Journal of Agriculture & Forestry Research
Volume no.2, Issue no. 5, Year 2023
www.sarpo.net

Research Article

Open access

Phytochemical Detection and Medicinal Studies of Selected Plants from War Effected Areas of Khyber Pakhtoonkhwa Pakistan

*Lubna Shakir[1†]; Sanam Asif[2†]; Ayazul Haq[2]; Sajjadul Haq[2]; Khan Zada[2]; Muhammad Said[1]; Muhammad Sajid[3]; Shakir Ullah[1]*Rihan Ullah[4].*

[†]Both authors equally contributed to this study

[1]State Key Laboratory of Systematic and Evolutionary Botany (LSEB) Institute of Botany Chines Academy of Science China

[2] Department of Botany, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi Pakistan

[3] Department of chemistry, Govt Ghazi Umara Khan Degree College Samarbagh Dir Lower Khyber Pakhtoonkhwa Pakistan

[4] Department of Botany, Bacha Khan University, Charsadda, Khyber Pakhtoonkhwa Pakistan, Pakistan

ARTICLE INFORMATION

Corresponding author:
Shakir Ullah
E-mail:
shakirawkum321@gmail.com

Keywords:

Phytochemical
Medicinal Studied
Verbascum thapsus
Micromeria biflora
Khyber
Pakhtoonkhwa
Pakistan

Received: 05.08.2023
Received in revised form: 29.10.2023
Accepted: 01.11.2023

ABSTRACT

In the present study qualitative investigation of methanolic, ethanolic and aqueous extracts of *Verbascum thapsus* and *Micromeria biflora* and Medicinal studied of Selected Plants was carried out. Phytochemical detection of *Verbascum thapsus* plant ethanolic extracts in leaves contained a dark colour which shows that Alkaloids are present. Where phenol was present in both methanolic, ethanolic and aqueous extracts. The saponins in aqueous show dark concentration comparison with ethanolic and methanolic extracts. The flavonoids were present in all three types of extract and Tannins were found in all types of extract in large amounts but in Aqueous found in small amounts. The alkaloids, glycosides and Phlobatannins are absent in aqueous extract. The Flavonoids were present in moderate amounts in both methanolic and ethanolic extract in leaves and they were present in low amounts in the aqueous extract. The Phlobatannins were present in moderate amounts in the methanolic extracts and low amounts in the ethanolic extracts of *Verbascum thapsus* and absent in the aqueous extracts. Tannins were present in the highest amount in ethanolic extracts followed by the methanolic extracts. The qualitative phytochemistry also shows that the Carbohydrate, Glycosides, were found in the highest amount in the plant extracts and the other phytochemicals such as Alkaloids, Flavonoids and Phenol were present in moderate amount. The Alkaloid, Carbohydrate, Glycosides, Phlobatannins, Saponins, Terpenoids. In the current study ethno-botanical importance plant of Munda Khazana district lower Dir an overall of 50 valuable plants assembled from the research region. These plants belong to different families. The dominant valuable plants and the bases of habit were herbs (22 species) followed by shrubs (8 species) and trees (10 plant species).

1. INTRODUCTION

Phytochemicals (from the Greek word Phyto, meaning plant) are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans further than those attributed to macronutrients and micronutrients (Hasler and Blumberg, 1999). They protect plants from disease and damage and contribute to the plant's color, aroma and flavor. In general, the plant chemicals that protect plant cells from environmental hazards such as pollution, stress, drought, UV exposure and pathogenic attack are called phytochemicals (Ullah et al. 2023). Recently, it is clearly known that they have roles in the protection of human health when their dietary intake is significant. More than 3,000 phytochemicals have been cataloged and classified by protective function, physical characteristics and chemical characteristics and About 150 phytochemicals have been studied in detail (Ullah et al., 2021). Wide-ranging dietary phytochemicals are found in fruits, vegetables, legumes, whole grains, nuts, seeds, fungi, herbs and spices. Broccoli, cabbage, carrots, onions, garlic, whole wheat bread, tomatoes, grapes, cherries, strawberries, raspberries, beans, legumes, and soy foods are common sources (Moorachian, 2000). Phytochemicals accumulate in different parts of the plants, such as in the roots, stems, leaves, flowers, fruits, or seeds7. Many phytochemicals, particularly pigment molecules, are often concentrated in the outer layers of the various plant tissues. Levels vary from plant to plant depending upon the variety, processing, cooking, and growing conditions (Ullah et al. 2019). Phytochemicals are also available in supplementary forms, but evidence is lacking that they provide the same health benefits as dietary phytochemicals (Harvey and Strategy, 2000). These compounds are known as secondary plant metabolites and have biological properties. Such as antioxidant activity, antimicrobial effect, modulation of detoxification enzymes, stimulation of the immune system, decrease of platelet aggregation, and modulation of hormone metabolism and anticancer properties. There are more than a thousand known and many unknown phytochemicals. It is well-known that plants produce these chemicals to protect themselves, but recent research demonstrates that many phytochemicals can also protect human against diseases (Rao, 2002).

Phytochemicals are not essential nutrients and are not required by the human body for sustaining life, but have important properties to prevent or to fight some common diseases. Many of these benefits suggest a possible role for phytochemicals in the prevention and treatment of disease, Because of this property; many researchers have been performed to reveal the beneficial health effects of phytochemicals. The purpose of the present review is to provide an overview of the extremely diverse phytochemicals present in Medicinal plants (Ahmad et al., 2023).

1.2 Plants Introduction

1.2.1 *Verbascum thapsus*

Common mullein, also known as Wooly Mullein (*Verbascum thapsus* L., Scrophulariaceae) has been used as a Medicinal herb since ancient times. The leaves and flowers are reported to have expectorant and demulcent features which are used to treat respiratory problems such as bronchitis, dry coughs, whooping cough, tuberculosis, asthma, and hoarseness. The plant is reported to be mildly diuretic to have a soothing and anti-inflammatory effect on the urinary tract, and to act as a mild sedative. It has also been used as a domestic remedy for pneumonia, fever, congestion, allergies, migraine, catarrhs, and colic (Hameed et al. 2022). During our routine field excursions, it was found that this plant is used to treat respiratory tract infections and external boils and abscesses. Also, it has also been as a traditional remedy to treat various ailments such as spasmodic, digestive disorders, and menstrual problems. Therefore, the aim was to determine V. Thapsus extracts that have been shown earlier to have biological activity against urinary tract pathogens (Turker et al. 2002).

