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Diversity and Utilization of Medicinal Flora of Baba Ghulam Shah Badshah University Campus Rajouri Jammu and Kashmir, India

Humaira, Shreekar Pant, Abdul Rashid Dar[1],
Afroza Akhter[1], Mohammad Rafiq Wani[1], Naseer Hussain Shah[1]

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ABSTRACT

Background: Indian Himalayan region has a rich heritage of species and genetic strains of flora and fauna and is considered as mega hot spot of biological diversity. Wild plant raw material is in great demand around the world for use by pharmaceutical companies, ethnomedicinal practitioners and variety of traditional medicines. India is one of the world's major exporters of raw herbal drugs and the Himalayas are renowned for their vast storehouse of medicinal plants. The present study conducted at Baba Ghulam Shah Basdshah University located in District Rajouri, Jammu and Kashmir recorded the presence of 46 species of medicinal plants belonging to 34 families.

Methods: The plant specimens were collected from different parts of Baba Ghulam Shah Badshah University Campus. All the parameters like habit, habitat, life form, parts used, methods of use were recorded on filed notebook along with date of collection. Routine herbarium practices were followed for preserving the plant specimens. The plant specimens were collected and their external morphology was studied and examined carefully. The specimens of medicinal plants were properly labelled and subsequently deposited in the Herbarium, Centre of Biodiversity Studies, BGSBU, Rajouri, Jammu and Kashmir, India.

Result: During ethnobotanical exploration, 46 species distributed over 44 genera in 34 Families of wild medicinal plants were documented from four sampling sites. The details pertaining to common names, part used, medicinal uses and active constituents of each species were tabulated. Among the plant parts used, leaves contributed for medicinal use in about 63% species, followed by fruits in 19% species, underground parts in 10.8% species and flowers in 6.5% species. The enlisted plant species belonged to three life forms *viz*., herbs (21), shrubs (15) and trees (10). Asteraceae was the most dominant family represented by 4 species followed by Moraceae, Lamiaceae and Fabaceae each represented by 3 species, while as families like Meliaceae, Violaceae, Berberidaceae were represented by 01 species each.

Key words: Active constituents, Diversity, Habit, Medicinal plants, Nativity.

INTRODUCTION

India is commonly called as 'Botanical Garden' of the world, owing to its wealth of herbal medicines. Medicinal plants constitute precious resources for mankind. Since times immemorial, plants have been put to medicinal use by traditional *Herbalists/Hakims*, *Vaidays, Ayurvedic* practitioners and common man. Also, the health care obtained by utilizing plants, plant parts or plant compounds has always been held in high esteem by folk medicine. Medicinal plants have been unique sources of medicines and constitute the most common human use of biodiversity (Hamilton, 2004).

India has one of the world's richest medicinal plant heritage. In India, medicinal plants comprise approximately 8000 species and account for around 50% of all higher flowering plant species. In terms of volume and value of medicinal plants exported, it is after only China which tops the list of exporting countries (Singh, 2001). Also, in India there is a substantial volume of internal trade in medicinal plants. There are about 7800 medicinal drug-manufacturing units in India consuming about 2000 tonnes of herbs annually (Singh, 2001). It has been estimated that 14-28% of higher plant species are used medicinally, whereas 15% of all angiosperms have been investigated chemically and 74% of pharmaceutically active plant derived components were discovered after following the ethno- medicinal use of the plant.

District Rajouri, located in south-western side of the state of Jammu and Kashmir, India is known for its economically valued plants and their products, such as medicine, food, fodder, fibre *etc*. Owing to its rich and unique floristic diversity, a good proportion of plants are used as

Centre for Bio-Diversity Studies, Baba Ghulam Shah Badshah University, Rajouri-185 234, Jammu and Kashmir, India.
[1]Department of Botany, Abdul Ahad Azad Memorial Degree College, Bemina-190 018, Cluster University Srinagar, Jammu and Kashmir, India.

Corresponding Author: Abdul Rashid Dar, Department of Botany, Abdul Ahad Azad Memorial Degree College, Bemina-190 018, Cluster University Srinagar, Jammu and Kashmir, India.
Email: rashid_bot@rediffmail.com

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medicine in one or the other form. The ethnic use of these herbs as medicine has probably been the only means of curing and protecting the human population from various diseases. Although a number of ethno-botanical studies have been carried out on the medicinal plants in Indian Himalayan region in general and Rajouri in particular, these studies were mainly focused on the enumeration of medicinal plants and were conducted on scattered basis on different ethnic groups. In spite of their availability and utilization by a large proportion by the middle hill dweller, no concerted effort has been made for the sustainable development of this renewable natural resource (Samin *et al*., 2008).

Baba Ghulam Shah Badshah University has been established in the year 2002. The University is located at the foothills of the great Himalayan Pir Panjal range. The University campus is located at a distance of approximately 8 km from the main city Rajouri. The region in which the university is located has rich geographic, climatic and cultural diversity. The climate varies from sub-tropical to sub-temperate type. The snow-capped peaks of the mighty Himalaya, rich biodiversity and valuable agri-diversity make entire Rajouri a nature Lover's Paradise. Baba Ghulam Shah Badshah University campus has ample and rich diversity of plant species. The University campus is also very rich in medicinal wealth. Centre of Biodiversity Studies (CBS), BGSBU has herbal garden for propagation and conservation of germplasm of medicinal and aromatic plants. However, fewer efforts have been undertaken to explore and document the medicinal values and decipher the benefits from them. Therefore, taking into consideration the significance and non-availability of any published account on the subject, an attempt was made to;

I. Assess the diversity and use of medicinal plants and
II. Identify the nativity and use pattern of medicinal plants present in BGSBU Campus.

