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

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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 a 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 Badshah 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, Vaidyas, 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.

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Identify the nativity and use pattern of medicinal plants.

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).

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 field 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 for preserving the plant specimens (Jain and Rao, 1976). 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 2,630 km² and lies between 33°. 23’ N 74°.18’ E and 33°.38’ N 47°.30’ E. The district is over shadowed by Poonch in north, Jammu and 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-tempperate 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 lyycium, Rubus ellipticus etc and herbs: Cynodon dactylon, Mentha longifolia, Cannabis sativa, Vicia sativa etc.

MATERIALS AND METHODS

Survey and identification

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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).
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*, *Artemisia scoparia*, *Ajuga reptans*, *Bergenia ciliata*, *Buddleja asiatica*, *Conyza canadensis*, *Callistemon citrinus*, *Calotropis procera*, *Catharanthus roseus*, *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 canescens*, *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*, *Embilia officinalis*, *Ficus racemosa*, *Ficus palmata*, *Morus alba*, *Punica granatum*, *Rubus ellipticus*, *Vicia sativa*, *Zanthoxylum aromatum* and *Ziziphus 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 *Apocynaceae*, *Euphorbiaceae* and *Liliaceae* 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*, *Apocynaceae* and *Euphorbiaceae* (2 species each). The other families like *Meliaceae*, *Violaceae*, *Berberidaceae*, *Saxifragaceae*, *Cannabaceae*, *Punicaceae* etc 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*, *Bergenia 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.](image-url)
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     | Emblica officinalis Gaertn. | Tree      | India or Burma | Deciduous tree, leaves solitary or in clusters.                                         |
| Moraceae          | Ficus racemosa L.     | Herb      | Southeastern China | Deciduous tree, leaves alternate, fruit is a berry.                                      |
| Apocynaceae       | Gossypium hirsutum L.  | Shrub     | Central Asia   | Deciduous tree, leaves alternate, flowers in racemes, fruits are fleshy.                  |
| Apocynaceae       | Apocynum cannabinum L. | Shrub     | Himalayan Region | Deciduous tree, leaves alternate, flowers in racemes, fruits are fleshy.                  |
| Lamiaceae         | Asparagus racemosus Willd. | Herb      | Nepal, India   | Under-shrub, stem scabrid, flowers yellow, lower lip blotted with purple.               |
| Lamiaceae         | Mentha longifolia L.   | Herb      | Temperate      | Perennial herb, leaves ovate, flowers white in dense whorls.                           |
| Lamiaceae         | Mentha piperita L.     | Herb      | Temperate      | Perennial herb, leaves ovate, flowers white in dense whorls.                           |
### Table 3: Diversity and diagnostic description of medicinal flora of BGSBU Campus, Jammu and Kashmir.