1.2.2 *Micromeria biflora*

A perennial herb, found in rock crevices and gravel slopes of sub-tropical and temperate `zones: Stem ascending, slender, 10-25cm long, glabrous. Leaves simple, small, sessile, ovate, entire, thick, acute, 2-10 mm long and 2-5mm broad. The inflorescence is verticillaster, few-flowered. Flower zygomorphic,

pale pink, bract small, linear. Calyx ribbed with narrow lobes. Corolla 2-lipped, lower lip 2-lobed, upper lip flat. Fruit outlet, oblong, brown. Flowering and Fruiting: Medicinal Value: Locally used as an herbal tea for flu, and throat irritation and plant extract treats pneumonia, stomach disorders, headache and wounds. Essential oil is anti-inflammatory (Rajiv et al. 2016).

2. MATERIAL AND METHODS

2.1. Collection of plants and their parts

Rhizome and whole plants of *Verbascum thapsus* and *Micromeria biflora* were Collected in October 2020 from the District Lower Dir of Khyber Pakhtunkhwa.

2.2. Botanical Identification

Plant samples collected throughout the fieldwork were taxonomically identified by using Flora of Pakistan, and placed in the Herbarium of Ghazi Umara Khan Degree College Samarbagh Dir Lower. The voucher specimens were kept after broad documents for future reference. From Medicinal Plant Names Services (mpns.kew.org/mpns) the correct name of plant was confirmed.

2.2. Solvent system used

The solvents like methanol ethanol and water were used. For the preparation of crude extract of the *Verbascum thapsus* and *Micromeria biflora* plants.

2.3. Crude Extract Preparation

Plants and their parts were collected in the field and then transferred into the lab and cleaned with the help of tap water to take away the unwanted constituents and silicate material then were placed for 30 days for dryness purposes in shade at room temperature 20-20°C (Rajiv et al. 2016).

2.5. Crashing and filtration of the plants

After the dryness of the whole plants and their parts with the help of an electric grinder selected plant and their parts were ground. 10 g of plant powdered was taken then retained in a distinct conical flask and 90 ml of solvent i.e. (Methanol, Ethanol, and aqueous) was added to the plants powdered separately. Then with the help of an aluminum file, the Flask was covered and retained in a shaker for 72 hrs. for shaking purposes. After 72 hrs of shaking the extracts were filtered with the help of man filter paper and then through the filtration process plant husk was removed (Ullah et al. 2019).

2.6. Rotary evaporation of the solvents

The extract enclosed organic solvents such as Ethanol, Methanol, and water which were basically the filtrate of the particular plant and their parts. Beneath the control temperature 30°C-35°C They were evaporated with the help of a rotary evaporator (Ullah et al. 2019).

2.7. Crud Extract

After the process of rotary evaporation certain liquid leftovers were further dried at a regulator temperature of 20°C- 25°C through a water bath. Then the plant paste was obtained known as crude extract and then the extract was placed in air-tight bottles (Fatima et al. 2023).

2.7. Phytochemical Detection

The plants extract of *Verbascum thapsus* and *Micromeria biflora* were taken in different types of solvents i.e. Methanol, Ethanol and aqueous and then tasted for the absence or presence of phytochemical constituents like Alkaloids, Tannins, Phlobatannins, Flavonoids, Carbohydrates, Phenols, Saponin and Glycosides (Soni et al. 2011).

2.8. Carbohydrates

The 0.5 ml of filtrate of *Verbascum thapsus* and *Micromeria biflora* was treated with 0.5 ml of Benedict's regent and the solution was heated for 2 minutes in boiling water. Then the presence of carbohydrates was confirmed by the formation of a reddish-brown precipitate (Soni et al. 2011).

2.9. Flavonoids

The alkali substitute test was useful when the extract solution of the selected plants was treated with sodium hydroxide solution. The formation of red precipitation indicates the presence of flavonoids (Soni et al. 2011).

2.10. Phenols

2 ml of ferric chloride ($FeCl_2$) solution was added to 2 ml of *Verbascum thapsus* and *Micromeria biflora*

extracts solution in a test tube. Formations of deep bluish-green solution show the presence of phenol. (Soni et al. 2011).

2.11. Tannins

A ferric chloride test was done for the detection of tannins The Ferric chloride ($FeCl_2$) was assorted with an extract solution. The formation of blue-green coloration indicates the presence of tannins (Soni et al. 2011).

2.12. Saponins

In the test tube, five milliliters of *Verbascum thapsus* and *Micromeria biflora* plant extract were shaken dynamically. When the formation of froth occurred shown the existence of Saponins (Soni et al. 2011).

2.13. Phlobatannins

In the test tube, 0.5-gram powder of the plant extracts remained put after the addition of 2 ml water and shaken for a few minutes then the filtrate was taken and 1% aqueous HCl was added to the filtrate and then boiled in water both. The presence of Phlobatannins is indicated by the formation of a red color (Ullah et al. 2022).

2.15. Glycosides

The 5% Ferric chloride solutions and 1 ml glacial acetic acid were added to five milliliters of plant extract and then further addition of a few drops of concentered sulphuric acid. The presence of glycosides was confirmed through the formation of a greenish-blue color (Zaman et al. 2022).

2.16. Alkaloids

A few drops of Wagner's reagent (Potassium iodine) are added to the two grams of plant extracts. When the formation of a reddish-brown precipitate occurred, it showed the presence of alkaloids (Khandelwal et al. 2015).

2.17. Tests for terpenoids

1ml of *Verbascum thapsus* and *Micromeria biflora* plant extract was assorted with 2ml of chloroform and carefully added concentrated sulphuric acid along the sides of the tube for the formation of a layer. The formation of reddish-brown coloration indicates the presence of terpenoids (Dahiru et al. 2006).

3. RESULTS

3.1. Phytochemical analysis

A qualitative investigation of methanolic ethanolic and aqueous extracts of *Verbascum thapsus* and *Micromeria biflora* was carried out.

3.2. Qualitative Detection of Bioactive Compound Verbascum thapsus Leaves

Qualitative analysis of *Verbascum thapsus* and *Micromeria biflora* was carried out for the detection of Alkaloid, Flavonoids. Carbohydrate, Phlobatannins, Glycosides, Saponins, Phenol, Terpenoids, Tannins. Phytochemical detection of *Verbascum thapsus* plant ethanolic extracts contained a dark colour which shows that Alkaloids are present. Where phenol was present in both methanolic, ethanolic, and aqueous extracts. The saponins in aqueous show dark concentration comparison with ethanolic and methanolic extracts. The flavonoids were present in all three types of extract and Tannins were found in all types of extract in large amounts but in Aqueous found in small amounts. The alkaloids, glycosides, and Phlobatannins are absent in aqueous extract. The data is shown in Table 1. The highest amount of carbohydrates was present in the methanolic extract and low amounts were present in both ethanolic and aqueous extracts. In the ethanolic extracts, the glycosides were found in low amounts. In the methanolic extract, glycosides were present in the highest amount the glycosides were absent in the aqueous extract of the plant. The Flavonoids were present in moderate amounts in both methanolic and ethanolic extract and they were present in low amounts in the aqueous extract. The Phlobatannins were present in moderate amounts in the methanolic extracts low amounts in the ethanolic extracts and absent in the aqueous extracts. The Phenol was founding in all three types of plant extracts i.e. (ethanol, methanol, and Aqueous). The Saponins were present in low amounts in the methanolic, ethanolic, and Aqueous extracts. The highest amounts of Tannins were present in the ethanolic extracts and low amounts of Tannins were found in both ethanolic and aqueous. Moderate amounts of

Terpenoids were present in the methanolic extracts of the *Verbascum thapsus* plants and low amounts of Terpenoids were found both ethanolic and aqueous. The data is stated in the following Table 1.