Study area

Baba Ghulam Shah Badshah University is located in the district Rajouri. The district covers an area of about 2,630km^2 and lies between 33^o. 23′ N 74^o.18′ E and 33^o.38′ N 47^o.30′ E. The district is over shadowed by Poonch in north, Jammu lies at its feet in south, Reasi in its east and is occupied by Kashmir in its west. The University campus exhibits marvellous altitudinal, topographic and edaphic diversity. Climate and vegetation of the area is sub-tropical to sub-temperate type. The area of the campus is largely hilly and exhibits rich diversity of flora and fauna.

The vegetation of the campus mainly comprises of trees: *Pinus roxburghii, Quercus leucotricophora, Melia azedarach, Olea ferruginea, Salix* sp. *etc*.; shrubs: *Dodonaea viscosa, Berberis lycium, Rubus ellipticus* etc and herbs: *Cynodon dactylon, Mentha longifolia, Cannabis sativa, Vicia sativa* etc.

MATERIALS AND METHODS

Survey and identification

The plant specimens were collected from different parts of Baba Ghulam Shah Badshah University Campus like surroundings of Centre for Biodiversity Studies, Department of Mathematics, College of Engineering and Technology and Administration Block between February - April, 2017. All the parameters like habit, habitat, life form, parts used, methods of use were recorded on filed notebook along with date of collection. Routine herbarium practices were followed for preserving the plant specimens (Jain and Rao, 1976). Uprooting tools like shovel and dissection box were used for collecting the specimens. The moist plant specimens were dried between folds of newspaper. The plant specimens were collected and their external morphology was studied and examined carefully. The plant specimens were identified in the department (CBS) BGSBU with the help of relevant floras (Sharma and Kachroo, 1981-1982; Hajra *et al*., 1995). The specimens of medicinal plants were properly labelled and subsequently deposited in the Herbarium, Centre of Biodiversity Studies, BGSBU, Rajouri, Jammu and Kashmir, India.

Determination of nativity and use pattern

Nativity of a species refers to the place of origin of species. Nativity was determined with the help of Anonymous (1883 - 1970) and Samant (1999). Utilization of the collected species is based on secondary information (Nisa *et al*., 2011; Shode *et al*., 2009; Jabeen *et al*., 2009).

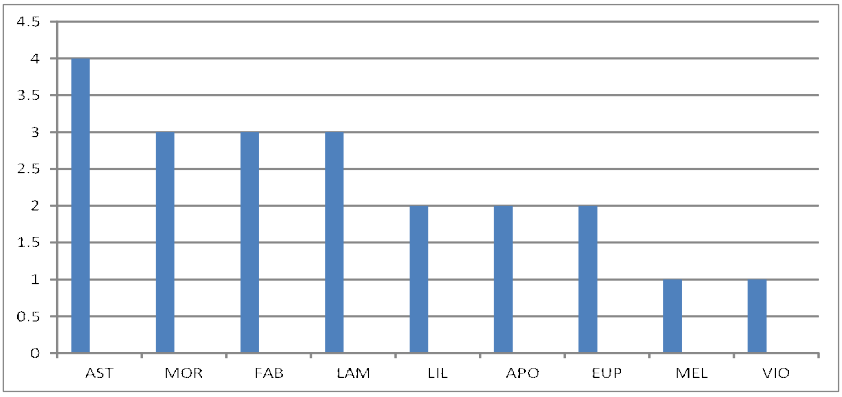


Fig 1: Family-wise distribution of medicinal plants of BGSBU campus, Rajouri, J and K.
Abbreviations used: AST=Asteraceae, MOR=Moraceae, LAM=Lamiaceae, LIL=Liliaceae, APO=Apocyanaceae, EUP=Euphorbiaceae, FAB=Fabaceae, MEL=Meliaceae, VIO= Violaceae.

RESULTS AND DISCUSSION

(a) Classification

Depending upon the parts used for medicine, the medicinal plants can be grouped in following categories:

i. Plants with underground parts

The underground parts of some plants form an important source of medicine used mostly by some tribal and manufacturing medicinal companies. The common examples of such plants are *Adiantum capillus-veneris, Berginia ciliata, Valeriana wallichii, Taraxacum officinale* and *Asparagus racemosus.*

ii. Plants with medicinal leaves

Most of the plants are medicinally important for their leaves. The species belonging to this category are: *Aloe vera, Artemesia scoparia, Ajuga reptans, Berginia ciliata, Buddleja asiatica, Conyza canadensis, Callistemon citrinus, Calotropis procera, Catharanthu sroseus, Cannabis sativa, Debregea siasalicifolia, Dodonaea viscosa, Ginkgo biloba, Hercleum candicans, Justicia adhatoda, Cassia fistula, Melia azedarach, Mentha longifolia, Oxalis corniculata, Olea ferruginea, Plantago lanceolata, Rumex nepalensis, Reinwardtia indica, Taraxacum officinale, Sonchus arvensis, Trifolium pratense, Thalictrum foliolosum, Vitex negundo* and *Withania somnifera.*

iii. Plants with medicinal flowers

Few species of the plants are known to be important in having medicinal flowers and inflorescences. This category includes the species like *Viola canascens, Punica granatum* and *Oenothera lamarkiana.*

iv. Plants with medicinal fruits

Some of the plant species were recorded whose fruits are medicinally important. This category includes the species like *Berberis lycium, Embilica officinalis, Ficus racemosa, Ficus palmata, Morus alba, Punica granatum, Rubus ellipticus, Vicia sativa, Zanthoxylum aromatum* and *Zizipusm auritiana*.

v. Other medicinal plant types

This category includes the plants with bark and resin with medicinal properties. The common examples of this category are: *Euphorbia heliscopia* with latex and *Zanthoxylum aromatum* with bark having medicinal properties.

