryllidaceae	Onion	प्याज
4.	<i>Allium sativum</i> L.	Amaryllidaceae	Garlic	लहसुन
5.	<i>Amaranthus blitum</i> L.	Amaranthaceae	Guernsey Pigweed	चोलई
6.	<i>Annona squamosa</i> L.	Annonaceae	Sugar Apple	सीताफल
7.	<i>Arachis hypogaea</i> L.	Leguminosae	Peanut	मूंगफली
8.	<i>Artocarpusheterophyllus</i> Lam.	Moraceae	Jackfruit	कटहल
9.	<i>Bauhinia variegata</i> L.	Leguminosae	Mountain Ebony	कचनार
10.	<i>Beta vulgaris</i> L.	Amaranthaceae	Beet	चुकंदर
11.	<i>Brassica juncea</i> (L.) Czern.	Brassicaceae	Mustard Greens	सरसों
12.	<i>Brassica oleracea</i> L.	Brassicaceae	Cauliflower	गोभी
13.	<i>Brassica oleracea</i> L.	Cruciferae	Cabbage	पत्तागोभी
14.	<i>Brassica rapa</i> L.	Brassicaceae	Turnip	शलजम
15.	<i>Brassica rapa</i> L.	Brassicaceae	Mustard	सरसों
16.	<i>Capsicum annuum</i> L.	Solanaceae	Chillies	लालमिर्च
17.	<i>Carica papaya</i> L.	Caricaceae	Papaya	शरीफा
18.	<i>Cascabela thevetia</i> (L.) Lippold	Apocynaceae	Yellow Oleander	पीली कनेर
19.	<i>Casuarina equisetifolia</i> L.	Casuarinaceae	horsetail tree	जंगली सारू
20.	<i>Catharanthus roseus</i> (L.) G.Don	Apocynaceae	Rosy Periwinkle	सदाबहार
21.	<i>Celosia argentea</i> L.	Amaranthaceae	Cockscomb	लालमुर्गा
22.	<i>Chenopodium album</i> L.	Amaranthaceae	Pig Weed	बथुआ
23.	<i>Cicer arietinum</i> L.	Fabaceae	Gram	चना
24.	<i>Citrus maxima</i> (Burm.) Merr.	Rutaceae	Chinese grapefruit	पपीता
25.	<i>Citrus medica</i> L.	Rutaceae	Citron	चकोतरा
26.	<i>Colocasia esculenta</i> (L.) Schott	Araceae	Taro	अरवी
27.	<i>Cucumis pepo</i> L.	Cucurbitaceae	Pumpkin	कद्दू
28.	<i>Cucumis sativus</i> L.	Cucurbitaceae	Cucumber	खीरा
29.	<i>Cycas revoluta</i> Thunb.	Cycadaceae	Sago Palm	साइकैस
30.	<i>Cymbopogon flexuosus</i> (Nees ex Steud.) W.Watson	Poaceae	Leamon Grass	लेमन ग्रास
31.	<i>Dioscorea alata</i> L.	Dioscoreaceae	Wild yam	गीठे
32.	<i>Eucalyptus globulus</i> Labill.	Myrtaceae	Eucalyptus	सफेदा
33.	<i>Glycine max</i> (L.) Merr.	Papilionaceae	Soyabean	सोयाबीन
34.	<i>Helianthus annuus</i> L.	Compositae	Sun Flower	सूरजमुखी
35.	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	China Rose	गुडल
36.	<i>Hordeum vulgare</i> L.	Poaceae	Barley	जौ
37.	<i>Ipomoea batatas</i> (L.) Lam.	Convolvulaceae	Sweet Patato	शकरकंद
38.	<i>Jatropha curcas</i> L.	Euphorbiaceae	Curcas	रतनजोत
39.	<i>Juglans regia</i> L.	Juglandaceae	Walnut	अखरोट
40.	<i>Lagenaria siceraria</i> (Molina) Standl.	Cucurbitaceae	Bottle Gourd	लोकी
41.	<i>Lawsonia inermis</i> L.	Lythraceae	Henna	मेहेंदी
42.	<i>Lens culinaris</i> Medik.	Leguminosae	Lentil	मसूर
43.	<i>Lens culinaris</i> Medik.	Leguminosae	Lentil	मसूर
44.	<i>Litchi chinensis</i> Sonn.	Sapindaceae	Lichi	लीची
45.	<i>Lycopersicon esculentum</i> Mill.	Solanaceae	Tomato	टमाटर
46.	<i>Mangifera indica</i> L.	Anacardiaceae	Mango	आम
47.	<i>Mentha arvensis</i> L.	Lamiaceae	Peppermint, Mint	पुदीना
48.	<i>Momordica charantia</i> L.	Cucurbitaceae	Bitter Gourd	करेला
49.	<i>Morus alba</i> L.	Moraceae	Mulberry	शहचूत
50.	<i>Musa × paradisiacal</i> L.	Musaceae	Banana	केला
51.	<i>Nerium oleander</i> L.	Apocynaceae	Oleander, Nerium	कनेर
52.	<i>Oryza sativa</i> L.	Poaceae	Rice	चावल
53.	<i>Pelargonium graveolens</i> L'Hér.	Geraniaceae	Rose Geranium	जरेनियम
54.	<i>Pennisetum glaucum</i> (L.) R.Br.	Poaceae	Pearl millet	बाजरा
55.	<i>Phaseolus lunatus</i> L.	Leguminosae	Butter bean	लोबिया
56.	<i>Phaseolus vulgaris</i> L.	Leguminosae	Kidney Bean	राजमा

