Ethnobotanical uses, diversity, and palatability of weeds in the tobacco crop, Yaqubi field, tehsil Razar, district Swabi

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Research

Abstract

Background: A research region's phyto-diversity provides a diversity of services to humans and their livestock, including food, feed, and medicines. The livestock's inclinations are quantified by the plants' palatability. This present study is the first attempt to document the diversity, palatable status, and ethnomedicinal uses of weeds in the region.

Objectives: The primary aim of this investigation was to record the biodiversity of weed species in tobacco crops and their ethnomedicinal uses and palatability.

Methods: An examination survey with frequent visits to the research area was conducted to determine the ethnobotanical uses and palatability status of weeds in tobacco crops.

Results: The present study highlights the ethnobotanical importance of weed species traditionally used by indigenous communities for treating various ailments. Several of these species also serve as valuable fodder resources for livestock, reflecting their dual role in local healthcare and agricultural practices. In total, 50 weed species were recorded, belonging to 47 genera and 23 families. Poaceae with 12 spp. (24 %) emerged as the most dominant family, followed by Asteraceae with 9 spp. (18 %), and Amaranthaceae with 4 spp. (8 %). Therophytes were the prevailing life-form (66 %), with microphylls being the most common leaf-size category (30 %). The overall diversity reflects a rich and ecologically significant weed flora in the study area. Moreover, a large proportion of these species (94 %) were found to be palatable, indicating their strong potential as a forage resource.

Conclusion: Based on our findings, it is recommended to employ natural weed management procedures that conserve the ethnobotanical value of palatable species while reducing the influence of lethal weeds on tobacco cultivation.

Keywords: Weeds diversity, Tobacco field, life forms, leaf size spectra, palatability, ethnobotany, Yaqubi field, Swabi district.

Background

Harshberger first used the term “Ethnobotany” in 1896 to indicate plants utilized by natives. It is a branch of ethnobiology. Ethnobotanical study is not limited to the taxonomy of botanical data; it also encompasses regional botanical knowledge. It examines the analysis and assessment of natives' relationships with plants at all stages, as well as the impact of the plant environment on human civilization. The study of how natives use local flora within specific territories or ethnicities is referred to as ethnobotany (Naveed *et al.* 2018). This field includes research on how humans utilize these plants for medicine, food, construction, art, rituals, music, and much more. Weeds are often considered plants unsuitable for the environment; they typically grow near domestic areas, certain cultivated lands, and in arid regions, thriving under various climatic conditions and edaphic factors (Anwar *et al.* 2020). Due to their allelopathic and competitive behavior, they are deemed undesirable as they provide a habitat for harmful species (Sher *et al.* 2011). Weeds diminish yields, reduce crop quality, and raise the costs of harvesting, threshing, and cleaning (Shah *et al.* 2004). They disrupt the habitat of the crops in which they grow; their distribution and classification vary from crop to crop. The annual losses in crop yields are contingent on the intensity, nature, and duration of competition with weeds. Notably, most medicinal plants are classified as weeds in comparison to cultivated plants. For instance, the poisonous plant *Parthenium hysterophorus* L. has multiple physiological functions and is utilised to cure seizures by releasing fragments in platelets in the blood that are related to the migraine's aetiology (Kaur *et al.* 2021). *Melastoma malabathricum* L. is utilised to treat respiratory issues and pain in the joints (Rizki *et al.* 2019). For this reason, weeds are recognised as an essential source of medicinal plants. In towns and cities, weeds are essential, particularly when it comes to controlling multiple illnesses (Kaur *et al.* 2021). *Calendula arvensis* (Vaill.) L., for instance, is utilised within conventional therapy for the management of healing of wounds, neurological and microbiological allergies, ENT, and typhoid disorders (Khouchlaa *et al.* 2023). Gout, rheumatism, kidney problems, and venereal infections are all treated using *Sida rhombifolia* L. According to Rizki *et al.* (2019), *Hedyotis auricularia* L. is utilised to heal the gastrointestinal system, decrease coughing and influenza, cure fever, eliminate pollutants from the body, proliferate blood vessel cells, and stabilise blood circulation (Rizki *et al.* 2019). The most effective method for documenting essential medicinal information is through ethnomedicinal surveys. This documentation of folk or traditional knowledge regarding native weeds has facilitated the discovery of numerous important drugs. Weeds have been explored for their synthetic pathways, biological potential, chemistry, toxicity, structural modifications, and synthesis. They play a significant role as anticancer agents, cytotoxic substances, anti-inflammatory agents, antimicrobials, antioxidants, and plant growth regulators. Important role as anticancer, cytotoxic, anti-inflammatory, anti-microbial, and antioxidant, as well as plant growth regulators (Kaur *et al.* 2021).

Pakistan's economy profoundly depends on agriculture, which plays a pivotal role in the production of fiber and food. This sector accounts for 18.09% of the nation’s GDP and employs 43.2 % of the workforce, both directly and indirectly. Moreover, agriculture contributes 70% to the country’s foreign exchange earnings, according to a report by the Government of Pakistan, 2018-2019. Among various crops, tobacco (*Nicotiana tabacum* L.) stands out as a potential cash crop, significantly boosting the income and economic progress of farmers. Its cultivation provides substantial financial gains, supporting socio-economic growth. Established in 1947, the Pakistan Tobacco Company Limited (PTC) was among the first multinational companies in the country, playing a central role in the tobacco industry's rise (Aman & Khan 2020). The significance of tobacco in Pakistan's economy is evident from the fact that 40% of all government excise taxes and 10% of total government revenue come from tobacco and its products. District Swabi is conducive to producing both Desi and Flue Cured Virginia Tobacco due to favorable environmental, agronomic, and soil conditions (Qamar *et al.* 2006).