(b) Diversity

The study recorded 46 species, 44 genera belonging to 34 families distributed within different life forms *i.e*. shrubs (15 species), trees (10 species) and herbs (21 species). Family wise distribution indicated that Asteraceae is the dominant family with 04 species followed by Moraceae, Lamiaceae and Fabaceae with 03 species each and Apocyanaceae, Euphorbiaceae and Lilliaceae with 2 species each and the rest of the families with only 1 species (Table 1-4).

(c) Family wise distribution

Family-wise distribution reveals that out of the total 46 species, family Asteraceae represents the maximum distribution (4 species) followed by Moraceae, Lamiaceae and Fabaceae (3 species each), Liliaceae, Apocyanaceae and Euphorbiaceae (2 species each). The other families like Meliaceae, Violaceae, Berberidaceae, Saxifragaceae, Cannabaceae, Punicaceaeetc are represented by only one species each (Table 1-4; Fig 1).

(d) Nativity

Out of the total (46) collected species; more than 50% are non-native, while the rest are native to Himalayan region (Table 1-4). Some of the examples of native species are *Asparagus racemosus, Berginia ciliata, Conyza canadensis, Cannabis sativa etc*. The examples of some non-native species are *Aloe vera, Dodonaea viscosa, Ginkgo biloba, Thalictrum foliolosum etc*.

(d) Utilization pattern

The utilization pattern of the species indicated that leaves of 29 species, underground parts of 05 species, whole plants of 06 species, flowers of 03 species, fruits of 08 species and other parts like latex of 01 species were utilized (Fig 2). Among the medicinal part used, leaves contribute for the maximum portion with 29 species (63%) followed by 09 species as fruits (19%), 03 species as flower (6.5%), 05 species as underground parts (10.8%), 01 specie as latex (1%) and 01 specie as bark (1%) (Table 5-12).

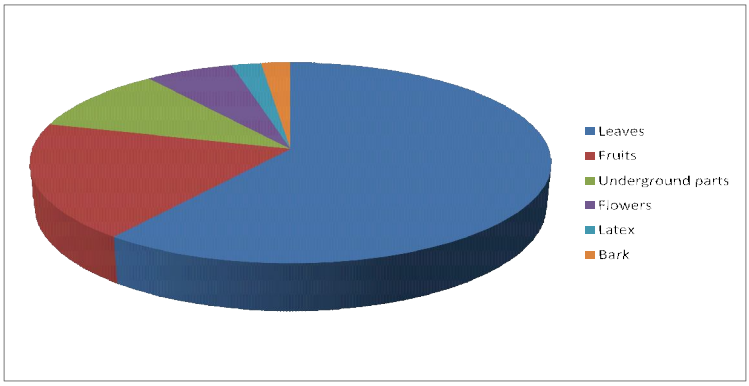


Fig 2: Utilization pattern of medicinal plants of BGSBU campus Rajouri, J and K, India.

Table 1: Diversity and diagnostic description of medicinal flora of BGSBU Campus, Jammu and Kashmir.

Family	Botanical name	Life form	Nativity	Diagnostic characters
Liliaceae	*Aloe vera* L.	Shrub	North America	Short-stemmed, succulent, flower pendulous with yellow tubular corolla.
Asteraceae	*Artemisia scoparia* Waldst and Kitam	Herb	Eurasia, India, France, China	Annuals, stem mostly erect, leaves are cauline, pinnatified, glabrous.
Liliaceae	*Asparagus racemosus* Willd.	Herb	Nepal, India	Under-shrub, stem scandent, flowers solitary or fascicles.
Lamiaceae	*Ajuga reptans* L.	Herb	Europe, Southwestern Asia	Pubescent herb, leaves usually purple, flowers bluish or lilac.
Polypodiaceae	*Adiantum capillus-veneris* L.	Herb	Tropical America	Fern with drooping habit, short creeping rhizomes, bipinnate to tripinnate fronds.
Berberidaceae	*Berberis lycium* Royle	Shrub	Regional Himalaya	Glabrous, shrub, flowers yellow in corymbose racemes, fruits oblong-ovoid, bright red berries.
Saxifragaceae	*Bergenia ciliate* Sternb.	Herb	South Tibet, Bhutan, India	Perennial, stunted creeping herb, leaves orbicular or broadly obovate, inflorescence is one sided raceme, fruit a capsule.
Scrophulariaceae	*Buddleja asiatica* Lour.	Shrub	East Asia	Evergreen shrub, leaves lanceolate, flowers crowded, terminal or axillary.
Asteraceae	*Conyza canadensis* (L). Cronquist	Herb	India, Canada	Erect herb with usually crowded leaves, radical and lower cauline, coarsely serrated.
Myrtaceae	*Callistemon citrinus* L.	Tree	Australia	Woody, aromatic tree, flowers are borne in spikes of about 40-150mm long with prominent stamens.
Apocynaceae	*Calotropis procera* (Aito) R.Br.	Shrub	Southeast Australia	Erect or suberect shrub, flowers white, blotched with purple purplish- pink, umbellate cymes on stout lateral peduncles.
Apocynaceae	*Catharanthus roseus* L.	Shrub	Madagascar	Perennial shrub, inflorescence of axillary 1-4 flowered cymes, flowers pink or white.
Cannabaceae	*Cannabis sativa* L.	Herb	Central Asia	Erect, herbaceous, resinous annual, flowers pale greenish, dioicous.