S. No.	Botanical name	Family	English name	Hindi name
57.	<i>Phoenix dactylifera</i> L.	Arecaceae	Date	खजूर
58.	<i>Pisum sativum</i> L.	Papilionaceae	Garden Pea	मटर
59.	<i>Prunus persica</i> (L.) Batsch	Rosaceae	Peach	आड़ू
60.	<i>Psidium guajava</i> L.	Myrtaceae	Guava	अमरुद
61.	<i>Punica granatum</i> L.	Lythraceae	Pomegranate	अनार
62.	<i>Raphanus sativus</i> L.	Brassicaceae	Radish	मूली
63.	<i>Ricinus communis</i> L.	Euphorbiaceae	Castor	अरंडी
64.	<i>Rubus armeniacus</i> Focke	Rosaceae	Himalayan blackberry	
65.	<i>Saccharum officinarum</i> L.	Poaceae	Sugarcane	गन्ना
66.	<i>Sesamum indicum</i> L.	Pedaliaceae	Sesame	तिल
67.	<i>Solanum melongena</i> L.	Solanaceae	Brinjal	बैंगन
68.	<i>Spinacia oleracea</i> L.	Amaranthaceae	Spinach	पालक
69.	<i>Tamarindus indica</i> L.	Leguminosae	Tamarind	इमली
70.	<i>Trifoliumalexandrinum</i> L.	Leguminosae	Egyptian clover	बरसीन
71.	<i>Trigonellafoenum-graecum</i> L.	Leguminosae	Fenugreek	मेंथी
72.	<i>Triticum aestivum</i> L.	Poaceae	Wheat	गेहूँ
73.	<i>Vigna mungo</i> (L.) Hepper	Leguminosae	Black Gram	कालाचना
74.	<i>Vigna radiata</i> (L.) R.Wilczek	Leguminosae	Green Gram	हराचना
75.	<i>Zea mays</i> L.	Poaceae	Maize	मक्का
76.	<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Ginger	अदरक
77.	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Indian plum	बेर

Table 2: A consolidate list of wild medicinal plants.