Palatability is an indication of the feed’s edibility or quality and is related to the total intake of feed, its nutritional value, and digestion. Palatability, irrespective of the consumption of feed, is easy to be well document and gives a comparable idea of the feed’s nutritional value. Palatability, as an evident ability of the feed to provoke the animal appetite is usually measured by a test of its intake, in which the animals are given the option of choosing among more than one feeds (Kirilov *et al.* 2016). Different workers have contributed to the weeds of various cultivated fields (Marwat *et al*. 2013) surveyed to investigate weed species in the wheat field. About 32 weed species, belonging to two monocot and thirteen dicot families, were collected from the study area. (Wazir *et al.* 2011) experimented to decipher the feasibility of using crop extract (bio-herbicide) as an alternative for chemical weed control in rice (Ahmed *et al.* 2016) studied and measured the effect of environmental variables on weed species composition, abundance, distribution pattern, and formation of various weeds communities in Union Council Shahbaz Ghari (total area 3956 ha, Agriculture land 1701 ha), District Mardan. The purpose of this research is to examine the variety of weed species found in tobacco crops, as well as their palatability and ethnomedical applications.

Materials and Methods

Study area

The research was carried out at Tehsil Razar, District Swabi. Research areas included the Yaqubi field of Tehsil Razar, District Swabi, having a marked difference in their altitudes. It is located 1400 m above sea level with 34° 7' 48" N and 72° 28' 11" E. Fieldwork was carried out during the summer of 2023 and the spring of 2024. Swabi experiences a harsh climate, with extremely hot summers. Temperatures gradually increase from May to September, peaking in June at around 41.5 °C. During the winter season, the temperature drops to 10 to 4 °C, and the month of December is the coldest month of the year. Intensive cultivation and artificial irrigation contribute to the region's hot and humid conditions. The study area lies within the influence of monsoon and western dew systems, which contribute to increased humidity and rainfall (Jamal & Jamal 2018; Ullah *et al.* 2023).

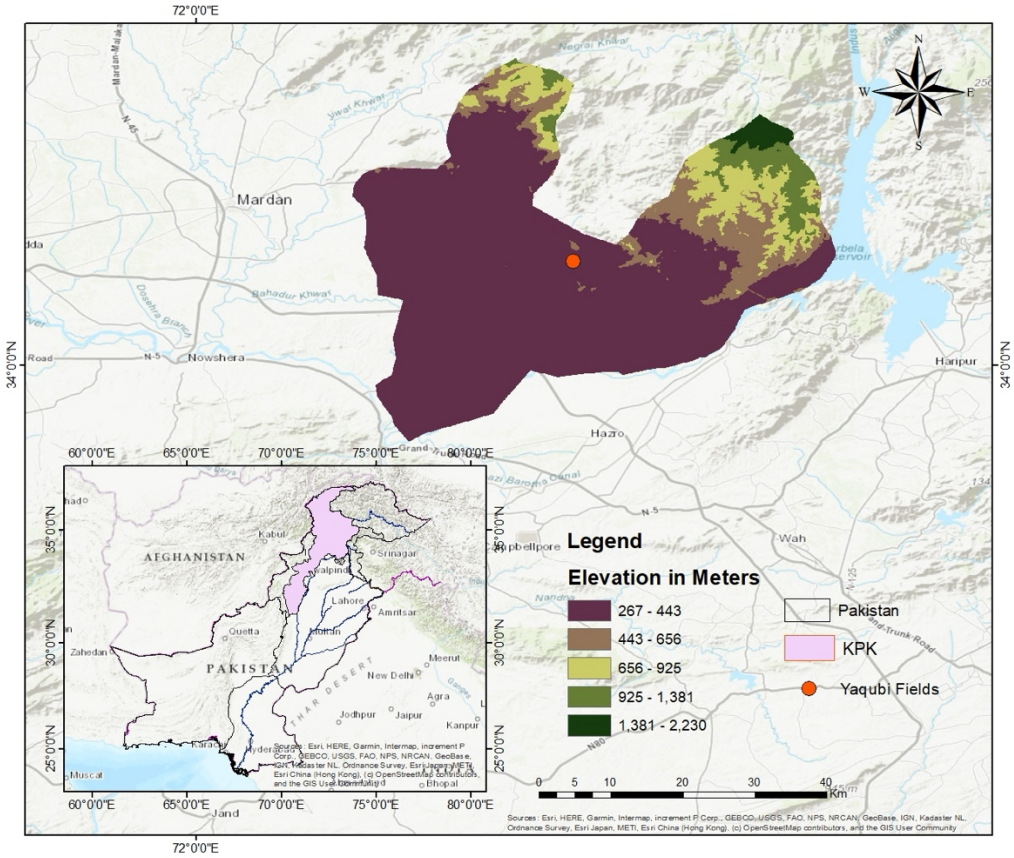

Figure 1. Location of Yaqubi fields in Swabi, KPK, Pakistan, and the study area is represented by an orange dot

Collection and preservation of plants

During the study period from summer 2023 to spring 2024, about 50 weed species belonging to 47 genera and 23 families were collected from the tobacco field. They were taken to the Department of Botany, University of Peshawar. All the plants were identified with the help of Flora of Pakistan (Ali and Qaisar 1995-2006), and after all, verified with the help of World Flora Online (WFO) (2023-onwards). All the collected species were given a voucher specimen number (S. Mushtaq Bot. 1-50) for the study of future researchers. During the studies, questionnaires also collected information about the ethnobotanical uses of these weeds from the people of the research site.

Biological spectrum

The plants were allotted into various life form classes constructed on their buds' perennation following the standard method described by (Raunkiaer 1934; Hussain 1989). Raunkiaer's biological spectrum of the flora is calculated using the following formula:

$$\text{Raunkiaer's biological spectrum} = \frac{\text{No. of species of a particular life form}}{\text{Total No. of all species in a strand}} \times 100$$

Leaf size spectra

According to Raunkiaer (1934), plants were also categorized into different quantitative leaf sizes: leptophyllous (L), Leaf area up to 25 mm^2 Nanophyllous (N), Leaf area from 25 to 225 mm^2 Microphyllous (Mic), Leaf area from 225 to 2025 mm^2 Mesophyllous (Mes), Leaf area from 2025 to 18225 mm^2 Macrophyllous (Mac), Leaf area from 18225 to 164025 mm^2.