Table 2: Diversity and diagnostic description of medicinal flora of BGSBU Campus, Jammu and Kashmir.

Family	Botanical name	Life form	Nativity	Diagnostic characters
Urticaceae	*Debregea siasalicifolia* Rendle.	Shrub	Europe	Evergreen shrub, under surface of leaves white-tomentose, flowers minute in sessile clusters.
Sapindaceae	*Dodonaea viscosa* Jacq.	Shrub	Australia	Evergreen shrub, inconspicuous unisexual flowers.
Euphorbiaceae	*Embilica officinalis* Gaertn.	Tree	Asian Tropical	Deciduous tree, leaves pinnate, flowers in axillary fascicles, unisexual.
Moraceae	*Ficus racemosa L.*	Tree	India or Burma	Tall or medium tree, leaves ovate to ovate oblong or elliptic.
Moraceae	*Ficus palmate* Forsk.	Tree	African Tropical or India	Sub-deciduous tree, leaves 3-5 lobed to broadly ovate or orbicular, receptacles solitary or twin.
Ginkgoaceae	*Ginkgo biloba* L.	Tree	Southeastern China	Tall tree, leaves bi-lobed somewhat leathery, fan-shaped, rich green leaves with diverging veins.
Apiaceae	*Heracleum candicans* Wall.	Herb	Bhutan, North India, Nepal	Tall pubescent herb, leaves 20-40cm long, pinnate, outer petals longer than others, fruit compressed, prominently winged.
Acanthaceae	*Justicia adhatoda* L.	Shrub	Asia	Evergreen, bushy or erect shrub, leaves ovate, elliptic or lanceolate, flowers white with purple-lines on lower lip.
Fabaceae	*Cassia fistula* L.	Tree	India	Deciduous tall tree, leaves alternate, pinnate, flowers in long drooping terminal clusters, fruits pendulous.
Meliaceae	*Melia azedarach* L.	Tree	Himalayan Region	Small to medium, deciduous tree, leaves are bipinnate, flowers are star-shaped in conspicuous clusters.
Lamiaceae	*Mentha longifolia* L.	Herb	Regional Temperate	Strongly aromatic, tomentose or pubescent herb, flowers white in dense whorls.
Lamiaceae	*Mentha piperita* L.	Herb	Regional Temperate	Aromatic perennial plant with distinctively square stem, spike-like, pink to lilac-coloured inflorescences.
Moraceae	*Morus alba* L.	Tree	Asian Temperate	Deciduous tree, leaves alternate, fruit is a berry.

Table 3: Diversity and diagnostic description of medicinal flora of BGSBU Campus, Jammu and Kashmir.

Family	Botanical name	Life form	Nativity	Diagnostic characters
Onagraceae	*Oenothea lamarckiana* L.	Herb	America, India	Erect, leaves ovate-lanceolate, lyrate, flowers solitary, axillary.
Oxalidaceae	*Oxalis corniculata* L.	Herb	Amphigaeae Temp or Tropical	Creeping or ascending herb, flowers subumbellate on axillary peduncles.
Oleaceae	*Olea ferruginea* Royle.	Tree	Mediterranean Region	Medium sized tree, leaves oblong-lanceolate to ovate, often cuspidate, flowers in trichotomous axillary cymes.
Plantaginaceae	*Plantago lanceolata* L.	Herb	Eurasia	Densely silky to nearly glabrous herb with lanceolate-accuminate leaves, flowers in ovoid or cylindric spikes.
Punicaceae	*Punica granatum* L.	Shrub	Eurasia or Australia	Shrub, leaves oblong, obovate or lanceolate, cuneate, flowers terminal, solitary or in groups of 2-3.
Rosaceae	*Rubus ellipticus* Sm.	Shrub	India	Glabrous annual, leaves serrulate, opposite and whorled upwards, alternate below, involucres umbellately cymose, capsule cocci.
Polygonaceae	*Rumex nepalensis* Spreng	Herb	India or Malaya	Diffuse, bushy perennial, leaves often crispate and contracted above the base, flowers very small, in small whorls, perianth-lobes pink.
Linaceae	*Reinwardtia indica* Dumort.	Shrub	China and Northern India	Galabrous, stems sometimes decumbent and rooting at nodes, leaves elliptic-lanceolate or oblanceolate, capsule globose.
Asteraceae	*Sonchus arvensis* f. Brachyotus.	Herb	Europe	Perennial herb, leaves generally oblanceolate or oblong, irregularly pinnatifid.
Asteraceae	*Taraxacum officinalis* Webber.	Herb	Regional Temperate	Perennial herb, leaves runcinate, fruit is terminating in cylinder stalk crowned by a silky, spreading pappus, and borne on a globular fruiting head.

Table 4: Diversity and diagnostic description of medicinal flora of BGSBU Campus, Jammu and Kashmir.