S. No.	Botanical name	Family name	English name	Hindi name	Uses
1.	<i>Abrus precatorius</i> L.	Leguminosae	Crab's Eye	रत्ती	The Jewelers are frequently used these seeds for measurements of gold and silver items. A traditional myth in the local society that if these seeds were kept in any house, the family members will be fight to each other and the peace and harmony of the home will drastically affected.
2.	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Indian Abutilon	कंधी	The plant is used in traditional herbal formulations to treat many ailments, mainly scratches, sores, and wounds caused by dogs, cats, and mice.
3.	<i>Acacia nilotica</i> (L.) Delile	Leguminosae	Gum Arabic	बबूल	The tender stem of the plant is used as a toothbrush.
4.	<i>Achyranthes aspera</i> L.	Amaranthaceae	Devil's Horsewhip	चिरचिटा लटजीरा	The root of the plant is used in stomach pain and jaundice.
5.	<i>Ailanthus excelsa</i> Roxb.	Simaroubaceae	Tree of Heaven	महानिंब	The local human being uses the plant for antifertility, anthelmintic and rejuvenating use.
6.	<i>Albizia ebbbeck</i> (L.) Benth.	Leguminosae	Siris tree	कालोशिरिष	It is astringent, and used by some cultures to treat boils, cough, to treat the eye flu, ingivitis, lung problems, pectoral problems. It is also used as a tonic, and is used to treat abdominal tumors
7.	<i>Aloe vera</i> (L.) Burm.f.	Xanthorrhoeaceae	Aloe vera	एलोविरा	It helps moisturize the skin, gets rid of fine lines, wrinkles, dead cells on the surface of the skin, rejuvenate the skin keeps them flexible and bright. The plants also have a remarkable capacity to remove stretch marks and blemishes helping the skin retain its soft and smooth texture.
8.	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Amaranthaceae	Sessile Joyweed	गुरु	The stems and leaves of sessile joy weed are used to treat eye problems. The shoots of the weed are mixed with other ingredients to improve male sexual potency.
9.	<i>Amaranthus viridis</i> L.	Amaranthaceae	Green Amaranth	जंगलीचौलाई	The root juice is used to care for inflammation at some stage in urination.
10.	<i>Antidesma ghaesembilla</i> Gaertn.	Phyllanthaceae	Black Currant Tree		The worm wood leaves powder, paste function on the scalp can prevent epilepsy attack and convulsions.
11.	<i>Artemisia absinthium</i> L.	Compositae	Grand Wormwood	विजयाती अफसंतिन	It is useful to maintain the blood sugar and blood pressure.

S. No.	Botanical name	Family name	English name	Hindi name	Uses
12.	<i>Azadirachta indica</i> A.Juss.	Meliaceae	Margosa Tree	नीम	The juice is used to kill intestinal worms. The neem barks are used against allergy and prickle. It is antibacterial, antifungal and antiprotozoal. The tree barks are useful in the treatment of the tumor. The twigs give relief from a toothache; it cleans the tooth and acts as a deodorant to mouth.
13.	<i>Bambusa bambos</i> (L.) Voss	Poaceae	Indian Thorny Bamboo	बांस	The stems are used for preparation of pickles. They are taken internally to stimulate menstruation and to help relieve period pain
14.	<i>Bombax ceiba</i> L.	Malvaceae	Silk Cotton	सेमल	The plant parts i.e., flowers, young root, gum, leaves, shoots, and bark have medicinal properties and are used as treatment for cholera, fractures, toothache, coughs, urinary problems, influenza, and snake bites etc.
15.	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Crassulaceae	Life plant	अपराजिता	It has been recorded in traditional treatment for hypertension and for the treatment of kidney stones.
16.	<i>Butea monosperma</i> (Lam.) Taub.	Leguminosae	Flame of the Forest	ढाक	The flowers are astringent to leprosy, strangury, gout, skin diseases; thirst sensation. The flower juice is used to treat eye diseases.
17.	<i>Calotropis gigantea</i> (L.) Dryand.	Apocynaceae	Sodom	सफेद आक	The <i>Calotropis</i> is used for digestive disorders including diarrhea, constipation and stomach ulcers; for painful conditions including toothache, cramps, and joint pain; and for parasitic infections including elephantiasis and worms.
18.	<i>Calotropis procera</i> (Aiton) Dryand.	Apocynaceae	Sodom	आक	The milky juice of <i>Calotropis procera</i> is used against arthritis, cancer, and as an antidote for snake bite.
19.	<i>Cannabis sativa</i> L.	Cannabaceae	Hemp	भांग	The dried leaves and flowers buds of the cannabis is smoked through a pipe. The resinous secretions of the plant can be smoked. The seeds are eaten and helpful in stress.
20.	<i>Cassia fistula</i> L.	Leguminosae	Golden Shower Tree	अमलतास	The root-bark, leaves and flowers also have laxative properties, but to a lesser extent. In modern medicine, the fruit pulp is sometimes used as a mild laxative in pediatrics.
21.	<i>Commelina benghalensis</i> L.	Commelinaceae	Benghal Dayflower	काना	The plant is astringent, demulcent, laxative and mucilaginous. The plant is used to counter infertility in women.
22.	<i>Corchorus olitorius</i> L.	Malvaceae	Nalta Jute	पाटसाग	The leaves are used for ascites, pain, piles, and tumors. The leaves are used for cystitis, dysuria, fever, and gonorrhoea. The cold infusion is whispered to restore the appetite and strength.
23.	<i>Curcuma longa</i> L.	Zingiberaceae	Turmeric	हल्दी	The turmeric is used extensively in foods for both its flavor and color. Turmeric has a long tradition of use in the different medicinal purposes.
24.	<i>Cymbopogon martini</i> (Roxb.) W.Watson	Poaceae	Lemongrass	रोषघंस	The plant and its oils are used to treat rheumatism, hair loss, arthritis, lumbago and spasms.
25.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Bermuda Grass	दूबघास	The plant is used to treat all types of bleeding and skin troubles.
26.	<i>Dahlia pinnata</i> Cav.	Compositae	Garden Dahlia	खरपात	Petals and tubers were used by aztecs for treating infected grazes, rashes and cracks in skin.
27.	<i>Dalbergia sissoo</i> DC.	Leguminosae	Indian Rosewood	शीशम	The leafy juice for eye ailments, the woody bark paste as anthelmintic, antipyretic and analgesic.
28.	<i>Datura metel</i> L.	Solanaceae	Angel's Trumpet	धतूरा	It is used additionally to treat hydrophobia, epilepsy, convulsion, and syphilis, inflammation of the breasts, smallpox, mumps and leprosy. The plant is also used as a pesticide. The seeds are mixed with sorghum flour are used as poison bait for rats.
29.	<i>Datura stramonium</i> L.	Solanaceae	White Thorn-Apple	धतूरा	The seeds of <i>Datura</i> are analgesic, anthelmintic and anti-inflammatory and as such, they are used in the treatment of stomach and intestinal pain that results from worm infestation, toothache, and fever from inflammation.