Palatability

Palatability is a type of plant characteristic that determines the stimulation of plants, their parts, or feed stimulated by the sensory impulses of grazing animals (Hussain & Durrani 2009). The degree of palatability for each plant species was noted in the field and the local people and shepherds involved in livestock keeping were interviewed. The palatable species were further categorized by animal preference (goats, sheep, cow, and donkey) and parts grazed (whole plant, leaves, Roots, etc.). Based on frequency use, the documented plants were grouped as: 1) Highly palatable (Hp), species highly preferred by the most grazing animals; 2) moderately palatable (Mp), species with an average likeness by the livestock; 3) Less palatable (Lp), species with less preference. Likewise, plants were classified by animal preferences, parts used, and seasonal availability.

Questionnaires for ethnobotanical uses

Questionnaire No._____ Date_____

Name with age_____ Education_____

Literate Local name of a plant_____

Part used and their ethnobotany_____

In order to address important facets of how plants were used and cultural importance, interview questions were created based on previous research and professional recommendations. When required, interpreters assisted in conducting interviews in the native tongue. All participants received information about the study's goals, methods, and their rights prior to data collection.

The majority of Yaqubi's population is Pashtun, primarily from the Yusufzai tribe's Malakzai subtribe; Gujjars, Awans, Sadats, and Qazis make up the minority. Pashto is the main language used by the locals. The local community mostly engages in farming for sustenance, with the primary livelihood techniques being gardening and raising cattle.

Results and Discussion

Ethnobotanical uses

There were 400 participants in all, with 200 men and 200 women equally represented in the ethnobotanical survey. The vast majority of responders had formal educations and worked tirelessly in a variety of both private and public occupations. They worked in clerical labour, education, administration, and other similar professions. A wide variety of viewpoints were guaranteed by this balanced participation, which also improved the accuracy of the scientific information gathered. The data was collected from the indigenous peoples, more specifically, old age natives of the study locality to assemble information on the casual use of valuable plants of Tehsil Razar, District Swabi. The plant species included herbs (86 %), shrubs (10 %), and shrub/small tree (4 %) species. The ethnobotanical knowledge was collected on 50 plant spp. in the researched region and recapped in tabularized form along with their ethnomedicinal uses. Plants used as medicine account for about 78 % of the total plant species to treat many illnesses. The local people of the study region used some of the taxa as a whole or their organs (stems, leaves, flowers, and fruit) independently, and in other cases, plants were used in combination for treating ailments. Some taxa were used for single ailments such as *Avena fatua* (as a laxative), *Digera muricata* (urinary problems), *Eclipta alba* (skin disorder), and *Sorghum halepense* (as a diuretic), while the other taxa were used for curing many illnesses including *Artemisia scoparia* (indigestion and roundworms killing), *Achyranthes aspera* (rheumatism, skin disorders, stomachic, and rabies), *Cannabis sativa* (asthma, obesity, and dandruff) *Galium aparine* (diuretics, constipation, and obesity), *Erigeron bonariensis* (toothache and headache), *Lepidium didymium* (wound healing, antihypertensive, and diuretics), *Parthenium hysterophorus* (skin illnesses, rheumatic pain, and urinary tract infections), *Ricinus communis* (anthelmintics, laxative, and emollient), etc. Indigenous people use some taxa as vegetables (*Amaranthus viridis, Chenopodium album, Portulaca oleracea,* and *Rumex dentatus*), and two of the collected species were used by natives as fuel (*Broussonetia papyrifera* and *Sesbania sesban*) (Table 1).

In recent years, many evaluators, including Naveed *et al.* (2018), have evaluated the ethnobotanical uses of district Swabi wild plants, which supports the present evaluation. Naveed *et al.* (2019) studied the ethnobotanical significance of weed flora in rice, maize, and tobacco crops of tehsil Razar, district Swabi, and reported a similar result to that evaluated in the present findings. Ullah *et al.* (2023) researched the flora of the district Swabi and reported a similar evaluation in the present finding of tehsil Razar, district Swabi.

Weed flora

As recorded in the present findings, the weed flora in the tobacco crop of Yaqubi field, district Swabi, comprises 50 taxa distributed in 47 genera and 23 families. Among these, the Poaceae family was found dominant, having 12 species (24 %) followed by Asteraceae with 9 species (18 %), Asteraceae followed by Amaranthaceae with 4 species (8 %). Likewise, the families Euphorbiaceae and Polygonaceae with 3 species (6 %) each, while the Brassicaceae family with 2 species (4 %). The rest of the families include Apocynaceae, Boraginaceae, Cannabaceae, Caryophyllaceae, Chenopodiaceae, Cyperaceae, Cucurbitaceae, Convolvulaceae, Malvaceae, Moraceae, Papilionaceae, Portulacaceae, Rhamnaceae, Oxalidaceae, Solanaceae, Verbenaceae, and Zygophyllaceae, with 1 species (2 %) each (Table 1; Figure 2). Elsewhere, the numerical assessment of species richness, weed diversity in the tobacco agro-system plays a central role in sustaining. Diverse weed species afford habitats and food resources for beneficial insects, birds, and soil microbes, which improve eco-services such as pollination, nutrient cycling, and natural pest regulation. Furthermore, certain weed species serve as ethnobotanical resources, contributing to traditional medicine, fodder, and fuelwood, thus supporting the socio-economic well-being of farming communities. Therefore, the significance of weed flora in tobacco fields is not limited to their taxonomic diversity but also extends to their ecological and cultural importance in maintaining agro-ecosystem resilience and rural livelihoods.