Family	Botanical name	Life form	Nativity	Diagnostic characters
Fabaceae	*Trifolium pratense* L.	Herb	Asia	Glabrous trailing herb with obcordate-cuneate, minutely toothed, emarginate leaflets, flowers in globose heads on elongate, leafless peduncles.
Ranunculaceae	*Thalictrum foliolosum* Dc.	Herb	Southern Africa, South America, Australia	Herbaceous, blade 3-ternate, inflorescence terminal or axillary.
Violaceae	*Viola canescens* Wall.	Herb	India or Malaya	Perennial herb, leaves broadly ovate, obtuse, cordate, serrate, veined, sinus deep, flowers odorous violet, long peduncle.
Verbenaceae	*Vitex negundo* L.	Shrub	Eastern and Southern Africa and Asia	Shrub, leaves opposite-decussate, petiolate, leaflets usually lanceolate, inflorescence terminal, flowers small, subsessile or shortly pedicelled.
Fabaceae	*Vicia sativa* L.	Herb	Europe, North America, Asia, Africa	Climbing or semi erect, annual, leaflets 4-6 pairs, linear elliptic, flowers bluish-red, pod turgid, glabrous.
Valerianaceae	*Valeriana wallichii* Dc.	Herb	India, Nepal, China	Tall, radical leaves cordate or ovate, flowers in lax corymbose cymes or dense corymbs.
Solanaceae	*Withania somnifera* Dunal.	Shrub	Western Asia	Shrub with stellate-tomentose shoots, leaves elliptic-ovate to broadly ovate, flowers sessile to subsessile in axillary clusters of 2-5.
Rutaceae	*Zanthoxylum armatum* Dc.	Tree	Regional Himalaya or China	Small spiny shrub, leaves foliolate, rachis winged, leaflets sessile, opposite, fruits are aromatic, small and rounded.
Rhamnaceae	*Zizipus mauritiana* Lamk.	Shrub	India or Malaya	Glabrous shrub or treelet with purplish warts, thorns purple, leaves glabrous, flowers yellowish-green.
Euphorbiaceae	*Euphorbia heliscopia* L.	Shrub	Himalayan Region or India	Glabrous, annual, leaves serrulate, opposite and whorled upwards, alternate below, involucres umbellately cymose.

Table 5: Utilization and active constituents of medicinal flora of BGSBU Campus.

Botanical name	Common name	Part (s) used	Medicinal use	Active constituents
Aloe vera L.	Aloe	Leaves	Whole leaf is used as laxatives, antifungal, anti-inflammatory, moisturizer, anti-ageing, peptic ulcers, pimples, dandruff, constipation, urine disorders.	Glucomannans, galactogalacturans, galactoglucoarabinomannans, pectic substances, plant sterols and acetylated mannans.
Artemisia scoparia Waldst.	Red-stem worm weed	Leaves and aerial parts	Plant is anticholesterolemic, antipyretic, antiseptic, diuretic and vasodilator, used in the treatment of jaundice, hepatitis, liver, spleen, stomach and inflammation of the gall bladder.	Artemisinin, essential oils with the major compounds including alpha-pinene, camphene, beta-pinene, myrcene, 1,8-cineole artemesia ketone, linalool.
Asparagus racemosus L.	Shatavari	Roots	Mainly used as galactogogue and as a demulcent, improves immune system, can stimulate insulin secretion.	Alkaloids, proteins, starch, tannin, mucilage and diosgenin, shatavarin, vanillin, saponins-Shatavarin-4.
Ajuga reptans L.	Blue bugle/ bugleweed/carpet bugleweed	Leaves	Used as panacea (cure-all) and specifically for gastrointestinal disorders, diabetes and antihelminths. Anthocyanins extracted from it are used as appetizers.	Anthocyanins such as delphinidin 3, sophoroside-5 malonylglucoside, cyanidin-3-glucoside etc.
Adiantum capillus-veneris L.	Maidenhair fern	Rhizomes and aerial parts	Used as tonic and diuretic; in the treatment of cold, fever, cough and bronchial disorders.	Flavonoids, triterpenoids, sterols, quinic and shikimic acids.
Berberis lyceum Royle.	Barberry/tree turmeric	Root bark and fruit	Antimicrobial, anti-inflammatory, immune-stimulant, sedative, anticonvulsant and laxative, blood purifier, antidiabetic.	Berberine, berbamine, karachine, palmatine, oxyacanthine and oxyberberine.

Table 6: Utilization and active constituents of medicinal flora of BGSBU Campus.

Botanical name	Common name	Part (s) used	Medicinal use	Active constituents
Berginia ciliate Sternb.	Pashanbheda	Leaves, roots and rhizomes	Used as litholytic agent for urinary calculi, in treatment of dysuria, renal failure, crystalluria, bronchitis. The rhizomes and roots are cooling, bitter, laxative, tonic, analgesic, aphrodisiac and are useful in tumours, heart diseases, urinary discharge, piles, spleen enlargement, ulcers, menorrhagia, hydrophobia, biliousness, eye sores and diseases of lung and liver.	Bergenin, galloylbergenin, p-hydroxybenzoic acid, gallic acid, glucose, mucilage and wax along with afzelchin, catechin, quercetin, arbutin, sitosterol and flavonoids.
Buddleja asiatica Low.	White butterfly	Leaves and roots	Used as an antibacterial, antifungal, antispasmodic. Essential oil extracted from the plants is used in perfumery.	Mannitol, steroids, glucosides, phenylpropanoids, dihydrobuddledin-A, buddledone-B, ursolic acid and buddlin.
Conyza canadensis Less.	Horse weed	Leaves, roots, flowers and seeds	Valued for astringency, treatment of diarrhoea, dysentery, bleeding haemorrhoids, gonorrhoea and bleeding piles.	Beta-sitosterol, 171 stigmasterol, glucopyranoside, 173 harmine, p-hydroxybenzoic acid, hydroxyolean and erythrodiol.
Callistemon citrinus L.	Bottle brush	Leaves	Used for treating haemorrhoids, bioindicators for environmental management. It shows antimicrobial and antistaphylococcal.	1,8-cineole, alpha-pinene, beta-pinene, myrcene, limonene, linalool, methyl acetate, alpha-terpineol, monoterpenes.
Calotropis procera R.Br.	Rubber bush	Leaves, stem bark and roots	A decoction of infusion of the whole plant is taken as tonic and to cure diarrhoea, dysentery, intestinal worms, spleen complaints, stomach-ache, cardiovascular problems, pneumonia, jaundice, elephantiasis and leprosy.	Glycosides such as calotropin, calotoxin, calactin, uscharidin, voruscharin and steroidal moiety ascalotropagenin.