S. No.	Botanical name	Family name	English name	Hindi name	Uses
30.	<i>Dioscorea bulbifera</i> L.	Dioscoreaceae	Bulb Bearing Yam	गैण्डी	The plant bulbils are used in the treatment of piles, dysentery, syphilis, ulcers, cough, leprosy, diabetes, asthma, and cancer.
31.	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Asthma Weed	बड़ादुधी	It is used in the treatment of cancer, diarrhea, dysentery, intestinal, asthma, bronchitis, fever, eyelid styes, cough, asthma, bronchial infections, bowel complaints, helminthic infestations, wounds, kidney stones and abscesses etc.
32.	<i>Ficus benjamina</i> L.	Moraceae	Benjamin Fig	पुकर	The plant is also used as antimicrobial, antinociceptive, antipyretic, hypotensive and anti-dysentery remedy.
33.	<i>Ficus religiosa</i> L.	Moraceae	Bodhi Tree	पीपल	It is a tree which is used for the treatment of cough, skin diseases, improving the skin complexion, nausea, vomiting, diarrhea and improving the sexual potency.
34.	<i>Justicia adhatoda</i> L.	Acanthaceae	Malabar nut	अडूसा	The plant is used in the treatment of cough and other respiratory ailments.
35.	<i>Malva parviflora</i> L.	Malvaceae	Cheese weed Mallow		The seeds are demulcent. They are used in the treatment of coughs and ulcers in the bladder.
36.	<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae	Sweet Neem Leaves	मीठानीम / कड़ी	The fresh leaves are eaten to treat dysentery, and a leaf infusion is drunk to stop vomiting.
37.	<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Rubiaceae	Kadam	कदम	The decoction of the bark is used to wash the infected wound. The decoction of the bark of the plant is used for gargling to treat mouth ulcers and inflammation of the gums.
38.	<i>Nyctanthes arbor-tristis</i> L.	Oleaceae	Tree of Sorrow, Sad Tree	हारसिंगार	The plant is used in various ailments like fever, enlargement of the spleen, malaria, blood dysentery, cough and gastritis. The juices of leaves are used as digestives, antidote to reptiles' venoms.
39.	<i>Ocimum sanctum</i> L.	Lamiaceae	Holy Basil	तुलसी	The different parts of leaves, stem, flower, root, seeds and even whole plant is used in different ayurvedic medicines. A small herb has been recommended for the treatment of bronchitis, bronchial asthma, malaria, diarrhea, dysentery and skin diseases etc.
40.	<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Indian gooseberry	आमला	The plants exhibit strong antioxidant activity. It is used immunomodulatory, anti-inflammatory, antiulcer, hepatoprotective, and anticancer actions.
41.	<i>Polygonum plebeium</i> R.Br.	Polygonaceae	Knotweed	मचेची	The crushed seeds are cooked and eaten as remedy for bowel complaints.
42.	<i>Pongamia pinnata</i> (L.) Pierre	Leguminosae	Pongam Tree	करंज	The root is effective for treating gonorrhoea, cleaning gums, teeth, and ulcers, and is used in vaginal and skin diseases.
43.	<i>Portulaca oleracea</i> L.	Portulacaceae	Hogweed	लूनिया	It exhibits a wide range of pharmacological effects, including antibacterial, antilcerogenic, anti-inflammatory, antioxidant, and wound-healing properties.
44.	<i>Putranjiva roxburghii</i> Wall.	Putranjivaceae	Putrajivaka, Sutajva	पुत्रन्जिवा	This tree is an Ayurvedic Herb used for the for the treatment of eye disorders, burning sensation, elephantiasis, difficulty in maturation, azoospermia and habitual abortions.
45.	<i>Saccharum spontaneum</i> L.	Poaceae	Kans Grass	काँस	The roots are sweet, astringent, emollient, refrigerant, diuretic, lithotripter, purgative, tonic, aphrodisiac and useful in treatment of dyspepsia, burning sensation, piles, sexual weakness, gynecological troubles, respiratory troubles etc.
46.	<i>Senna tora</i> (L.) Roxb.	Leguminosae	Chinese senna	चकुंदा	It has been used for treating skin diseases such as leprosy, ringworm, itching and psoriasis and also for snakebites.
47.	<i>Solanum americanum</i> Mill.	Solanaceae	Black Nightshade	मकोई	The leaf juice is used to treat eye complaints especially conjunctivitis
48.	<i>Tectona grandis</i> L.f.	Lamiaceae	Teak	सागौन	The wood is acrid, cooling, laxative, sedative to gravid uterus and useful in treatment of piles, leucoderma and dysentery. Flowers are acrid, bitter and dry and useful in bronchitis, biliousness, urinary discharges etc