In the past, many investigators, including Sher *et al.* (2011), researched the floristic compositions of weeds in wheat fields in the district of Swabi and showed that Poaceae was the dominant family with 7 species. Anwar *et al.* (2020) explored the weed flora of maize crops in the district of Swabi and showed that Poaceae was the leading family with 8 species. Anwar *et al.* (2022) investigated the weed flora of wheat fields of Tehsil Razar, District Swabi, KP, Pakistan, and declared the family Poaceae with 11 species. Khan *et al*. (2017) reported the floristic composition of weeds in wheat crops of Ochawala Valley, district Charsadda, and affirmed that Poaceae was the dominant family with 6 genera (7 spp.); Zaman *et al*. (2019) investigated the weed flora of wheat field in Shabqadar tehsil, district Charsadda, and reported the family Poaceae with 5 species; Afridi *et al.* (2015) examined the weed floral composition in the fields of maize and sugarcane of district Mardan and revealed that the Poaceae was the leading family with 6 species in sugarcane field and 8 species in maize fields. Ahmad *et al.* (2016) analyzed the weed flora composition in the maize crop of the Mardan and found that the leading families were Amaranthaceae and Poaceae, all these previously researched reports' findings of researchers are similar and align with our research work on the tobacco field, Razar tehsil, Swabi district.

Life form

The life form of the research area is dominated by therophytes with the presence of 33 species (66 %) chased by hemicryptophytes, which account for 9 species (18 %), the chamaephytes and geophytes revealed the presence of 3 species (6 %) each, while nanophanerophytes and microphanerophytes with 1 taxon (2 %) each (Table 3; Figure 3). Many workers explored different floras; Sher *et al.* (2011) researched the floristic compositions of weeds in wheat fields in the district of Swabi and showed that the therophytes were the dominant life form comprising 33 spp. (82.5 %). Hayat *et al.* (2019) investigated the flora of weed composition of tehsil Razar, district Swabi, and showed that the therophytes with 67 species (40.1 %) were the dominant life forms. Maqsood *et al.* (2020) reported the floral composition of weeds in crops of maize, district Swabi, KP, and suggested that among the life forms the therophytes were the indicating life forms with 17 species (60.7 %). All these supported the present investigations of weed floral composition in tobacco crops, Yaqubi field, tehsil Razar, district Swabi.

Leaf size spectra

In the current investigations of leaf spectra, the study area is ruled by microphylls with 15 species (30 %) chased by leptophylls and nanophylls with 12 species (24 %) each. Mesophylls are present with 7 species (14 %), while the macrophylls are present with 4 species (8 %) (Table 4; Figure 4).

Sher *et al.* (2011) studied the weed flora in the wheat field of district Swabi and stated that the microphylls are found to be the dominant leaf size class with 17 spp. (42.5 %) Ibrahim *et al*. (2019) studied the flora of Takht Bhai and listed that microphylls were the dominant leaf size class followed by nanophylls which powerfully aligns with the current research study. Naveed *et al.* (2018) analyzed the floral composition of district Swabi and reported the microphyll leaf class was the leading class with 41. 3 % of the total species which supports the present findings. Anwar *et al*. (2020) worked on the floristic diversity of weeds in the maize crop of district Swabi and revealed that the microphylls class was the leading leaf size class, strengthening the current findings.

Table 1. Weed floristic composition in tobacco crops, Yaqubi field, Tehsil Razar, District Swabi.

Family	Voucher No.	Species	Vernacular name	Habit	Life form	Leaf size	Part used	Ethnobotanical uses
Asteraceae	S. Mushtaq Bot. 1	*Artemisia scoparia* Waldst. and Kit.	Jukai	Herb	Ch	Mic	Leaves, roots, and stems	Indigestion and roundworm killing
Asteraceae	S. Mushtaq Bot. 2	*Erigeron bonariensis* L.	Unknown	Herb	Th	N	Whole plant	Tooth pain and headache
Asteraceae	S. Mushtaq Bot. 3	*Erigeron canadensis* L.	Sessa	Herb	Th	Mac	Leaf and whole plant	Fever and backache
Asteraceae	S. Mushtaq Bot. 4	*Calendula arvensis* (Vaill.) L.	Mekhaky gul	Herb	Th	Mic	Leaves and flowers	Antispasmodic, emmenagogue, and ornamental
Asteraceae	S. Mushtaq Bot. 5	*Cichorium intybus* L.	Hun	Herb	Th	Mic	Whole plant	Skin disease and ornamental
Asteraceae	S. Mushtaq Bot. 6	*Eclipta alba* (L.) L.	Bhotey	Herb	G	N	Leaves, seeds, and whole plant	Skin disorders
Asteraceae	S. Mushtaq Bot. 7	*Parthenium hysterophorus* L.	Kharboty	Herb	Th	Mes	Whole plant	Skin disease, rheumatic pain, and urinary tract infections
Asteraceae	S. Mushtaq Bot. 8	*Xanthium strumarium* L.	Gurashkay	Herb	Th	Mac	Whole plant	Sedative and diuretic
Asteraceae	S. Mushtaq Bot. 9	*Silybum marianum* (L.) Gaertn.	Orejakai	Herb	Th	Mes	Whole plant	Appetizers, obesity, and diuretics
Amaranthaceae	S. Mushtaq Bot. 10	*Achyranthes aspera* L.	Sur guly	Herb	Th	Mes	Roots	Rheumatism, skin diseases, stomachic,and rabies
Amaranthaceae	S. Mushtaq Bot. 11	*Amaranthus viridis* L.	Chalwai	Herb	Th	Mic	Leaves	Vegetable potherb
Amaranthaceae	S. Mushtaq Bot. 12	*Amaranthus blitum* L.	Unknown	Herb	Th	Meso	Leaves	Inflammation and lung disorders
Amaranthaceae	S. Mushtaq Bot. 13	*Galium aparine* L.	Ganal	Herb	Th	Meso	Leaves and fruit	Diuretics and constipation
Apocynaceae	S. Mushtaq Bot. 14	*Calotropis procera* (Aiton) W. T. Aiton	Spalmai	Shrub	Ch	Mac	Latex	Pimples, rheumatism, and scorpion stings
Brassicaceae	S. Mushtaq Bot. 15	*Lepidium didymum* L.	Mordar botay	Herb	Th	L	Whole plant	Healing of wounds, antihypertensive, headache, and diuretics
Brassicaceae	S. Mushtaq Bot. 16	*Digera muricata* (L.) Mart.	Soor guly	Herb	Th	N	Stem	Urinary disorders