Table 7: Utilization and active constituents of medicinal flora of BGSBU Campus.

Botanical name	Common name	Part (s) used	Medicinal use	Active constituents
Catharanthus roseus L.	Rose periwinkle	Leaves and roots	Used as spasmogenic, uterine relaxant, diuretic, anti-dysenteric, antiseptic, antiascariasis, antimalarial. It is also used to treat diabetes as it promotes insulin production.	More than 100 alkaloids and related compounds have so far been isolated and characterised from the plant. These alkaloids include indolealkaloids, 2-acyl indoles, oxindole, dihydroindoles, vinblastine, vincristine.
Cannabis sativa L.	Hemp/Gallow grass	Leaves, flower, stem	Used for the treatment of Parkinson's disease, Alzheimer's disease, asthma, atherosclerosis.	Cannabinoids, tetra-hydrocannabinol (THC), cannabidiol, cannabinol.
Debregeasia salicifolia Rendle.	Sundahari	Stem and leaves	Paste of aerial parts is mixed with mustard oil and is used as antifungal for curing skin rashes, dermatitis and eczema.	Flavonoids, anthraquinones, tannins, glycoside moieties like saponins, cardiac glycosides, ursolic and oleanolic acid.
Dodonaea viscose Jacq.	Hopbrush	Leaves, stems and seeds	Used for the treatment of gout, rheumatism, swelling, burns, fomentation. The leaves are chewed for toothache.	Tannins, flavonoids, triterpenes, saponins and steroids.
Embilica officinalis Gaertn.	Goose berry	Fruit	*Emblica officinalis* is one of the most important plants of ayurvedic Materica Medica, fruit is very rich source of Vitamin C, diuretic, laxative, leucorrhoea and also as ingredient in shampoo and hair oil. The herb is an excellent antioxidant and is used to treat cardiovascular disorders, diabetes and insulin resistance.	Vitamin C, glutamic acid, proline, alanine. The edible fruit contains cytokinin like zeatin, zeatin riboside and zeatin nucleotide, gallic acid, tannin, sugar, gum, albumin, chromium, zinc, copper, phyllemblin and curcuminoids.
Ficus racemosa L.	Fig tree	Leaves, bark and fruits	Used for the treatment of mouth disorders, sinus, stomach pain, white leucorrhoea, metrorrhagia, bronchitis, bronchial asthma, urinary disorders and hypoglycaemia.	Glycosides, gluanol acetate, beta-sitosterol, lupeol, stigmasterol, ketone and dumurin.
Ficus palmate Forsk.	Punjab fig	Fruits, bark and roots	Used for the treatment of constipation, lung and bladder diseases. Milky latex is used in the treatment of warts, small tumours, pimples and prickles.	Trans-psoralenoside, germanicol acetate, furanocoumarins, bergapten, vanillic acid and flavone glycoside rutin.

Table 8: Utilization and active constituents of medicinal flora of BGSBU Campus.

Botanical name	Common name	Part (s) used	Medicinal use	Active constituents
Ginkgo biloba L.	Maiden hair tree	Leaves and roots	Used for the treatment of dementia and alzheimer's disease, schizophrenia, vitiligo, arterial disease, migraines, glaucoma and stroke recovery. It also relieves airway inflammation in asthma patients, treats pulmonary interstitial fibrosis, reduces severity of pre-menstrual syndrome and symptoms of seasonal allergic conjunctivitis.	Flavonol, flavone glycosides, lactone derivatives, bilobalide, ascorbic acid, catechin, shikimic acid, sterols vanillic acid and ginkgolides and ginkgotoxin.
Heracleum candicans Wall. ex DC.	White leaf hogweed	Leaves and seeds	The essential oils extracted from the plant are used for increasing the shelf life of foods, treatment of running sores, rashes and running ears.	Beta-piene, 1,8-cineole, beta-phellandrene, p-cymen-8-ol, dihydrochloride and alpha-tocopherol.
Justicia adhatoda L.	Malabar nut	Leaves	Used for the treatment of cough, bronchitis, asthma, dysentery, bleeding gums, haemorrhoids.	Quinazoline, vasicine, vasicinone, volatile oil, betain.
Cassia fistula L.	Golden shower tree/Indian laburnum	Leaves	Useful in fever, bleeding disorders, bloating, colic pain and detoxifying the digestive tract.	Anthraquinones, flavonoids and flavan-3-ol derivatives.
Melia azedarach L.	Chinaberry tree	Leaves	Used for the treatment of eye diseases, headache, malarial fever. The tree has anti-oxidant, anti-microbial, anti-inflammatory, cardio-protective, analgesic, anti-cancer and anti-plasmodial properties.	Azadirone, epoxy azadiradione, nimbin, gedunin, deacetylnimbin, azadiractol.
Mentha longifolia (L.) Huds.	Mint	Leaves	Useful in stomach-ache. It is a strong diuretic, mild decongestant and mosquito repellent. It is used in teas, beverages, jellies, syrups, candies and ice creams.	Menthol, menthone, isomenthone, borneol, 1, 8-cineole and piperitenone oxide.
Mentha piperita L.	Peppermint	Leaves, seeds, roots and fruits	Used to treat skin diseases, asthma, bronchitis, sinusitis, cough, migraine and headache. Peppermint is a cooling, relaxing herb that helps to ease inflamed tissues, calm muscle spasms or cramps and also used in toothpaste, mouthwash, cough drops and digestive aids.	Menthol, menthone, methyl acetate, vitamin A and C, inositol and niacin.