S. No.	Botanical name	Family name	English name	Hindi name	Uses
49.	<i>Toona ciliata</i> M.Roem.	Meliaceae	Indian mahogany	तून	The various parts of the plant, but especially the bark, are used in traditional medicine in the distribution area of <i>Toona ciliata</i> .
50.	<i>Trianthema portulacastrum</i> L.	Aizoaceae	Black Pigweed	पुनर्नवा	Traditionally it is used as analgesic, stomachic, laxative, treatment of blood disease, anemia, inflammation, and night blindness.
51.	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Devil's Thorn	गोखरू	This herb is purported to help a variety of health issues such as high blood pressure, high cholesterol, kidney stones, erectile dysfunction, sexual dysfunction, and act as a diuretic.
52.	<i>Woodfordia fruticosa</i> (L.) Kurz	Lythraceae	Fire Flame Bush		It is treating various ailments/disorders i.e., leprosy, toothache, leucorrhea, fever, dysentery, bowel disease etc.

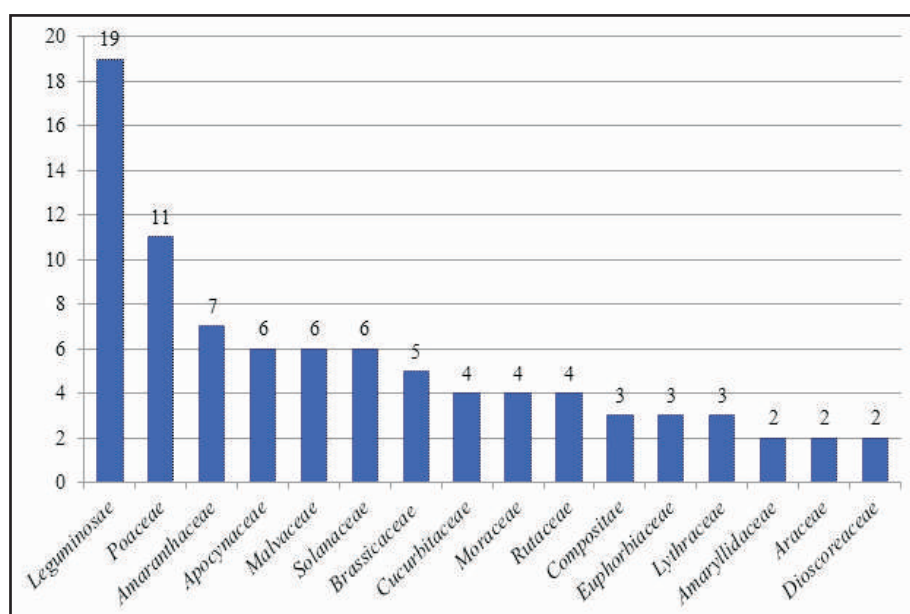


Fig. 2: Family-wise dominant of plant species.