Boraginaceae	S. Mushtaq Bot. 17	*Heliotropium europaeum* L.	Hathisunda	Herb	Th	L	Whole plant	Bites of snakes and mad dogs and ulcers
Cannabaceae	S. Mushtaq Bot. 18	*Cannabis sativa* L.	Bhang	Herb	Th	Mic	Leaves	Asthma, obesity, and dandruff
Caryophyllaceae	S. Mushtaq Bot. 19	*Stellaria media* (L.) Vill.	Stargai	Herb	Th	L	Whole plant	Demulcent, laxative, and expectorant
Chenopodiaceae	S. Mushtaq Bot. 20	*Chenopodium album* L.	Sarmy	Herb	Th	L	Leaves	Dysentery, Anthelmintic, and Vegetable
Convolvulaceae	S. Mushtaq Bot. 21	*Convolvulus arvensis* L.	Perwatai	Herb	Th	Mic	Whole plant	Fodder
Cucurbitaceae	S. Mushtaq Bot. 22	*Citrullus colocynthis* (L.) Schrad	Markunday	Herb	Th	Mes	Roots and fruit	Anthelmintic and Antirheumatic,
Cyperaceae	S. Mushtaq Bot. 23	*Cyperus rotundus* L.	Dila	Herb	G	L	Leaves	Malaria, diarrhea, and diabetes
Euphorbiaceae	S. Mushtaq Bot. 24	*Euphorbia serpens* Kunth.	Prawaty	Herb	Th	N	Latex	Chest congestion and Anti-asthmatic
Euphorbiaceae	S. Mushtaq Bot. 25	*Euphorbia geniculata* Orteg.	Dhudani	Herb	Th	Mic	Leaves	Skin irritation and a skin or scorpion bite
Euphorbiaceae	S. Mushtaq Bot. 26	*Ricinus communis* L.	Harind	Shrub/S mall tree	Th	Mic	Leaves, seeds, and stems	Anthelmintic, laxative, and emollient
Malvaceae	S. Mushtaq Bot. 27	*Malvastrum coromandelianum* (L.) Gareke.	Kharenti	Shrub	Th	Mic	Leaves	Analgesic and antibacterial
Moraceae	S. Mushtaq Bot. 28	*Broussonetia papyrifera* (L.) Vent.	Tout	Tree	Mp	Mes	Leaves and wood	Fuel
Oxalidaceae	S. Mushtaq Bot. 29	*Oxalis corniculata* L.	Zyre beta	Herb	G	Mic	Whole plant	Diuretics, Joint pain, stomachic, and depurative
Poaceae	S. Mushtaq Bot. 30	*Avena fatua* L.	Zangaly jodar	Herb	Th	Mic	Whole plant	Laxative
Poaceae	S. Mushtaq Bot. 31	*Bothriochloa pertusa* (L.) A. Camus	Gayya	Herb	H	N	Whole plant	Fodder
Poaceae	S. Mushtaq Bot. 32	*Cenchrus ciliaris* L.	Unknown	Herb	H	L	Whole plant	Fodder
Poaceae	S. Mushtaq Bot. 33	*Cynodon dactylon* (L.) Pers.	Kabal	Herb	H	L	Whole plant	Fodder
Poaceae	S. Mushtaq Bot. 34	*Dactyloctenium aegyptium* (L.) Willd.	Madhana	Herb	Th	N	Leaves and whole plant	Fodder, Fever and ulcers

Poaceae	S. Mushtaq Bot. 35	*Dichanthium annulatum* (Forssk.) Stapf	Kabal gayya	Herb	H	L	Whole plant	Fodder, hay, and silage
Poaceae	S. Mushtaq Bot. 36	*Echinochloa colona* (L.) Link.	Zangaly gayya	Herb	Th	N	Whole plant	Fodder
Poaceae	S. Mushtaq Bot. 37	*Eragrostis minor* Host.	Unknown	Herb	Th	N	Whole plant	Livestock fodder
Poaceae	S. Mushtaq Bot. 38	*Hordeum murinum* L.	Shanilay	Herb	Th	N	Shoots	Fodder
Poaceae	S. Mushtaq Bot. 39	*Polypogon monspeliensis* (L.) Desf.	Gayya	Herb	Ch	Mic	Whole plant	Fodder
Poaceae	S. Mushtaq Bot. 40	*Setaria surgens* Stapf.	Ghat Wakha	Herb	Th	L	Shoots	Fodder
Poaceae	S. Mushtaq Bot. 41	*Sorghum halepense* (L.) Pers.	Dadum	Herb	H	L	Shoots	Diuretic
Papilionaceae	S. Mushtaq Bot. 42	*Sesbania sesban* Britton	Harhar	Shrub/S mall tree	H	N	Fruit and shoot	Sore throat and fuel
Polygonaceae	S. Mushtaq Bot. 43	*Persicaria maculosa* Gray	Dut jala	Herb	Th	N	Flowers and leaves	Dyspepsia, diarrhea, and hemorrhoids,
Polygonaceae	S. Mushtaq Bot. 44	*Polygonum plebeium* R. Br.	Kheer wal	Herb	Th	Mes	Whole plant	Liver disorders, dysentery, and diarrhea
	S. Mushtaq Bot. 45	*Rumex dentatus* L.	Chalkhay	Herb	Th	Mic	Leaves	Vegetable
Portulacaceae	S. Mushtaq Bot. 46	*Portulaca oleracea* L.	Warkhary saag	Herb	Th	L	Whole plant	Vegetable
Rhamnaceae	S. Mushtaq Bot. 47	*Ziziphus xylopyrus* (Retz.) Willd.	Sowaabera	Shrub	Np	Mac	Fruit	Food, diabetes, liver disorders, and bronchitis
Solanaceae	S. Mushtaq Bot. 48	*Physalis minima* L.	Mangoty boti	Shrub	H	Mic	Whole plant	Antipyretic and diuretic
Verbenaceae	S. Mushtaq Bot. 49	*Verbena officinalis* L.	Unknown	Herb	Th	Mic	Leaves and roots	Antipyretic, headache, and dysentery
Zygophyllaceae	S. Mushtaq Bot. 50	*Tribulus terrestris* L.	Ghana	Herb	H	L	Fruit and whole plant	Aphrodisiac and kidney stone