Table 1: phytochemical detection of *Verbascum thapsus* leaves extracts

SL.NO	Phytochemical test	Methanol	Ethanol	Aqueous
1	Alkaloid	++	+	_
2	Flavonoids	++	+ +	+
2	Carbohydrate	+++	+	+
3	Phlobatannins	++	+	_
5	Glycosides s	+++	+	_
6	Saponins	+	+	+
7	Phenol	+	+ +	+
8	Terpenoids	++	+	+
9	Tannins	++	+++	+

Key: -; Not found, +: Low, ++: Moderate, +++: High

3.2. Qualitative Detection of Bioactive compound in the Verbascum Thapsus stems

Phytochemical detection of rhizome of Verbascum thapsus extract in all the three solvents i.e., ethanolic, methanolic, and aqueous are used which indicates the existence of bioactive compounds except glycosides are not present in aqueous extracts while the dark concentrations indicate the presence of saponins. The qualitative phytochemical detections of the selected plants show that the Carbohydrates, Glycosides, and Tannins were present in the highest amount in ethanolic extracts followed by the methanolic extracts. The qualitative phytochemistry also shows that the Carbohydrates and glycosides were found in the highest amount in the plant extracts and the other phytochemicals such as Alkaloids, Flavonoids, and Phenol were present in moderate amounts. The Alkaloid, Carbohydrate, Glycosides, Phlobatannins, Saponins, Terpenoids. The Alkaloids, Glycosides, and Phlobatannins were absent in Aqueous extracts. The concentration of alkaloids was highest in the methanolic extracts and present in low amounts in the ethanolic extracts and the alkaloids were absent in the Aqueous extracts. The flavonoids were present in all types of extracts i.e. (methanol, ethanol, and Aqueous). Glycosides and Phlobatannins were present in the highest amount in the methanolic extract and moderate amounts in the ethanolic extracts and these both are absent in the Aqueous extracts of the P*. ceritica* plants. The Phenol is present in moderate amounts in the methanolic extracts and the amounts in methanolic extracts and Aqueous extracts. The saponins were present in low quantities in the *P. ceritica* plant. The phytochemical Tannins were found in the highest amounts in the ethanolic extracts and moderate amounts in methanolic and Aqueous extracts. The Alkaloids, Terpenoids, Tannin, and Flavonoids are present in moderate amounts in the methanolic extracts. The data is stated in the following Table 2.

Table 2: Phytochemical detection of *Verbascum thapsus* stem

SL.NO.	Phytochemical test	Methanol	Ethanol	Aqueous
1	Alkaloid	++	+	_
2	Flavonoids	++	+ +	+
2	Carbohydrate	+++	+	+
3	Phlobatannins	++	+	_
5	Glycosides	+++	+	_
6	Saponins	+	+	+
7	Phenol	+	+ +	+
8	Terpenoids	++	+	+
9	Tannins	++	+++	+

Key: -; Not found, +; Low, ++; Moderate, +++; High

3.5. Qualitative Detection of Bioactive Compound Verbascum thapsus Roots

Phytochemical detection of roots of *Verbascum thapsus* in all three solvents i.e., ethanolic, methanolic, and aqueous are used which indicated the existence of bioactive compound except glycosides are not present in aqueous extracts while the dark concentrations indicate the presence of saponins. The qualitative phytochemical detections of the selected plants show that the Carbohydrates, Glycosides, and Tannins were present in the highest amount in ethanolic extracts followed by the methanolic extracts. The qualitative phytochemistry also shows that the Carbohydrates and glycosides, were found in the highest amount in the plant extracts and the other phytochemicals such as Alkaloids, Flavonoids, and Phenol were present in moderate amounts.

The Alkaloid, Carbohydrate, Glycosides, Phlobatannins, Saponins, Terpenoids. The Alkaloids, Glycosides, Phlobatannins, were absent in Aqueous extracts. The concentration of alkaloids was highest in the methanolic extracts and present in low amounts in the ethanolic extracts and the alkaloids were absent in the Aqueous extracts. Glycosides and Phlobatannins were present in the highest amount in the methanolic extract and moderate amounts in the ethanolic extracts and these both are absent in the Aqueous extracts of the Verbascum Thapsus plants. The Phenol is present in moderate amounts in the methanolic extracts and the amounts in methanolic extracts and Aqueous extracts. The saponins were present in low quantities in the Verbascum Thapsus plant. The phytochemical Tannins were found in the highest amounts in the ethanolic extracts and moderate amounts in methanolic and Aqueous extracts. The Alkaloids, Terpenoids, tannins, and Flavonoids are present in moderate amounts in the methanolic extracts. The data is stated in the following Table 3.

Table 3: Phytochemical Investigation of *Verbascum thapsus* Root Extracts

SL.NO	Phytochemical test	Methanol	Ethanol	Aqueous
1	Alkaloid	++	+	_
2	Flavonoids	++	+ +	+
2	Carbohydrate	+++	+	+
3	Phlobatannins	++	+	_
5	Glycosides s	+++	+	_
6	Saponins	+	+	+
7	Phenol	+	+ +	+
8	Terpenoids	++	+	+
9	Tannins	++	+++	+

Key: -; Not found, +; Low, ++; Moderate, +++; High

3.6. Qualitative Detection of Bioactive compound Micromeria biflora leaves

The highest amount of carbohydrates was present in the methanolic extract and low amounts were present in both ethanolic and aqueous extracts. In the ethanolic extracts, the glycosides were found in low amounts. In the methanolic extract, glycosides were present in the highest amount the glycosides were absent in the aqueous extract of the plant. The Flavonoids were present in moderate amounts both methanolic and ethanolic extract and they were present in low amounts in the aqueous extract. The Phlobatannins were present in moderate amounts in the methanolic extracts low amounts in the ethanolic extracts and absent in the aqueous extracts. The Phenol was found in all three types of plant extracts i.e. (ethanol, methanol, and Aqueous). The alkaloids, Glycosides, and Phlobatannins were absent in Aqueous extracts. The concentration of alkaloids was highest in the methanolic extracts and present in low amounts in the ethanolic extracts and the alkaloids were absent in the Aqueous extracts. Glycosides and Phlobatannins were present in the highest amounts in the methanolic extract and moderate amounts in the ethanolic extracts and these both are absent in the Aqueous extracts of the *Micromeria biflora* plants. The data are shown in Table 4.