| Family          | Botanical name                | Life Form | Nativity               | Diagnostic Characters                                                                 |
|-----------------|-------------------------------|-----------|------------------------|---------------------------------------------------------------------------------------|
| Onagraceae      | Oenothera lamarckiana L.      | Herb      | America, India         | Erect, leaves ovate-lanceolate, lyrata, flowers solitary, axillary.                    |
| Oxalidaceae     | Oxalis corniculata L.         | Herb      | Amphibiaes Temp or Tropical | Creeping or ascending herb, flowers subumbellate on axillary peduncles.                |
| Oleaceae        | Oka terruginea 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-accumulate leaves, flowers in ovoid or cylindric spikes. |
| Puniceae        | 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 umbrillately 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, periansh-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-terinate, inflorescence terminal or axillary.                       |
| Violaceae       | Viola canescens Wall.         | Herb      | India or Malaya        | Perennial herb, leaves broadly ovate, obtuse, cordate, serrate, veined, sinus deep, flowers odoorous 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, subsesile 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 subsesile 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 umbrillately 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            | Aloe             | Leaves       | Whole leaf is used as laxatives, antifungal, anti-inflammatory, moisturizer,   | Glucomannans, galactogalacturans, peptic substances, plant sterols and acetylated  |
|                      |                  |              | antihypertensive, anti-inflammatory, antiaging, anticancer, antiparasitic,      | mannans, galactoglucoarabinomannans, plant sterols and acetylated mannans.        |
| Artemisia scoparia    | Red-stem worm    | Leaves and   | Plant is anticholesterolemic, antipyretic, antiseptic, diuretic and vasodilator, | Artemisinin, essential oils with the major compounds including alpha-pinene,       |
|                      | Waldst. et Kit.  | aerial parts | used in the treatment of jaundice, hepatitis, liver, spleen, stomach and       | beta-pinene, camphene, beta-pinene, myrcene, 1,8-cineole, capme, beta-pinene,     |
| Arugula              | B. L.            | leaves       | Antioxidants used for treatment of jaundice, hepatitis, liver, spleen, stomach, | artemisia ketone, linalool.                                                      |
| Asparagus racemosus   | Shatavari        | Roots        | Mainly used as galactogogue and as a demulcent, improves immune system,       | Alkaloids, proteins, starch, tannin, mucilage, and diosgenin.                     |
|                      | L.               |              | specifically for digestive and nutritional disorders, stimulates insulin        | Berberine, berbamine, kaempferol, saponins-Shatavarin-4.                         |
| Ajuga reptans        | Blue bugle/      | Rhizomes     | Used as tonic and diuretic, in the treatment of cold, fever, cough and bronchial | Flavonoids, triterpenoids, sterols, quinic and shikimic acids.                    |
|                      | bugleweed/carpet |              | disorders.                                                                    |                                                                                   |
| Adiantum capillus-   | Maidenhair fern  | Rhizomes     | Used as a tonic and diuretic, in the treatment of cold, fever, cough and        | Flavonoids, triterpenoids, sterols, quinic and shikimic acids.                    |
|                      | venus L.         | aerial parts | bronchial disorders.                                                           |                                                                                   |
|                        |                  | root         | Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Bergenia ciliate      | Pashanbhedaid    | leaves, roots| Used as a litholytic agent for urinary calculi, in treatment of dysuria, renal   | Bergenin, galloyl-bergenin, 1-hydroxybenzoic acid, gallic acid, glucose,           |
| Berberis lycium       | Barberry         | leaves, roots| failure, crystalluria, bronchitis. The rhizomes and roots are cooling, bitter,  | mucilage, and diosgenin, studies.                                               |
| Calotropis            | Bottleneck       | leaves, root | root bark uses in the treatment of dysuria, renal failure, crystalluria,      | Calotropin, calotoxin, calactin, uscharidin, voruscharin and steroidal                |
| Callistemon          | Bottle brush      | leaves       | 1,8-cineole, alpha-pinene, beta-pinene, myrcene, 1,8-cineole, capme, beta-pinene, | moiety ascalotropagenin.                                                          |
| Buddleja asiatica     | White butterfly  | leaves, roots| Used as a litholytic agent for urinary calculi, in treatment of dysuria, renal   | Berberine, berbamine, kaempferol, saponins-Shatavarin-4.                         |
| Conyza canadensis     | Horse weed       | leaves, roots| failure, crystalluria, bronchitis. The rhizomes and roots are cooling, bitter, |                                                                                   |
| Callistemon citrinus  | Callicot Sneetle  | flowers and  | root bark uses in the treatment of dysuria, renal failure, crystalluria,      |                                                                                   |
| Calopropis           | Rubber bush      | leaves, stem | 1,8-cineole, alpha-pinene, beta-pinene, myrcene, 1,8-cineole, capme, beta-pinene, |                                                                                   |