Leaf size; Mic (Microphyll); Mes (Mesophyll); Mac (Macrophyll); N (Nanophyll); L (Leptophyll). Life form; Th (Therophytes); Mp (Microphanerophytes); H (Hemicryptophytes); Ch (Chamaephytes); Np (Nanophanerophytes); G (Geophytes).

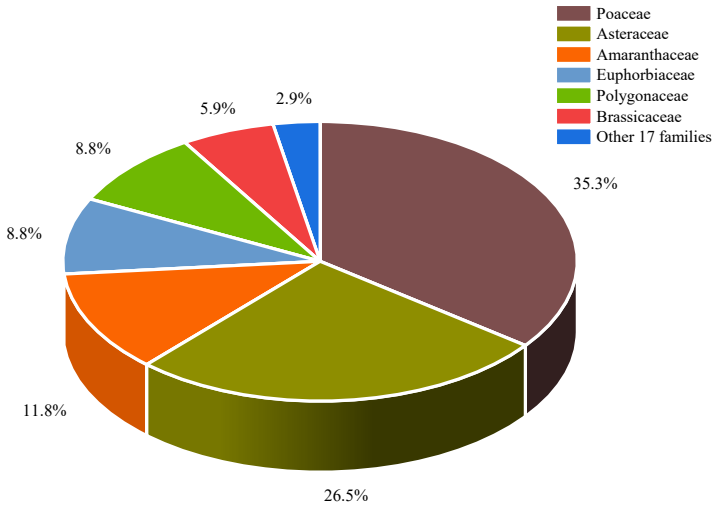

Figure 2. Family-wise distribution of weed flora of Yaqubi field, District Swabi

Table 2. Family-wise distribution of weed flora of Yaqubi field, Tehsil Razar, District Swabi.

FAMILY	NO. OF SPECIES	PERCENTAGE (%)
Poaceae	12	24
Asteraceae	9	18
Amaranthaceae	4	8
Euphorbiaceae	3	6
Polygonaceae	3	6
Brassicaceae	2	4
Other 17 families	1 (each)	2
Total	**50**	**100**

Table 3. Life form of classes of weed flora of Yaqubi field, Tehsil Razar, District Swabi

LIFE FORM	NO. OF SPECIES	PERCENTAGE (%)
Therophytes	33	66
Hemicryptophytes	9	18
Chamaephytes	3	6
Geophytes	3	6
Nanophanerophytes	1	2
Microphanerophytes	1	2
TOTAL	**50**	**100**

Table 4. Leaf size spectra of weed flora of Yaqubi field, Tehsil Razar, District Swabi

LEAF SIZE	NO. OF SPECIES	PERCENTAGE (%)
Microphyll	15	30
Leptophyll	12	24
Nanophyll	12	24
Mesophyll	7	14
Macrophyll	4	8
Total	**50**	**100**

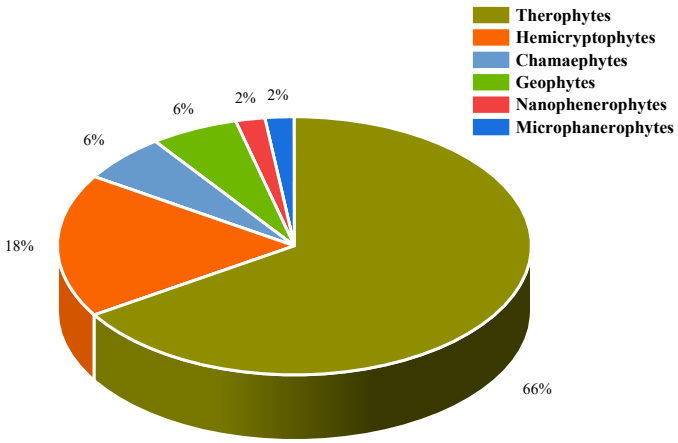

Figure 3. Life form classes of weed flora of Yaqubi field, District Swabi

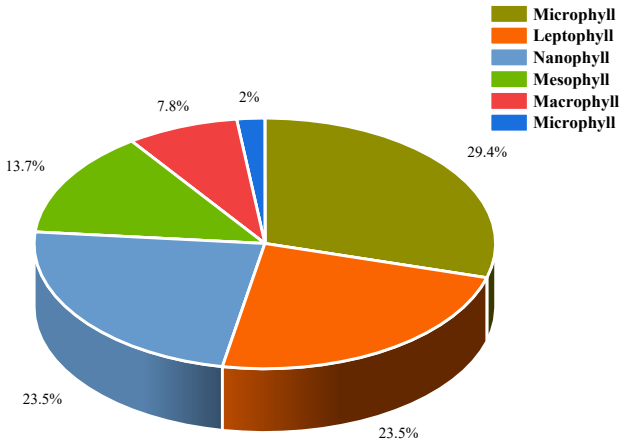

Figure 4. Leaf size spectra of weed flora of Yaqubi field, District Swabi

Palatability

In the present evaluation, out of 50 plant species, about 16 (32 %) plant species were highly palatable, 13 (26 %) were moderately palatable, 13 (26 %) were low palatable, and 5 (10 %) were rare palatable, while 3 (6 %) plant species were non-palatable owing to a variety of extent of palatability in the study zone (Table 5; Figure 5). The ratio of palatable plants was greater (94 %) than non-palatable (6 %) plants in the study zone. It was observed that among palatable species, leaves of 8 species, whole plants of 22 species, and roots of 26 species were grazed by livestock. According to results out of the total palatable browse species, 33 species (66 %) were grazed by cattle, Goats were observed to prefer 42 species (84 %), Sheep grazed 39 species (78 %), and 24 (48 %) species were grazed by donkeys.