3.7. *Qualitative Detection of Bioactive compound Micromeria biflora Stem*

The qualitative phytochemical detections of the selected plants shows that the Carbohydrate, Glycosides, Tannins were present in highest amount in ethanolic extracts and followed by the methanolic extracts. The qualitative phytochemistry also shows that the Carbohydrate, Glycosides, were found in highest amount in the plants extracts and the other phytochemical such as Alkaloid, Flavonoids and Phenol were present in moderate's amount. The Alkaloid, Carbohydrate, Glycosides, Phlobatannins, Saponins, Terpenoids. The Alkaloid, Glycosides, Phlobatannins, were absent in Aqueous extracts. The Saponins were present in low amounts in the methanolic, ethanolic, and Aqueous extracts. The highest amounts of Tannins were present in the ethanolic extracts and low amounts of Tannins were found in both ethanolic and aqueous. Moderate amounts of Terpenoids were present in the methanolic extracts of the *Micromeria biflora* plants and low amounts of Terpenoids were found both ethanolic and aqueous. The data are shown in Table 5.

Table 4: Phytochemical Investigation of *Micromeria biflora* Leaves Extracts

SL.NO	Phytochemical Test	Methanol	Ethanol	Aqueous
1	Alkaloid	++	+	_
2	Flavonoids	++	+ +	+
2	Carbohydrate	+++	+	+
3	Phlobatannins	++	+	_
5	Glycosides s	+++	+	_
6	Saponins	+	+	+
7	Phenol	+	+ +	+
8	Terpenoids	++	+	+
9	Tannins	++	+++	+

Key: -; Not found, +; Low, ++; Moderate, +++; High

Table 5: Phytochemical Investigation *Micromeria biflora* Stem Extracts

SL.NO	Phytochemical test	Methanol	Ethanol	Aqueous
1	Alkaloid	++	+	_
2	Flavonoids	++	+ +	+
2	Carbohydrate	+++	+	+
3	Phlobatannins	++	+	_
5	Glycosides s	+++	+	_
6	Saponins	+	+	+
7	Phenol	+	+ +	+
8	Terpenoids	++	+	+
9	Tannins	++	+++	+

Key: -; Not found, +; Low, ++; Moderate, +++; High

3.8. Qualitative Detection of Bioactive compound *Micromeria biflora* Roots

Phytochemical detection of *Micromeria biflora* plant ethanolic extracts contained dark colour which shows that Alkaloids are present. Where phenol was present in both methanolic, ethanolic and aqueous extracts. The saponins in aqueous show dark concentration comparison with ethanolic and methanolic extracts. Where the flavonoids were present in all three types of extract and Tannins were found in all types of extract in large amount but in Aqueous found in small amounts. The alkaloid, glycosides, and Phlobatannins are absent in aqueous extract. The flavonoids were present in all types of extracts i.e. (methanol, ethanol and Aqueous). Glycosides and Phlobatannins were present in highest amount in the methanolic extract and moderates amounts in the ethanolic extracts and these both are absent in the Aqueous extracts of the

Micromeria biflora plants. The Phenol is present in moderates amounts in the methanolic extracts and the amounts in methanolic extracts and Aqueous extracts. The data are shown in Table 6.

In the current study ethno-botanical importance plant of Munda Khazana District is lower Dir an overall of 50 valuable plants assembled from the research region. These plants belong to different families. The dominant valuable plants and the bases of habit were herbs (22 species) followed by shrubs (8 species) and trees (10 plant species,). Complete details of the plant, local name, botanical name, habit, family, components of plant use, and ethnobotanical utilizations are as follows.

Table 6: Phytochemical Investigation *Micromeria biflora* Roots Extracts

SL.NO	Phytochemical test	Methanol	Ethanol	Aqueous
1	Alkaloid	++	+	_
2	Flavonoids	++	+ +	+
2	Carbohydrate	+++	+	+
3	Phlobatannins	++	+	_
5	Glycosides	+++	+	_
6	Saponins	+	+	+
7	Phenol	+	+ +	+
8	Terpenoids	++	+	+
9	Tannins	++	+++	+

Key: -; Not found, +; Low, ++; Moderate, +++; High

Plant No: 1
Botanical name: *Ajuga parviflora* Benth
Family: Lamiaceae
Local name: Kauri Booti
Habit: Shrub
Part used: Leaves
Medicinal uses: Used in curing pimples, pimples, headache, stomach acidity and pimples.

Plant No: 2
Botanical name: *Amaranthus virdis* L.
Family: Amaranthaceae
Local name: Chorlai
Habit: Herb
Part used: Leaves
Medicinal uses: For Diuretic, lithasis, headache swelling, and used food and fooder.

Plant No: 3
Botanical name: Cannabis sativa L.
Family: Canabaceae
Local name: Bhang
Habit: Shrub
Part used: Seeds, leaves
Ethnobotanical uses: pleasant excitement and astringent.

Plant No: 4
Botanical name: *Sisymbrium irio* L.
Family: Brassicaceae
Local name: Genger
Habit: Shrub
Part used: Seeds
Medicinal uses: Seeds are used in dropsy.

Plant No: 5
Botanical name: Chenopodium album L.
Family: Chenopdiaceae
Local name: Sarmay
Habit: Shrub
Part used: Seeds, leaves and roots
Medicinal uses: Use as fodder, urinary problem, and worm killer.

Plant No: 6
Botanical name: *Convolvulus arvensis* L.
Family: Convolvulaceae
Local name: Perwathy.
Habit: Herb
Part used: Whole plant
Medicinal uses: For fuel young plants are grazed by the cattle and skin disorders.

Plant No: 7
Botanical name: *Fumaria indica* (Husskn.) H.N. Pugsley
Family: Fumariaceae
Local name: Shahtra
Habit: Herb

Part used: Whole plant
Medicinal uses: It is used as fodder as well as fuel. Shoots are also used in diarrhea, blood purifier, and fever.

Plant No: 8
Botanical name: *Morus alba* L.
Family: Moraceae
Local name: Spen Toot
Habit: Tree
Part used: Root, leaves
Medicinal uses: Fruits are edible and wood is used for furniture as well as for the treatment of throat infection.

Plant No: 9
Botanical name: *Ricinus communis* L.
Family: Euphorbiaceae
Local name: Arhanda
Habit: Tree
Part used: Whole plant
Medicinal uses: Leaves are purgative, poisonous and narcotic.