agriculture and horticulture crops were represented by a total of 77 representatives (Table 1) whereas wild medicinal plants were represented by 52 individuals (Table 2). The dominant family is Leguminosae which showed maximum number of species (19) followed by Poaceae (11), Amaranthaceae (7), Apocynaceae (6), Solanaceae (6) and Brassicaceae (5) (Fig. 2). Dewangan (2015) reported similar dominancy pattern while documenting the phytodiversity of D.B. Girls P.G. College Campus of Raipur (C.G.). The phytodiversity is the functional and structural unit of any biotic component of an ecosystem and is subject to change due to the interaction of biotic and abiotic factors of the environment (Kumar *et al.*, 2016). The technical information of similar botanical nature is also available in the flora and books (Hooker, 1875; Bentham and Hooker, 1876; Chopra *et al.*, 1956). The rich floristic diversity in this area showed that the Himalayan foothills are very rich and diverse and provide a rich source of food to the local people. The description of

various medicinal plants has also been documented by Bhandari (1978) and Jain (1977). The systematic study evidently demonstrates that we must come together and improve the efforts to preserve local biological diversity and save traditional food systems and farming practices as well. This risk to a number of species of wild medicinal plants must be taken to conserve for sustainable natural resources management system.

दूनघाटी, उत्तराखण्ड, भारत के भागों में जंगली औषधीय पादपों
और कृषि फसलों का प्रलेख-पोषण
गणेश दत्त भट्ट, दीपाली राणा और महेश सिंह
सारांश

सेलाकुई, जिला देहरादून, उत्तराखण्ड, भारत में और इसके चारों ओर उगे जंगली औषधीय पादपों और कृषि फसलों का प्रलेख-पोषण करने के लिए यह अध्ययन किया गया। जंगली औषधीय पादपों और कृषि

फसलों की गणना करने के लिए नवम्बर, 2016-अक्टूबर, 2018 में दो वर्ष की अवधि के लिए अनेकों क्षेत्र भ्रमण किया गया। पादप वर्गिकी के लिए नियमित अन्तराल पर सेलाकुई के विभिन्न भागों से जंगली औषधीय पादप एकत्र किए गए। क्षेत्र सर्वेक्षण के आधार पर कुल 129 पादप प्रजातियों को एकत्र किया और पहचान करके सूचीबद्ध किया। सूची में अनाजों, बाजरा, फली, जड़ वनस्पति, तना वनस्पति, शाकीय वनस्पति, फल वनस्पति, फल, रेशा, काष्ठ, जंगली औषधीय पादपों एवं तेल फसलों से संबंधित पादप शामिल हैं। अभिलिखित पादप प्रजातियों को दो समूहों, यथा- कृषि-औद्योगिक फसल और जंगली औषधीय पादपों में विभाजित किया गया। अंग्रेजी और हिन्दी नामों के साथ वानस्पतिक नामों, कुलों को वर्तमान वनस्पति के अनुसार अद्यतन किया गया। यह प्रेक्षित किया गया कि कृषि और का प्रतिनिधित्व औद्योगिक फसलों का प्रतिनिधित्व कुल 77 प्रतिनिधियों द्वारा किया गया जबकि जंगली औषधीय पादपों का प्रतिनिधित्व 52 प्रजातियों द्वारा किया गया। परिणामों ने दर्शाया कि प्रजातियों की अधिकतम संख्या (19) के साथ कुल लीगुमिनोसा प्रधान है, इसके बाद पोएसीया (11) और एमारेन्थेसीया (7) है। अध्ययन ने दर्शाया कि ये पादप प्रजातियाँ स्थानीय लोगों और ग्रामीण समुदायों के लिए गौण किन्तु महत्वपूर्ण खाद्य घटक बनाती हैं। निवासी समुदाय के सम्पूर्ण खाद्यस्टफ और दैनिक आहार उपायों के लिए प्राकृतिक औषधीय वनस्पति फसल खाद्यस्टफ की भागीदारी पर भी अध्ययन को केंद्रित किया गया, जिसे कम महत्व दिया गया है।