Table 9: Utilization and active constituents of medicinal flora of BGSBU Campus.

Botanical name	Common name	Part (s) used	Medicinal use	Active constituents
Morus alba L.	Mulberry	Roots, bark, fruits and leaves	Used as diaphoretic, emollient, anti-helminthic, astringent, anti-inflammatory, anti-biotic and laxative. It is also used for the treatment of sore throat, hair loss, dyspepsia and melancholia.	Flavane, chalcones, benzofurans and coumarin.
Oenothera lamarckiana L.	Evening primrose	Roots, seeds and leaves	Evening primrose oil is used primarily by women to help relieve post-menstrual symptoms, hormonal imbalance, infertility, eczema, skin irritations, rheumatoid arthritis, high blood pressure, high cholesterol levels, liver cirrhosis, gastrointestinal disorders, whooping cough and asthma.	Arachidonic acid, linoleic acid and linolenic acid.
Oxalis corniculata L.	Creeping wood-sorrel	Flowers and leaves	Used as anthelminthic, astringent, diuretic, stomachic, febrifuge and styptic. It is used as remedy for fever, influenza, diahorrea, traumatic injuries and urinary tract infections.	Corniculatin, flavonoid, palmitic acid, tannins, oleic, linoleic and linoleinic acid, amino acid, flavones and calcium oxalates.
Olea ferruginea Royle	Indian Olive	Leaves	Used as astringent, antiseptic, antiperiodic, diuretic. It is also used for the treatment of toothache, hoarseness of voice, asthma, headache, indigestion, eye diseases and back pains.	Oleuropein, phenolic compounds, olive oil, iridoids, flavonoids, tannins, saponosides, anthracene heterosides, cardiotone heterosides and alkaloids.
Plantago lanceolata L.	Lamb's tongue/ Narrow-leaf plantain	Leaves and seeds	Used for the treatment of hyperlipidemia, respiratory tract infections like asthma, bronchitis. The seeds are used as laxative, exhibit cholesterol-lowering activity and promote wound healing.	Iridoids (aucubin), flavonoids (apegenin), tannins, mucus and salicylic acid.
Punica granatum L.	Pomegranate	Rind of bark, seeds, flowers and fruits	Used for the treatment of cancer, osteoarthritis, sore throats, coughs, urinary infections, digestive disorders and skin disorders. The seed juice is used to treat syphilis, jaundice and diarrhoea.	Alkaloids including pelletierine, isopelletierine, ellagitannins and antioxidants like polyphenols, punicalagins, anthocyanins, prodelphinidins and cyaniding.

Table 10: Utilization and active constituents of medicinal flora of BGSBU Campus.

Botanical name	Common name	Part (s) used	Medicinal use	Active constituents
Rubu sellipticus Sm.	Yellow Himalayan raspberry	Roots, leaves and fruits	Used as an astringent, febrifuge and for treatment of fever, gastric troubles, dysentery, weakening of the senses, vaginal /seminal discharge, polyuria and micturition during sleep.	Phenolic compounds and a source of calcium.
Rumex nepalensis Spreng.	Dock weed	Leaves and roots	The decoction of roots is used for the treatment of rheumatism, colic, stomach-ache and abdominal pains. A leaf decoction is said to be effective in the treatment of schistosomiasis.	Nepthalene acyl glucosides, rumexneposides A (1) and B (2).
Reinwardtia indica Dumort.	Yellow flax	Leaves and stem	Crushed leaves and stems are applied to wounds for quick healing. Also used for the treatment of backache, headache, boils and pimples.	Alkaloids, phenols, tannins, flavonoids, terpenoids, amino acids and steroids.
Sonchus arvensis L.	Hare lettuces /Sow thistles	Stem and leaves	Used to treat variety of infections, headache, general pain, diarrhoea, menstrual problems, fever, hepatitis, eye problems, liver infections, inflammation and rheumatism. It has an antidepressant, antioxidant, antimalarial and anticancer properties.	Alkaloids, antraquinones, flavonoids, terpenes, tannins, steroids, glycosides, saponins and quercetin.
Taraxacum officinale (L.) Webber ex Wigg	Dandelion	Roots and leaves	It is used to improve the health of pancreas. Roots exhibit the potential for fighting cancer. The aqueous extract of the herb is used to stimulate the immune responses.	Sesquiterpenes, eudesmanolides tetra-hydroridentin B, germacranolides, taraxinic acid, glucopyranoside, hydroxyphenylacetic acid derivative, taraxacoside, triterpenes, taraxasterol, taraxerol and inulin.
Trifolium pratense L.	Red clover	Leaves and roots	Greatly valued in recurrent boils or acne, eczema, psoriasis, healing of burns, expectorant, antispasmodic, autoimmune diseases and cancer.	Daidzein, genistein, biochanin A, glycitein, prunetin, irilone, pratensin, coumarins, cyanogenic glycosides, minerals, vitamin A, vitamin C, B-complex, calcium, chromium, iron and magnesium.