Plant No: 10
Botanical name: *Solanum nigrum* L.
Family: Solanaceae
Local name: Kaach Maacho
Habit: Shrub
Part used: Fruits and leaves
Medicinal uses: younger leaves as used for curing fever and flue cough. Dehydrated fruits are utilized for stomach ailments.

Plant No: 11
Botanical name: *Withania somnifera* (L.) Dunnel.
Family: Solanaceae
Local name: Kotilal
Habit: Shrub
Part used: Roots
Medicinal uses: Root paste is applied in painful swellings, bleeding wounds as well as ulcers and as well used for cure of asthma.

Plant No: 12
Botanical name: Phoenix dactylifera L.
Family: Arecaceae
Local name: Khajoor
Habit: Tree
Parts used: Fruit
Medicinal uses: It is used as an aphrodisiac and tonic.

Plant No: 13
Botanical name: *Calotropis procera* (Willd.) R. Br.
Family: Asclepiadaceae
Local name: Spulmay
Habit: Shrub
Parts used: Leaves, flowers, latex
Medicinal uses: Remove Intestinal pain, inflammation and respiratory disease.

Plant No: 14
Botanical name: *Brasica compestris* L.
Family: Brassicaceae
Local name: Sharrsham
Habit: Shrub
Parts used: Leaves,
Medicinal uses: Used as food and fodder. Beautification skin disease, Asthma and cough disease.

Plant No: 15
Botanical name: *Dalbergia sissoo* Roxb.
Family: Fabaceae
Local name: Shawa
Habit: Tree
Parts used: Whole plant
Medicinal uses: Use for fuel and fodder.

Plant No: 16
Botanical name: Melia azedirach L.
Family: Meliaceae.
Local name: Toora shandai
Habit: Tree
Parts used: Leave, fruit
Medicinal uses: Leaf extract is employed for antimicrobial agent,blood purification aswell as used for animal food.

Plant No: 17
Botanical name: *Acacia nilotica* (L.) Deliled.
Family: Mimosaceae
Local name: kikar
Habit: Tree
Parts used: Fruit and seeds
Medicinal uses: Used for fuel as well as fodder.

Plant No: 18
Botanical name: *Morus nigra* L.
Family: Moraceae
Local name: Toor Tooth
Habit: Tree
Parts used: Leaves, fruit
Medicinal uses: Used for cooling agent, astringent and cleaning throat.

Plant No: 19
Botanical name: *Eucalyptus camaldulensis* Dehnh.
Family: Myrtaceae
Local name: Lachi
Habit: Tree
Parts used: Leaves
Medicinal uses: Leaves are used to prepaire Joshanda to relieve flu. Leaves are used to cure Diarrhea.

Plant No: 20
Botanical name: *Psidium guajava* L.
Family: Myrtaceae
Local name: Amrood
Habit: Tree
Parts used: Leaves and fruit
Medicinal uses: Used as a tonic. It is also useful to expel abdominal worms.

Plant No: 21
Botanical name: *Cynodon dactylon* (L.) Pers.
Family: Poaceae
Local name: Kabal
Habit: Herb
Parts used: Root, leaves
Medicinal uses: Used for animal and also use for cough, dysentery and stones.

Plant No: 22
Botanical name: *Citrus sinensis* (L.) Osbeck
Family: Rotaceae
Local name: Malta
Habit: Tree
Parts used: Fruit
Medicinal uses: It is used for appetizer along with tonic and also given to the constipating patients.

Plant No: 23
Botanical name: *Datura alba* Nees
Family: Solanaceae
Local name: Dhatura
Habit: Shrub
Parts used: Whole plant,
Medicinal uses: Leaves are smoked to cure asthma.

Plant No: 24
Botanical name: *Vitis vinifera* L
Family: Vitaceae
Local name: Angoor
Habit: Shrub
Parts used: Fruit
Medicinal uses: Fruit is used like a common tonic and laxative.

Plant no.: 25
Botanical name: *Ocimum basilicum* L.
Family name: Lamiaceae
Local name: Kashmally
Habit: Herb
Part used: Leaves and flower
Medicinal uses: Used as a food, shelter and fodder, Antioxidant's skin and antipyretic disease.

Plant no: 26
Botanical name: *Nerium odurum* L.
Family name: Apocynaceae
Local name: Gandhery
Habit: Herb
Part used: Roots and bark
Medicinal uses: Use for fodder beatification, shelter Asthma and heart attack.

Plant no.: 27
Botanical name: *Plantago lanceolate* L.
Family name: Plantaginaceae
Local name: Ghwa jabbi
Habit: Herb
Part used: Whole plant
Medicinal uses: Respiratory, skin, insect and infection.

Plant no.: 28
Botanical name: *Debregeasia saneb* F.
Family: Urticaceae.
Local Name: Karwarra.
Habit: Shrub
Parts used: Fruits leaves.
Medicinal uses: Used as a fruit fodder, fuel and used for blood purification, and stomach.

Plant no.: 29
Botanical name: Sunchus aspera L
Family name: Asreraceae
Local name: Shoda pii
Habit: Herb
Part used: Whole plant
Medicinal uses: Used as food for farm animals.

Plant no.: 30
Botanical name: *Trifolium vesipinatum* L.
Family name: Fabaceae
Local name: Shaftal
Habit: Herb
Part used: Whole plant
Medicinal uses: It is used as food for farm animals. The seeds utilized for pimples.

Plant no.: 31
Botanical name: *Populus alba* L.
Family na33e: Salicaceae
Local name: Sufedad
Habit: Tree
Part used: Whole plant
Medicinal uses: Used like a fodder, timber, fuel and furniture.

Plant no.: 32
Botanical name: *Narcissus Poeticus* L.
Family name: Amayrlidaceae
Local name: Goli Nargas
Habit: Herb
Part used: Flowers
Medicinal uses: It is used for ornamental purposes.

Plant no.: 33
Botanical name: *Diospyros kaki* L.
Family name: Ebenaceae
Local name: Amlook
Habit: Tree
Part used: Fruit
Medicinal uses: Fruit is suitable for eating; Leaves are utilized as food and fuel.

Plant no.: 34
Botanical name: *Galium aparine* L.
Family: Rubiaceae
Local name: Jalakai
Habit: Herb
Part use: Whole plant.
Medicinal uses: Used as Antidiuretic.

Plant No: 35
Botanical Name: *Allium sativa* L
Family: Amaryllidaceae
Local Name: Ouaga
Habit: Herb
Parts used: Whole plant.
Medicinal Uses: Use as a food. Arteries, high blood pressure and heart diseases.

Plant no: 36
Botanical name: *Morus lavaegata* Wall. ex Brandis
Family name: Moraceae
Local name: Shah toot
Habit: Tree
Part used: Whole plant
Medicinal uses: Fruit is edible. Leaves are utilized as food for farm animals.