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

| Botanical name       | Common name      | Part(s) used | Medicinal Use                                                                 | Active Constituents                                                                 |
|----------------------|------------------|--------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Aloe vera            | Aloe             | Leaves       | Whole leaf is used as laxatives, antifungal, anti-inflammatory, moisturizer,   | Glucomannans, galactogalacturans, peptic substances, plant sterols and acetylated  |
|                      |                  |              | antihypertensive, anti-inflammatory, antiaging, anticancer, antiparasitic,      | mannans, galactoglucoarabinomannans, plant sterols and acetylated mannans.        |
| Arnica montana       | Arnica           | aerial parts | Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Asparagus racemosus   | Shatavari        | aerial parts | Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Ajuga reptans        | Blue bugle/      | rhizomes     | Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Adiantum capillus-   | Maidenhair fern  | rhizomes     | Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Bergenia ciliate      | Pashanbhedaid    | leaves, roots| Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Berberis lycium       | Barberry         | leaves, roots| Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Calotropis            | Bottleneck       | leaves, root | Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Callistemon          | Bottle brush      | leaves       | Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Buddleja asiatica     | White butterfly  | leaves, roots| Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Conyza canadensis     | Horse weed       | leaves, roots| Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Callistemon citrinus  | Callicot Sneetle  | flowers and  | Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| Calopropis           | Rubber bush      | leaves, stem | Antimicrobial, antiviral, immune-stimulant, analgesic, aphrodisiac and is useful  |                                                                                   |
| 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, antidysernetic, antiseptic, antiascarisis, 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, cannabinoil.                                                                                   |
| 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 oleoanolic acid. Tannins, flavonoids, triterpenes, saponins and steroids. |
| Dodonaea viscosa Jacq. | Hopbrush            | Leaves, stems and seeds  | Used for the treatment of gout, rheumatism, swelling, burns, fomentation. The leaves are chewed for toothache. | 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. |
| Emblica 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, gluvian acid, beta-sitosterol, lupeol, stigmasterol, ketone and dumurin.                                                                 |
| 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, gluvian 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 | Leaves and roots | Used for the treatment of dementia and Alzheimer’s disease, schizophrenia,      | Flavonol, flavone glycosides, lactone derivatives, bilobalide, ascorbic acid,       |
|                              | tree        |                  | vitiligo, arterial disease, migraines, glaucoma and stroke recovery. It also   | catechin, shikimic acid, sterols vanillic acid and ginkgolides and ginkgotoxin.   |
|                              |             |                  | relieves airway inflammation in asthma patients, treats pulmonary interstitial  |                                                                                     |
|                              |             |                  | fibrosis, reduces severity of pre-menstrual syndrome and symptoms of seasonal  |                                                                                     |
|                              |             |                  | allergic conjunctivitis.                                                      |                                                                                     |
| *Heracleum candicans* Wall.  | White leaf  | Leaves and seeds | The essential oils extracted from the plant are used for increasing the shelf    | Beta-piene, 1,8-cineole, beta-phellandrene, p-cymen-8-ol, dihydrochloride and       |
| ex DC.                      | hogweed     |                  | life of foods, treatment of running sores, rashes and running ears.             | alpha-tocopherol.                                                                   |
| *Justicia adhatoda* L.       | Malabar nut | Leaves          | Used for the treatment of cough, bronchitis, asthma, dysentery, bleeding gums,  | Quinazoline, vasicine, vasicinone, volatile oil, betain.                            |
| *Cassia fistula* L.          | Golden shower | Leaves         | Useful in fever, bleeding disorders, bloating, colic pain and detoxifying the    | Anthraquinones, flavonoids and flavan-3-ol derivatives.                             |
| tree/Indian laburnum         | tree/Indian |                  | digestive tract.                                                               |                                                                                     |
| *Melia azedarach* L.         | Chinaberry  | Leaves          | Used for the treatment of eye diseases, headache, malarial fever. The tree has   | Azadirone, epoxy azadiradione, nimbin, gedunin, deacetylnimbirin, azadiractol.       |
| tree/L.                     |             |                  | anti-oxidant, anti-microbial, anti-inflammatory, cardio-protective, analgesic,   |                                                                                     |
|                             |             |                  | anti-cancer and anti-plasmodial properties.                                   |                                                                                     |
| *Mentha longifolia* (L.) Huds. | Mint       | Leaves          | Useful in stomach-ache. It is a strong diuretic, mild decongestant and mosquito  | Menthol, menthone, isomenthone, borneol, 1, 8-cineole and pipertenone oxide.      |
|                             |             |                  | repellent. It is used in teas, beverages, jellies, syrups, candies and ice       |                                                                                     |
|                             |             |                  | creams.                                                                        |                                                                                     |
| *Mentha piperita* L.         | Peppermint  | Leaves, seeds,  | Used to treat skin diseases, asthma, bronchitis, sinusitis, cough, migraine and  | Menthol, menthone, methyl acetate, vitamin A and C, inositol and niacin.           |
|                             |             | roots and fruits| 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.                                                |                                                                                     |
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   | 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 lamarkiana | 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   | Creeping wood-sorrel | Flowers and leaves        | Used as anthelminthic, astringent, diuretic, stomachic, febrifuge and styptic. It is used as remedy for fever, influenza, diarhorea, traumatic injuries and urinary tract infections. | Corniculatin, flavonoid, palmitic acid, tannins, oleic, linoleic and linoleic acid, amino acid, flavones and calcium oxalates. |
| Oleva 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. Iridoids (aucubin), flavonoids (apegenin), tannins, mucus and salicylic acid. |
| Plantago lanceolata  | 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. | Alkaloids including pelletierine, isopelletierine, ellagittannins and antioxidants like polyphenols, punicalagins, anthocyanins, prodelphinids and cyaniding. |
| 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. |
Table 10: Utilization and active constituents of medicinal flora of BGSBU Campus.