Previous researchers such as Amjad *et al.* (2013) assessed the palatability and animal preference of 110 plant species of Nikyal rangeland and revealed that 8 tree species (7.27 %), 21 shrub species (19.09 %), and 81 herbaceous species (73.63 %) were grazed among four species of animals in different seasons. Over all 60 species (55 %) were palatable and 50 species (45 %) were non-palatable. Abdullah *et al.* (2017) investigated forage productivity, carrying capacity, and palatability of browses. 25 browse species belonging to 12 families were identified. Haq and Badshah (2023) recorded the forage plants of Pashat Valley, District Bajaur, and revealed that 98 (25.45 %) spp. were non-palatable, 78 (20.25 %) spp. were highly palatable, 95 (24.67 %) spp. were moderately palatable, 60 (15.58 %) spp. were less palatable, and 54 (14.02 %) spp. were rarely palatable. All these investigations of the former researchers/evaluators support the current investigation of our study on weed flora in tobacco crops.

Table 5. Palatability, availability, and parts used of weeds of Tobacco crops, Yaqubi field, Tehsil Razar, District Swabi.

Voucher No.	Specie name	Palatability classes					Part used			Availability		Livestock			
		Np	Hp	Mp	Lp	Rp	W	L	R	C	R	G	S	D	C
S. Mushtaq Bot. 1	*Artemisia scoparia* Waldst. and Kit.	-	-	+	-	-	+	-	-	+	-	+	-	-	-
S. Mushtaq Bot. 2	*Erigeron bonariensis* L.	-	-	+	-	-	-	+	-	+	-	+	+	-	+
S. Mushtaq Bot. 3	*Erigeron canadensis* L.	-	-	+	-	-	-	+	-	+	-	+	+	-	+
S. Mushtaq Bot. 4	*Calendula arvensis* (Vaill.) L.	-	-	-	+	-	+	-	-	-	+	-	-	+	-
S. Mushtaq Bot. 5	*Cichorium intybus* L.	-	+	-	-	-	+	-	-	+	-	+	+	+	+
S. Mushtaq Bot. 6	*Eclipta alba* (L.) L.	-	-	-	-	+	-	+	-	-	+	+	+	+	+
S. Mushtaq Bot. 7	*Parthenium hysterophorus* L.	-	-	-	+	-	-	-	-	-	-	+	+	-	-
S. Mushtaq Bot. 8	*Xanthium strumarium* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-
S. Mushtaq Bot. 9	*Silybum marianum* (L.) Gaertn.	-	-	-	+	-	-	-	+	-	-	+	+	-	+
S. Mushtaq Bot. 10	*Achyranthes aspera* L.	-	-	-	+	-	+	-	-	+	-	+	+	-	+
S. Mushtaq Bot. 11	*Amaranthus viridis* L.	-	+	-	-	-	+	-	-	+	-	+	+	+	+
S. Mushtaq Bot. 12	*Amaranthus blitum* L.	-	-	+	-	-	-	-	+	-	+	-	-	-	+
S. Mushtaq Bot. 13	*Galium aparine* L.	-	-	+	-	-	-	-	+	+	-	-	+	+	+
S. Mushtaq Bot. 14	*Calotropis procera* (Aiton) W. T. Aiton	-	-	-	+	-	-	+	-	-	+	+	-	-	-
S. Mushtaq Bot. 15	*Lepidium didymum* L.	-	-	+	-	-	+	-	-	+	-	+	+	-	+
S. Mushtaq Bot. 16	*Digera muricata* (L.) Mart.	-	-	-	-	+	+	-	-	+	-	+	+	-	-
S. Mushtaq Bot. 17	*Heliotropium europaeum* L.	-	-	-	+	-	+	-	-	-	+	+	+	-	-
S. Mushtaq Bot. 18	*Cannabis sativa* L.	-	-	-	+	-	-	-	+	-	+	+	-	-	-
S. Mushtaq Bot. 19	*Stellaria media* (L.) Vill.	-	+	-	-	-	+	-	-	+	-	+	+	+	+
S. Mushtaq Bot. 20	*Chenopodium album* L.	-	-	-	-	+	+	-	-	+	-	+	+	+	+
S. Mushtaq Bot. 21	*Convolvulus arvensis* L.	-	+	-	-	-	+	-	-	+	-	+	+	+	+
S. Mushtaq Bot. 22	*Citrullus colocynthis* (L.) Schrad	+	-	-	-	-	-	-	-	-	-	-	-	-	-
S. Mushtaq Bot. 23	*Cyperus rotundus* L.	-	+	-	-	-	-	-	+	+	-	+	+	+	+
S. Mushtaq Bot. 24	*Euphorbia serpens* Kunth.	-	-	-	+	-	-	+	-	-	+	+	+	-	-
S. Mushtaq Bot. 25	*Euphorbia geniculata* Orteg.	-	+	-	-	-	-	-	+	+	-	+	+	+	+
S. Mushtaq Bot. 26	*Ricinus communis* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-
S. Mushtaq Bot. 27	*Malvastrum coromandelianum* (L.) Gareke.	-	-	+	-	-	-	+	-	+	-	+	+	+	+
S. Mushtaq Bot. 28	*Broussonetia papyrifera* (L.) Vent.	-	-	-	-	+	-	+	-	-	+	+	+	-	-
S. Mushtaq Bot. 29	*Oxalis corniculata* L.	-	-	-	-	+	-	+	-	+	-	+	+	-	-
S. Mushtaq Bot. 30	*Avena fatua* L.	-	+	-	-	-	-	+	-	+	-	+	+	+	+