Plant no.: 37
Botanical name: *Ficus carica* L.
Family name: Moraceae
Local name: Inzar
Habit: Tree
Part used: Fruit and leaves
Medicinal uses: It is use as fuel and fodder for the shelter. Diabetic, migraine, diarrhea

Plant no.: 38
Botanical Name: *Verbascum thapsus* L.
Family: Scrophulariaceae.
Local Name: Khurdug.
Habit: Herb
Parts used: Flower leaves.
Medicinal Uses: Fruits, fuel, shelter. Tuberculosis, cough, asthma.

Plant no.: 39
Botanical name: *Mentha longifulia* (L.) L.
Family name: Labiateae
Local name: Enally
Habit: Herb
Part used: Leaves
Medicinal uses: It is used to relieve abdominal pain and reduce gastric acidity.

Plant no.: 40
Botanical name: Monotheca buxifolia (Falc.) A. DC.
Family name: Sapotaceae.
Local name: Gurgora
Habit: Tree
Part used: Whole plant
Medicinal uses: The plant is grazing through animals and the fruits are used human food. It is also used for curing Asthma and antipyretic.

Plant no.: 41
Botanical name: *Myrtus communis* L.
Family name: Moraceae
Local name: Manrro
Habit: Shrub
Part used: Fruit and leaves
Medicinal uses: It is used as fodders. It is also practices to cured animal respiratory and digestive disorder.

Plant no.: 42
Botanical Name: *Xanthium strumarium* L.
Family: Asteraceae.
Local Name: Geeshy.
Habit: Herb

Parts used: Whole Plant.
Medicinal Uses: Used as fodder, tonic, fuel and in digestive problems.

Plant no: 43
Botanical Name: *Zizyphus Jujube* Mill.
Family: Rhamaceae
Local Name: Berra
Habit: Tree
Parts used: Whole plant
Medicinal Uses: It is used as food, fuel, Shelter and also for skin disease.

Plant no: 44
Botanical name: *Cedrus deodara* (Roxb. ex D.Don) G.Don
Family name: Pinaceae
Local name: Diyar
Habit: Tree
Part used: Whole plant
Medicinal uses: It is used as a food as well as for the treatment of Dysentery, Diarrhea and Urinary problems.

Plant no: 45
Botanical Name: *Coriandrium sativum* L.
Family: Apiaceae
Local Name: Dania
Habit: Herb
Parts used: Leaves, Fruit.
Medicinal Uses: Used as food and fodder and Skin disease, Asthma, blood purifier, cardiac and respiratory disease.

Plant No: 46
Botanical Name: *Deutura innoxia* Mill.
Family: Solanaceae
Local Name: Batura
Habit: Herb
Parts used: Whole plant.
Medicinal Uses: Fuel and shelter, Tonic, Dysentery and diabetic disease.

Plant no: 47
Botanical Name: *Papaver somniferum* L.
Family: Papaveraceae.
Local Name: Doda, kash.
Habit: Shrub
Parts used: Seeds, latex.
Medicinal Uses: Used as fodder, and fuel and also utilized for Dysentery and diarrhea.

Plant no: 48
Botanical name: Medacago denticulate Willd.
Family name: Fabaceae
Local name: Feshtary
Habit: Herb
Part used: Leaves
Medicinal uses: Used as food and for sugar control.

Plant no: 49
Botanical name: Malva neglacta Wallr
Family name: Malvaceae
Local name: Panerak
Habit: Herb
Part used: Leaves
Medicinal uses: Food and pain.

Plant no: 50
Botanical name: *Teraxicum officinale* (L.)
Family name: Asteraceae
Local name: Zyarr guly
Habit: Herb
Part used: Roots
Medicinal uses: Roots are used in diabetes and for kidney problems.

3. DISCUSSION

In the present study qualitative investigation of methanolic ethanolic and aqueous extracts of *Verbascum thapsus* and *Micromeria biflora* was carried out. Phytochemical detection of *Verbascum thapsus* plant ethanolic extracts in leaves contained a dark colour which shows that Alkaloids are present. Where phenol was present in both methanolic, ethanolic, and aqueous extracts. The saponins in aqueous show dark concentration comparison with ethanolic and methanolic extracts. The flavonoids were present in all three types of extract and Tannins were found in all types of extract in large amounts but in aqueous found in small amounts. The alkaloids, glycosides, and Phlobatannins are absent in aqueous extract. The Flavonoids were present in moderate amounts in both methanolic and ethanolic extract in leaves and they were present in low amounts in the aqueous extract. The Phlobatannins were present in moderate amounts in the methanolic extracts low amounts in the ethanolic extracts of *Verbascum thapsus* and absent in the aqueous extracts. Tannins were present in the highest amount in ethanolic extracts followed by the methanolic extracts. The qualitative phytochemistry also shows that the Carbohydrates and glycosides, were found in the highest amount in the plant extracts and the

other phytochemicals such as Alkaloids, Flavonoids, and Phenol were present in moderate amount. The Alkaloid, Carbohydrate, Glycosides, Phlobatannins, Saponins, Terpenoids. The Alkaloid, Glycosides, Phlobatannins, were absent in the Aqueous extracts of *Verbascum thapsus*. The concentration of alkaloid was highest in the methanolic extracts and present in low amounts in the ethanolic extracts and the alkaloid were absent in the Aqueous extracts. Qualitative detection of bioactive compound *Verbascum thapsus* Roots in all the three solvents i.e., ethanolic, methanolic and aqueous are used which indicates the existence of bioactive compounds except glycosides are not present in aqueous extracts while the dark concentrations indicate the presence of saponins. The highest amount of carbohydrates was present in the methanolic extract of *Micromeria biflora* leaves and a low amount was present in both ethanolic and aqueous extracts of roots and stem of *Micromeria biflora*. In the ethanolic extracts, the glycosides were found in low amounts. In the methanolic extract, glycosides were present in the highest amount the glycosides were absent in the aqueous extract of the plant. The Flavonoids were present in moderate amounts in both methanolic and ethanolic extract and they were present in low amounts in the aqueous extract. The Phlobatannins were present in moderate amounts in the methanolic extracts low amounts in the ethanolic extracts and absent in the aqueous extracts.