References

- Alam G. and Lucian P. (2008). *Cultivation of Medicinal Plants in Uttarakhand, Special article - Economic and Political Weekly 320-321, A to Z Industrial Estate, Ganpatrao Kadam Marg, Lower Parel, Mumbai - 400013.*
- Anon., (2010). Report on National Mission for Sustaining the Himalayan Eco-System under National Action Plan on Climate Change. Government of India, Department of Science & Technology, Ministry of Science & Technology, New Delhi.
- Babu C.R. (1997). *Herbaceous Flora of Dehradun*. CSIR, New Delhi.
- Bedi R. (2000). *Floral Spectrum*. International Book Distributors, Dehradun, India.
- Bennet S.S.R. (1979). *An Introduction to Plant Nomenclature*. International Book Distributors. Dehradun, India.
- Benthon G. and Hooker J.D. (1876). *Genera Plantarum in 3 Volumes*, L. Reeve and Co. London, United Kingdom.
- Bentley R. and Trimen H. (2000). *Medicinal Plants, Vol. 1-4*. International Book Distributors, Dehradun, India.
- Bhandari M.M. (1978). *Flora of Indian Desert*, Scientific Publisher, Jodhpur, India.
- Bharucha Zareen and Jules Pretty, (2010). The Roles and Values of Wild Foods in Agricultural Systems, *Philosophical Transactions of the Royal Society*, **365** (1564): 2767-2767.
- Bhatt G.D. and Parihar R., (2020). Use of Remote Sensing and Geographic Information System on Agroforestry Ecosystem in Himalayan Region of Uttarakhand. *Advances in Geographical and Environmental Sciences*, Seema Sahdev et al. (Eds): *Geoecology of Landscape Dynamics*, 978-981-15-2096-9, 473107_1_En, (12).
- Bisht D.S. and Pundir Y.P.S. (2008). Wild Medicinal Plants of Jaunsar-Bawar (Western Himalaya), Uttarakhand-II, *The Indian Forester*, **134**(5): 674-686.
- Bisht I.S., Mehta P.S., Negi K.S., Rawat R. and Singh R. (2017). Wild Plant Food Resources in Agricultural Systems of Uttarakhand Hills in India and Its Potential Role in Combating Malnutrition and Enhancing Human Health, *Journal of Food Science and Toxicology*, **2**: (1:3).
- Bisht A.S. and Bhatt A.B. (2012). A Contribution to The Medicinal Plants of Sahastradhara, District Dehradun, Uttarakhand (With Ethnobotanical Notes), *Journal of Drug Delivery and Therapeutics*, **2**(5): 114-120.
- Blater B. (1994). *The Palms of British India and Ceylon*, International Book Distributors, Dehradun, India.
- Borokini T.I., Okere A.U., Giwa A.O., Daramola B.O., and Odofin W.T., (2010). Biodiversity and Conservation of Plant Genetic Resources in Field Gene-Bank of The National Centre for Genetic Resources and Biotechnology, Ibadan, Nigeria, *The International Journal of Biodiversity and Conservation*, **2**: 37-50.
- Brands D. (1971). *Indian Trees*, Bishen Singh Mahendra Pal Singh, Dehradun, India.
- Chopra R.N., Nayer S.L. and Chopra I.C. (1956). *Glossary of Indian medicinal plants*, CSIR, New Delhi, India.
- Colder C.C., Naryanaswami V. and Ramaswami M.S. (1978). List of Species of Genera of Indian Phanerogams Not Included In Sir J.D. Hooker's Flora of British India, International Book Distributor, Dehradun, India.
- Curtis J.T. and Cottom G. (1956). *Plant Ecology Workbook-Laboratory Field Reference Manuals*, Burgess Publication Co. Minnesota U.S.A.
- Dewangan P., Verma S., Shukla S., Acharya V., Shrivastav K. and Girolkar A. (2015). Study of Phytodiversity of D.B. Girls P.G. College Campus of Raipur (C.G.), *Indian Journal of Pure and Applied Biosciences*, **30**: (1): 77-84.
- Drury C.H. (1991). *Useful Plants of India*, International Book Distributors, Dehradun, India.
- Duthie J.F., Parker R.N. and Turrill. W.B. (1912). Flora of The Upper Gangetic Plain and of The Adjacent Siwalik and Sub-Himalayan Tracts, *Nature*, **88**(411).
- Government of Uttaranchal, (2002). *Marketing of Medicinal Plants: Status and Action Plan, Horticulture and Rural Development Department, Government of Uttaranchal, Dehradun*.
- Hooker J.D. (1875). *Flora of British India*, Reeve and Co. Ltd., England.
- Jain S.K. and Rao R.R. (1976). *A Hand Book of Field and Herbarium Methods*. Today and Tomorrow's Printers and Publishers, New Delhi. Kanjilal, U.N., 1980, Forest Flora of Chakrata, Dehradun and Saliaranpur.
- Kumar S., Duggal S., Laura J.S., Singh N. and Kudesia R. (2016). Phyto-Diversity on Campus of K.M. Government College Narwana, India, *International Journal of Current Microbiology and Applied Sciences*, **5**(7): 565-570.
- Kwasek M., (2012). Threats to Food Security and Common Agricultural Policy, *Economics of Agriculture*, **59** (4): 701-713.
- Manyi-Loh C., Mamphweli S., Meyer E. and Okoh A. (2018). Antibiotic Use in Agriculture and Its Consequential Resistance in Environmental Sources: Potential Public Health Implications. *Molecules*, **23**(4): 795.
- Misra R., (1968). *Ecology Workbook*, Oxford and IBH Publishing Co., New Delhi, India.