S. Mushtaq Bot. 31	*Bothriochloa pertusa* (L.) A. Camus	-	+	-	-	-	-	+	-	+	-	+	+	+	+
S. Mushtaq Bot. 32	*Cenchrus ciliaris* L.	-	+	-	-	-	-	-	+	+	-	+	+	+	+
S. Mushtaq Bot. 33	*Cynodon dactylon* (L.) Pers.	-	+	-	-	-	+	-	-	+	-	+	+	+	+
S. Mushtaq Bot. 34	*Dactyloctenium aegyptium* (L.) Willd.	-	+	-	-	-	-	+	-	+	-	+	+	+	+
S. Mushtaq Bot. 35	*Dichanthium annulatum* (Forssk.) Stapf	-	-	-	+	-	-	+	-	+	-	+	+	+	+
S. Mushtaq Bot. 36	*Echinochloa colona* (L.) Link.	-	-	+	-	-	-	+	-	+	-	+	+	+	+
S. Mushtaq Bot. 37	*Eragrostis minor* Host.	-	-	+	-	-	-	-	+	+	-	+	+	+	+
S. Mushtaq Bot. 38	*Hordeum murinum* L.	-	-	+	-	-	+	-	-	-	-	-	-	-	-
S. Mushtaq Bot. 39	*Polypogon monspeliensis* (L.) Desf.	-	-	+	-	-	+	-	-	+	-	+	+	-	+
S. Mushtaq Bot. 40	*Setaria surgens* Stapf.	-	+	-	-	-	-	+	-	-	+	+	+	+	+
S. Mushtaq Bot. 41	*Sorghum halepense* (L.) Pers.	-	-	-	+	-	-	+	-	-	+	+	-	-	+
S. Mushtaq Bot. 42	*Sesbania sesban* Britton	-	+	-	-	-	+	-	-	-	+	+	+	-	-
S. Mushtaq Bot. 43	*Persicaria maculosa* Gray	-	-	-	+	-	-	+	-	+	-	+	+	-	-
S. Mushtaq Bot. 44	*Polygonum plebeium* R. Br.	-	+	-	-	-	-	-	-	+	-	+	+	+	+
S. Mushtaq Bot. 45	*Rumex dentatus* L.	-	-	-	+	-	-	+	-	+	-	+	+	+	+
S. Mushtaq Bot. 46	*Portulaca oleracea* L.	-	-	+	-	-	-	+	-	-	-	-	-	-	+
S. Mushtaq Bot. 47	*Ziziphus xylopyrus* (Retz.) Willd.	-	+	-	-	-	+	-	-	+	-	+	+	+	+
S. Mushtaq Bot. 48	*Physalis minima* L.	-	+	-	-	-	+	-	-	+	-	+	+	-	-
S. Mushtaq Bot. 49	*Verbena officinalis* L.	-	-	-	+	-	+	-	-	+	-	+	+	-	+
S. Mushtaq Bot. 50	*Tribulus terrestris* L.	-	-	+	-	-	+	-	-	+	-	+	+	+	+

Key:

Palatability classes: Hp (Highly palatable); Mp (Moderately palatable); Lp (Less palatable); Rp (Rarely palatable); Np (Nonpalatable)

Parts used: W (Whole plant); L (Leaves); R (Roots). Availability: C (Common); R (Rare). Livestock: G (Goat); S (Sheep); D (Donkey); C (Cow)

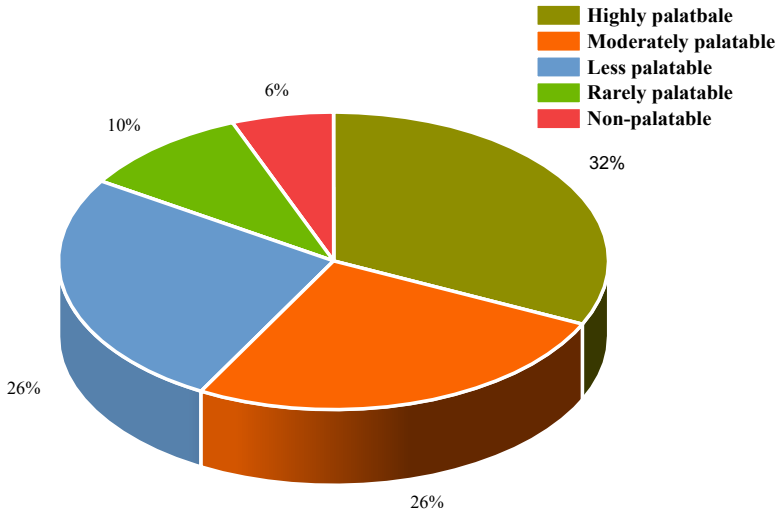

Figure 5. Percentage of palatability classes of weed flora of Yaqubi field, District Swabi

Conclusion

Based on our results, it is concluded that many of the weed species hold notable ethnobotanical value. Local communities rely on these plants not only for treating common ailments but also as a source of fodder for their livestock. The recorded diversity reflects a rich and varied weed flora in the area, with Poaceae and Asteraceae being the most prominent families. Importantly, the majority of these plants (94 %) were found to be palatable, underlining their potential role in supporting local grazing systems. This highlights the ecological, medicinal, and economic significance of weed species in rural livelihoods and emphasizes the need to recognize and preserve this traditional plant knowledge.

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Declarations

Ethics approval and consent to participate: The study was conducted in accordance with ethical research standards. Prior informed consent was obtained verbally from all contributors beforehand data collection, and they were guaranteed the voluntary nature of their participation, as well as the confidentiality of their responses, and the information was used solely for academic and research purposes.

Consent for publication: All participants provided oral prior informed consent.

Availability of data and materials: The dataset analyzed during this study is available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

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