A wide variety of pharmacological activities are shown by different phytochemicals, which may help in protection against chronic diseases. Tannins, flavonoids, saponins, glycosides, and amino acids have anti-inflammatory and hypoglycemic activities. Steroids and terpenoids show central nervous system (CNS) activities and analgesic properties. Because of their antimicrobial activity saponins are involved in plant defense systems (Ayoola et al. 2008). These phytochemicals showed antimicrobial activity through different mechanisms. With proline-rich proteins, tannins have been found to form irreversible complexes (Shimada, 2006) resulting in the inhibition of cell protein synthesis. (Parekh and Chanda, 2007) reported that tannins are known to react with proteins to deliver the typical tanning effect which is essential for the treatment of ulcerated or inflamed tissues. Herbs that have tannins as their key components are astringent in nature and are used for treating intestinal disorders such as dysentery and diarrhea (Dharmananda, 2002). Tannins and their derivatives are phenolic compounds considered to be primary antioxidants or free radical scavengers (Khan et al. 2018). These observations therefore support the use of *Verbascum thapsus* and *Micromeria biflora* in herbal cure remedies, thus suggesting that *Verbascum thapsus* and *Micromeria biflora* has potential as a source of important bioactive molecules for the treatment and prevention of cancer. The presence of tannins in *Verbascum thapsus* and *Micromeria biflora* supports the traditional Medicinal use of this plant in the treatment of different ailments. Alkaloid was another phytochemical constituent observed in the extract of *Verbascum thapsus* and *Micromeria biflora*. One of the most common biological properties of alkaloids is their toxicity against cells of foreign organisms. These activities have been widely studied for their potential use in the reduction and elimination of human cancer cell lines (Nobori, et al. 1993). One of the largest groups of phytochemicals is alkaloids in plants which have amazing effects on humans and this has led to the development of powerful pain killer medications (Kam and Liew, 2002). Shown the inhibitory effect of saponins on inflamed cells. Saponin was found to be present in *Verbascum thapsus* and *Micromeria biflora* extracts and has supported the usefulness of this plant in managing inflammation. Flavonoids, other phytochemicals show a varied range of biological activities like anti-inflammatory, antimicrobial, analgesic, anti-angionic, cytostatic, antioxidant, and anti-allergic properties (Hodek et al. 2002).

4. CONCLUSION

The local area (Dir Lower) is rich in medicinal plants and can be used for curing different diseases instead of using imported medicines. The extraction of different chemicals from the local plants can also be done to support Pakistan's health issues and economy. Indigenous knowledge regarding medicinal plant collection and its proper mode of administration should be collected from the local people and preserved properly. It is suggested here that this could be done through different stockholders i.e., government, research organizations NGOs, etc. The phytochemical analysis of medicinal plants is also important and has a commercial interest in both pharmaceutical companies and research institutes for the formation of new medicines for the treatment of several diseases. Thus, we hope that the important phytochemical properties identified by our study in the local plant of

War affected area of Bajaur agency, Pakistan will be helpful in the copping different diseases of this particular region.

Founding Source

There is no funding source for the students to do it by themselves.

5. REFERENCES

Ayoola, G.A.; Coker, H.A.; Adesegun, S.A.; Adepoju-Bello, A.A.; Obaweya, K.; Ezennia, E.C.; Atangbayila, T. O. Phytochemical Screening and Antioxidant Activities of Some Selected Medicinal Plants Used for Malaria Therapy in Southwestern Nigeria. *Tropical Journal of Pharmaceutical Research*, 2008, 7(3), 1019-1024.

Dahiru, D.; Onubiyi, J.A.; Umaru, H.A. Phytochemical Screening and Antiulcerogenic Effect of *Moringa oleifera* Aqueous Leaf Extract. *African Journal of Traditional, Complementary and Alternative Medicines*, 2006, 3(3), 70-75.

Dayal, J.; Cao, J.; Eisenhauer, G.; Schwan, K.; Wolf, M.; Zheng, F.; Lofstead, J. I/o containers: Managing the Data Analytics and Visualization Pipelines of High-End Codes. In 2013 IEEE International Symposium on Parallel & Distributed Processing, Workshops and PhD Forum, 2013, (pp. 2015-2024). IEEE.

Dharmananda, S. The Nature of Ginseng from Traditional Use to Modern Research. *Internet Journal of the Institute for Traditional Medicine and Preventive Health Care*, 2002. http://www.itmonline.org/arts/ginsengnature.htm

Harvey, M.G.; Speier, C.; Novicevic, M.M. Strategic Global Human Resource Management: The Role of Inpatriate Managers. *Human Resource Management Review*, 2000, 10(2), 153-175.

Hasler, C.M.; Blumberg, J.B. Phytochemicals: Biochemistry and Physiology. Introduction. *The Journal of Nutrition*, 1999, 129(3), 756S-757S.

Hodek, P.; Trefil, P.; Stiborová, M. Flavonoids-Potent and Versatile Biologically Active Compounds Interacting with Cytochromes P450. *Chemico-Biological Interactions*, 2002, 139(1), 1-21.

Yilmaz, F.; Çifci, H.E. Herbal Use among Presurgical Patients in Turkey: A Cross-Sectional Study. *Anesthesiology Research and Practice*, 2018.

Khandewal, D.; Ballal, N.V.; Saraswathi, M.V. Comparative Evaluation of the Accuracy of 2 Electronic Apex Locators with Conventional Radiography: An Ex Vivo Study. *Journal of Endodontics*, 2015, 41(2), 201-204.

King, A.M.Y.; Young, G. Characteristics and Occurrence of Phenolic Phytochemicals. *Journal of the American Dietetic Association*, 1999, 99(2), 213-218.

Nowlis, J.P. The Causes and Consequences of Host Preferences in Marine Gastropods. Cornell University, 1994.

Moorachian, M.E. Phytochemicals: Why and How. *Tastings*, 2000, 7(1), 4-5.

Nobori, T.; Szinai, I.; Amox, D.; Parker, B.; Olopade, O. I.; Buchhagen, D.L.; Carson, D.A. Methylthioadenosine Phosphorylase Deficiency in Human Non-Small Cell Lung Cancers. *Cancer Research*, 1993, 53(5), 1098-1101.

Shakir, U. Characteristics and Occurrence of Phenolic Phytochemicals. J*ournal of Agriculture & Forestry Research*, 2023, 9(2).

Parekh, J.; Chanda, S. Antibacterial and Phytochemical Studies on Twelve Species of Indian Medicinal Plants. *African Journal of Biomedical Research*, 2007, 10(2).

Rajiv, S.; Jerobin, J.; Saranya, V.; Nainawat, M.; Sharma, A.; Makwana, P.; Chandrasekaran, N. Comparative Cytotoxicity and Genotoxicity of Cobalt (Ii, Iii) Oxide, Iron (Iii) Oxide, Silicon Dioxide, And Aluminum Oxide Nanoparticles on Human Lymphocytes *In vitro*. Human & Experimental Toxicology, 2016, 35(2), 170-183.

Rao, S.R.; Ravishankar, G.A. Plant Cell Cultures: Chemical Factories of Secondary Metabolites. *Biotechnology Advances*, 2002, 20(2), 101-153.