Pande P.C., Vibhuti Awasthi P., Bargali K., and Bargali S.S. (2016). Agro-Biodiversity of Kumaun Himalaya, India: A Review, *Journal of Current Agriculture Research*, **4**(1): 16-34.

Phillips E.A. (1959). *Methods of Vegetation Study*, Henry Holt, Rinehart and Winston New York, U.S.A.

Pundir Y.P.S. and Singh D. (2002). Ethnobotanical Wild Food Plants of Jaunsar-Bawar (Western Himalaya), Uttaranchal, *Indian Forester*, **128**(5): 571-582

Raizada M.B., and Saxena H.O. (1978). *Flora of Mussoorie*, International Book Distributors, Dehradun, India.

Roy A. and Kushwaha S.P.S. (2018). *Landscape Level Plant Diversity Characterization in Indian Himalayan Region*, Plant Diversity in The Himalaya Hotspot Region, Vol. I, M/S. Bishen Singh Mahendra Pal Singh, Dehra Dun ISBN: 978-81-211-0946-8 Editors: A.P. Das and S. Bera.

Sharma A., Singh H. and Kumar N. (2017). Studies on Traditional Knowledge of Medicinal Flora and Its Contribution to Livelihood Enhancement in the Doon-Valley, Uttarakhand (India), *International Journal of Life-Sciences Scientific Research*, **3**(2): 951-960.

Shiva V., Singh V., Dankelman I., Negi B. and Singh S., (2005). Biodiversity, Gender and Technology in Mountain Agriculture, NAVDANYA A-60, Hauz Khas, New Delhi - 110016, India.

Shrestha P.M. and Dhillon S.S. (2006). Diversity and Traditional Knowledge Concerning Wild Food Species in A Locally Managed Forest in Nepal, *Agroforestry System*, **66**: 55-63.

TERI (2015). *Cluster Profile Report - Dehradun Pharmaceutical Industries* New Delhi: The Energy and Resources Institute 8 Pp. [Project Report No. 2014IE15]

Time and Date A.S. (2020). ("Aksjeselskap"), is a Private, Limited Liability Company Registered in The Norwegian "Foretaks Register et" (Register of Business Enterprises) as NO. 988 375 713 MVA.

Zimmerer K.S. (2010). Biological Diversity in Agriculture and Global Change, *The Annual Review of Environment and Resources*, **35**:137-66.

Acknowledgement

The Authors are highly thankful to the rural peoples of Selaqui, Dehradun, Uttarakhand, for their help and support for the shared the information about natural medicinal flora as well as agriculture crop. Thanks are also due to the anonymous reviewer for his valuables suggestions for improvement of the article. Authors are also acknowledging to Honorable Chancellor Shri Sunil Galgotia and Pro-Vice Chancellor Prof. Pradeep Kumar for encouragement and necessary guidance.