| Botanical name       | Common name | Part(s) used | Medicinal use                                                                 | Active Constituents                                                                 |
|----------------------|-------------|--------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Rubus sellipticus Sm.| Himalayan raspberry | Roots, leaves and fruits | Used as an astringent, febrifuge and for treatment of fever, gastric troubles, dysentery, weakening of the senses, vaginal /semenal 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 antitumor 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. | Sesqueripenes, eudesmanolides tetra-hydroridentin B, germacranolides, taraxinic acid, glucopyranoside, hydroxyphenylacetic acid derivative, taraxacoside, triterpenes, taraxasterol, taraxerol and inulin. Daidzein, genistein, biochanin A, glycitein, prunetin, irinole, pratensin, coumarins, cyanoecigenic glycosides, minerals, vitamin A, vitamin C, B-complex, calcium, chromium, iron and magnesium. |
| 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. |                                                                                      |
Table 11: Utilization and active constituents of medicinal flora of BGSBU Campus.

| Botanical name      | Common name          | Part(s) used | Medicinal use                                                                 | Active Constituents                                                                 |
|---------------------|----------------------|--------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Thalictrum          | 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, jatrohizine, berberine, palmitine, thalidasine.           |
| foliolosum Dc.      |                      |              |                                                                                 |                                                                                    |
| 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 throat, kidney disorder, liver disorder, infantile affictions, nervous disorders, prolapsed rectum uterus and inflammatory swellings. | Beta-ionone, eugenol, viol, friedeline, beta-sitosterol, odouratine, saponins, 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, sabine, linalod, globulol, vitexin 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, antiinflammatory, carminative, muscle relaxant, eczema, hypochondria, insomnia, menstrual disorders, migraine and epilepsy. The drugs like valepatriates are useful as tranquilizers and sedatives. The root and rhizome have anti-bacterial property. | Valepatriates, 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 |
|----------------|-------------|--------------|---------------|---------------------|
| Zanthoxylum armatum Dc. | Prickly ash/Toothache tree | Leaves, stem, bark, fruits and seeds | Used as antirheumatic, carminative, diaphoretic, hepatic, stimulant, also useful in cephalgia, otalgia, ophthalmopathy, dyspepsia, paralyses, geriatric, skin diseases, asthma, bronchitis, parayis, gout, convulsions, diabetes, ulcers and cardiac debility. The stem is used for toothbrush, 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. | Fagamic acid, nitidine, magnoflorine, tambertaline, candicine, xanthyletin, zanthoxyletin, pipevine, armatamide, lupeol, fargesin, asarinin and beta-sitosterol. |
| Withania somnifera L. | 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 hypocholesterolemic effects. It provides immunity to body by bringing about an increase in haemoglobin concentration. | Withanine, somniferine, somnine, pseudo-somnifera, withanine, tropine, anaferine, withanolides, withaferins, saponins. The roots are reported to contain starch, dulcitol, withancil, aspartic acid, glycine, glutamic acid and cysteine. |
| 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, triterpenic acids and lipids. |

**CONCLUSION**

The present study conducted at Baba Ghulam Shah Badshah 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, Apocynaceae 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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