Table 11: Utilization and active constituents of medicinal flora of BGSBU Campus.

Botanical name	Common name	Part (s) used	Medicinal use	Active constituents
Thalictrum foliolosum Dc.	Leafy Meadow-rue	Leaves and roots	Root is diuretic, ophthalmic, purgative, stomachic, tonic, dyspepsia, peptic ulcers, indigestion, fevers and toothache. The root decoction is used as laxative. The whole plant is used for rheumatism and gout.	Alkaloids like magnoflorine, jatrorrhizine, berberine, palmitine, thalidasine.
Viola canescens Wall.	Violet/Viola	Flowers	Valued as an expectorant, antipyretic, diuretic, laxative and pulmonary troubles. The flowers are used to treat epilepsy, eczema, sore threat, kidney disorder, liver disorder, infantile afflictions, nervous disorders, prolapsed rectum uterus and inflammatory swellings.	Beta-ionone, eugenol, violin, friedeline, beta-sitosterol, odouratine, saponoins, ferulic acid, scopoletin, methyl salicylate, mucilage, vitamin A, C and alkaloids.
Vitex negundo L.	Chinese chaste tree	Leaves and roots	Useful in treating arthritic disorders, dental disease and toothache. Root is used to treat dyspepsia, colic, rheumatism, boils, leprosy and also as tonic, febrifuge, diuretic and expectorant.	Alkaloids, flavonoids, carbohydrates, tannins, alpha-diacetoxyoleana, vitexin, isovitexin, sabinene, linalool, globulol, vitexdoin A, chrysophenol D, isoorientin, casticin, D-fructose, luteolin, vanillic acid, beta-sitosterol and nishindine.
Vicia sativa L.	Garden vetch	Fruits	Used for treating skin lesions, eczema, hair loss and digestive disturbances. It has anti-rheumatic, anti-poisonous and anti-neuralgic properties.	Apigenin-glucopyranoside, kaempferol, rhamno pyranoside and quercetin.
Valeriana wallichii Dc.	Indian valerian	Leaves, roots and rhizome	Traditionally used as analgesic, anti-inflammatory, antioxidant, antiviral, antianxiety, carminative, muscle relaxant, eczema, hypochondria, insomnia, menstrual disorders, migraine and epilepsy. The drugs like valepotriates are useful as tranquilizers and sedatives. The root and rhizome have anti-bacterial property.	Valepotriates, flavonoid, linarin-isovalerianate, piene, camphene, borneol, eugenol, caryophyllene, valerianol, valerenic acid, valeranone, choline.

Table 12: Utilization and active constituents of medicinal flora of BGSBU Campus.

Botanical name	Common name	Part (s) used	Medicinal use	Active constituents
Withania somnifera (L.) Dunal	Ashwagandha	Roots and leaves	Used as aphrodisiac, liver tonic, astringent and also used to treat bronchitis, asthma, ulcers, skin problems, insomnia, senile dementia, learning ability and memory capacity. Roots exhibit hypoglycemic, diuretic and hypo cholesterolemic effects. It provides immunity to body by bringing about an increase in haemoglobin concentration.	Withanine, somniferine, somnine, pseudo-withanine, tropine, anaferine, withanolides, withaferins, saponins. The roots are reported to contain starch, dulcitol, withancil, aspartic acid, glycine, glutamic acid and cysteine.
Zanthoxylum armatum Dc.	Prickly ash/ Toothache tree	Leaves, stem bark, fruits and seeds	The bark and fruits are antirheumatic, carminative, diaphoretic, hepatic, stimulant. It is also useful in cephalagia, otopathy, ophthalmopathy, dyspepsia, flatulence, helminthiasis, leprosy, skin diseases, asthma, bronchitis, paralysis, gout, convulsions, diabetes, ulcers and cardiac debility. The stem is used as toothbrush.	Fagarine, nitidine, magnoflorine, tambetarine, candicine, xanthyletin, zanthoxyletin, pipevine, armatamide, lupeol, fargesin, asarinin and beta-sitosterol.
Ziziphus mauritiana Lam.	Indian jujube/ Chinee Apple	Fruits and seeds	Fruit rich in vitamin C and is used for treating bleeding disorders, excessive thirst and burning sensation. It has antimicrobial, antiplasmodial, anti-infectious, antidiabetic, analgesic, anticonvulsant and anti-inflammatory properties.	Alkaloids, flavonoids, terpenoids, saponin, pectin, triterpenoic acids and lipids.

CONCLUSION

The present study conducted at Baba Ghulam Shah Basdshah University located in district Rajouri recorded the presence of 46 species of medicinal plants belonging to 34 families. Asteraceae was the dominant family with 04 species, followed by Moraceae, Lamiaceae and Fabaceae with 03 species each, Liliaceae, Apocyanaceae and Euphorbiaceae with 02 species each and the rest with 01 species each. Distribution of life forms showed the richness of herbs (21 species) followed by shrubs (15 species) and trees (10 species). The medicinal plants reported from BGSBU Campus can be used to enhance the economy of local inhabitants. In nutshell, this study could be of greater help in forming the pioneer compilation of medicinal wealth of the region.

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