Rejani, R.; Murugan, D.; Krishnan, D.V. Pixel Pattern-Based Steganography on Images. ICTACT *Journal on Image and Video Processing*, 2015, 5(3), 991-997.

Sahan, Y.; Gocmen, D.; Cansev, A.; Celik, G.; Aydin, E.; Dundar, A.N.; & Dulger, D. Chemical and Techno-Functional Properties of Flours from Peeled and Unpeeled Oleaster (*Elaeagnus angustifolia* L.). *Journal of Applied Botany and Food Quality*, 2015, 88, 34 -41.

Ullah, S.; Sohil, M.; Khattak, M.; Ihsan, M.; Begum, L. List of Some Selected Pteridophytes From Maidan Valley of Dir Lower Khyber Pakhtunkhwa Pakistan. *International Journal of Horticulture and Food Science*, 2019; 1(2): 15-22.

Ullah, S.; Begam, L.; Abasi, F.; Khan, S.; Bacha, I.; Sohil, M.; Ihsan, M. Floristic List and Biological Spectra of Plants of Arrang Sire Ghar, Bajaur District of Khyber Pakhtoonkhwa, Pakistan, 2021, *International Journal of Horticulture and Food Science*, 2019, 1(1), 103-110.

Ullah, S.; Ullah, Z.; Iqbal, J.; Abasi, F.; Khan, S.; Sohail, M.; Ihsan, M. Traditional Herbal Medicinal Plants of Khyber Pakhtoonkhwa Pakistan Is Used for Analgesic, Antiinflammatory, Anti-Cancer, Anti-Ulcer and Antidiabetic Activities. *International Journal of Horticulture and Food Science, 2019; 1(1), 90-98.* DOI: 10.33545/26631067.2019.v1.i1b.18

Shimada, T.; Saitoh, T.; Sasaki, E.; Nishitani, Y.; Osawa, R. Role of Tannin-Binding Salivary Proteins and Tannase-Producing Bacteria in The Acclimation of The Japanese Wood Mouse to Acorn *Tannins. Journal of Chemical Ecology*, 2006, 32, 1165-1180.

Smith, R.R.; Barile, L.; Cho, H.C.; Leppo, M.K.; Hare, J. M.; Messina, E.; Marbán, E. Regenerative Potential of Cardiosphere-Derived Cells Expanded from Percutaneous Endomyocardial Biopsy Specimens. *Circulation*, 115(7), 896-908.

Ullah, O.; Khan, A.; Ambreen, A.; Ahmad, I.; Akhtar, T.; Gandapor, A. J.; Khan, A.M. Antibiotic Sensitivity Pattern of Bacterial Isolates of Neonatal Septicemia in Peshawar, Pakistan. *Archives of Iranian medicine*, 2016, 19(12), 866–869.

Ullah, S. Ecological Study of Different Communities Site from District Lower Dir Laram Timargara Khyber Pakhtun Khwa Pakistan. *Journal of Botany*, 2017, 1(1), 60-78.

Wadood, A.; Ghufran, M.; Khan, A.; Azam, S.S.; Jelani, M.; Uddin, R. Selective Glycosidase Inhibitors: A Patent Review (2012–present). *International Journal of Biological Macromolecules*, 2018, 111, 82-91.

Welch, C.J.; Naijun, W.; Mirlinda, B.; Robert, H.; Tanja, B.X.;Gong, R.H. "Greening analytical chromatography." T*rAC Trends in Analytical Chemistry*, 2010, 29, 7, 667-680.

Ullah, S.; Shakir, L.; Ullah, R. Morphological and Phytochemical Study of *Cirsium arvense* from District Mardan Pakistan. *J Bioinfo Biotech Res*, 2023,1(1), 1-7.

Ahmad, N.; Ali, S.; Abbas, M.; Fazal, H.; Saqib, S.; Ali, A.; Sohail. Antimicrobial Efficacy of *Mentha piperata*-derived Biogenic Zinc Oxide Nanoparticles against Uti-Resistant Pathogens. *Scientific Reports*, 2023,13(1), 14972.

Hameed, A.; Zafar, M.; Ahmad, M.; Sultana, S.; Akhter, M.S.; Zaman, W.; Ullah, F. Micromorphology, Phytochemical and Pharmacological Evaluation of *Isodon rugosus* (Wall. ex Benth.) Codd. *Journal of Animal & Plant Sciences*, 2022, 32(3),736-745.

Zaman, W.; Ahmad, M.; Zafar, M.; Amina, H.; Saqib, S.; Ullah, F.; Ayaz, A.; Bahadur, S.; Park, S. Diversity of Medicinal Plants Used as Male Contraceptives: An Initiative Towards Herbal Contraceptives, *Indian Journal of Traditional Knowledge*, 2022, 21(3), 616-624.

Ahmad, S.; Ahmad, M.; Fawzy, R.M.; Sultana, S.; Papini, A.; Ullah, F.; Zafar, M. Palynological Study of Fossil Plants from Miocene Murree Formation of Pakistan: Clues to Investigate Palaeoclimate and Palaeoenvironment. *Agronomy*, 2023,13(1), 269.

Fatima, I.; Safdar, N.; Akhtar, W.; Munir, A.; Saqib, S.; Ayaz, A.; Zaman, W. Evaluation of Potential Inhibitory Effects on Acetylcholinesterase, Pancreatic Lipase, And Cancer Cell Lines Using Raw Leaves Extracts of Three Fabaceae Species. Heliyon, 2023, 9(5),1-8. https://doi.org/10.1016/j.heliyon.2023.e1590

Ullah, F.; Gao, Y.; Sari, İ.; Jiao, R.; Saqib, S.; Gao, X.F. Macro-Morphological and Ecological Variation in *Rosa sericea* Complex. Agronomy, 2022, 12, 1078.

Zaman, W.; Ullah, F.; Parmar, G.; Saqib, S.; Ayaz, A.; Park, S. Foliar Micromorphology of Selected Medicinal Lamiaceae Taxa And their Taxonomic Implication Using Scanning Electron Microscopy. *Microscopy Research and Technique*, 2022,85(9), 3217-3236.

Khan, S.; Jan, G.; Bibi, H.; Ullah, K.; Ullah, S. 2018, Antimicrobial, Phytochemical and Traditional Studies of Selected Medicinal Plant in Bajaur agency, Pakistan. *Int J Res Pharm Sci*, 2018, 8 (2),4-20.

Khan, S.; Jan, G.; Bibi, H.; Ullah, K.; Gul, F.; Ullah, S. Plants Traditional Medication in Arid and Semi-Arid Zone of Tehsil District Bannu, Khyber Pakhtunkhwa–Pakistan. *J. Appl. Environ. Biol. Sci*., 2018, 8(8)14-28.