

Ethnobotanical Study of Wild Edible Plant Species in South Kashmir

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(MSF-2020-126)



Division of Forest Products and Utilization

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Technology of Kashmir**

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Ethnobotanical Study of Wild Edible Plant Species in South Kashmir

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Thesis

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PAPA

**You're thought so often
In loving memory,
For you were all the special things
A Father ought to be.**

**We have all missed you being here
Since you went away,
But the happiness you brought us
is remembered every day.**

**So you may find a gentle peace
in your eternal rest.**

**We'll always love you, Papa
You really were the best.**

DEDICATE MY THESIS

**"May Allah grant you highest place in
Jannah"**

"MY BELOVED FATHER"

Sher-e-Kashmir
University of Agricultural Sciences and Technology of Kashmir
Division of Forest Products and Utilization,
Faculty of Forestry, Benhama, Ganderbal

Certificate – I

This is to certify that the thesis entitled, “**Ethnobotanical Study of Wild Edible Plant Species in South Kashmir**” submitted in partial fulfilment of the requirements for the award of the degree of **Master of Science in Forestry (Forest Products and Utilization)**, to the **Faculty of Forestry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir** is a record of bonafide research work carried out by **Ms. Mehvish Mushtaq (Regd. No. MSF-2020-126)** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

It is further certified that information received during the course of investigation has duly been acknowledged.

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We, the members of the Advisory Committee of **Ms. Mehvish Mushtaq (Regd. No. MSF-2020-126)** a candidate for the degree of **Master of Science in Forestry (Forest Products and Utilization)** have gone through the manuscript of the thesis entitled, **“Ethnobotanical Study of Wild Edible Plant Species in South Kashmir”** and recommend that it may be submitted by the student in partial fulfilment of the requirements for the award of the degree.

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Certificate – III

This is to certify that the thesis entitled, “**Ethnobotanical Study of Wild Edible Plant Species in South Kashmir**” submitted by **Ms. Mehvish Mushtaq (Regd. No. MSF-2020-126)** to the **Faculty of Forestry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir** in partial fulfilment of the requirements for the award of the degree of **Master of Science in Forestry (Forest Products and Utilization)** was examined and approved by the Advisory Committee and External Examiner on

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ABSTRACT

The ethnobotanical study of wild edible plant species (WEPS) was conducted during 2021-2022 within four districts of Southern Kashmir, Anantnag, Pulwama, Kulgam and Shopian. The study area's geographic coordinates are 33.5° and 75.1°, 33.8° and 75°, 33.6° and 75°, 33.7° and 74.9° respectively. The region is located in India's north-western agro-climatic zone and is on average 1650 meters (5410 feet) above mean sea level. The aim of this study was to identify plant species that provide wild edible products and to identify plant part used. In addition the biotic pressure on mostly consumed wild edible plant species (WEPS) was also examined.

Information was gathered from 560 informants from 64 villages in different localities. 96 species, belonging to 44 families and 77 genera were reported from the study. The study revealed that maximum of 14 species belong to family Rosaceae followed by Asteraceae with 8 species, Lamiaceae 7 species, Polygonaceae 6 species, Apiaceae and Amaranthaceae both with 5 species. These are well distributed in different life forms 58 herbs (60%), 19 trees (20%), 15 shrubs (16%) and 4(4%) fungus. The data revealed that the maximum of 44 species which constitute 39.8% of the total, were found to be used as leafy greens.

The fruits constitute 30.5 % with 33 species followed by roots (13 species), seeds (8 species), the entire plant (7 species), flowers (6 species) and stem (4 species) which made 12%, 7.4%, 6.4%, 5.5% and 3.7% respectively.

The results of CI value demonstrate that most plant species with high CI values were consumed as food. The CI of the species that were identified from various locations showed significant variances. *Rumex acetosa* came in first with a mCI of 0.95 while *Juglans regia* came in second with a mCI of 0.94. According to the cultural importance of families Malvaceae with 2 species was the most important family with mCIF (0.795).

Our findings demonstrate that wild food plants are in grave danger. This is mainly due to over harvesting, excessive grazing, uncontrolled fires, climate change, the collection of fuel wood, the development of agricultural land and insecticides. Each element contributed differently depending upon the location. The data revealed that over harvesting and climate change ranked 1st and second, over grazing and agricultural expansion ranked third and fourth, uncontrolled fire and fuel wood collection both ranked fifth and insecticides ranked sixth.

Keywords: Cultural index, Ethnobotany, Jammu and Kashmir, Wild edibles, Wild food plants.

Signature of Student

Dated _____

Signature of Major Advisor

Dated _____

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Place: Benhama, Ganderbal

Dated: _____

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Chapter 1

INTRODUCTION

Ethnobotanical study is the study to understand how native plants are used by people of a specific culture and region as well as how they are categorized and named (Abdurrahman *et al.*, 2006). An ethnobotanist's primary objective is to examine how and why people utilize and perceive plants in their environments. For many years, ethnobotany has been crucial in the development of new medicines. Today, it is even more crucial in defining strategies and actions for preservation or recovery of remaining forests. Nowadays, more people are interested in ethnobotany than ever before in the history of the field. Traditional knowledge which is passed down from one generation to the next through folklore and cultural learning is the in-gained wisdoms and beliefs that involve relationship between living things and their surroundings. Many indigenous communities value their traditional knowledge because it helps them to adjust to the disruptions and changes brought on by urbanization and global processes (Berkes, 2007). Traditional knowledge has been proven to be influenced by socio-demographic aspects like gender, age, ethnicity, degree of education and the usefulness of species (Ayantunde *et al.*, 2008).

In addition to other commodities and services, the forests are storehouse of natural resources that offer a wide range of wholesome and delectable foods in the form of fresh ingredients. Through experience and insight man has learned over the centuries how to use wild natural items to meet daily food demands and this process is ongoing. He became increasingly aware of the importance of preserving and protecting the natural riches found in forest. Since ancient times, wild food plant species have been essential. Wild edible plant species are any plants containing one or more parts that, when harvested at the right time of growth and processed appropriately can be eaten as food. Wild plants that are edible range from weeds that flourish in urban areas to native species that grow in remote areas (Kallas, 1996). These are accessible from a variety of habitats like roadsides,

waste-lands and forests. Utilizing wild food plants is a long standing practice that predates agriculture, these plants give tribal societies advantages and possibilities, enabling them to survive when food is scarce which is also known as adaptation based on the ecology (ebA). They are very important from a sociocultural perspective for dependent groups. Additionally, wild plant species that are edible improve the nutritional value of rural diets by providing micronutrients (minerals and vitamins) that are occasionally higher than those found in domesticated varieties due to their typically higher content of polyunsaturated fatty acids and vitamins E and C (Simpolous, 2004). Genes that can be exploited to increase cultivar yields can also be found in some wild edible plant species. They also aid in the abolition of poverty, which helps to achieve sustainable development.

Around 80,000 different edible plant species are thought to exist on earth, according to “Gaia Atlas of Planet Management”. Less than 150 plant species have historically been grown as food crops on a considerable basis. However, as huge industrial monocultures-cultivated with harmful pesticides for far off metropolitan markets have proliferated only 20 plant species currently cover 90 % of the requirements for the whole human diet. Therefore, out of the bounty that god has given to humanity; just a few species are being exploited. It is concerning that our GDP- driven economic civilization pays little attention to the wide variety of organic, nutrient dense foods that our natural forests provide for free in one of the most effective ways to harvest solar energy, store carbon, conserve and regenerate our soils and their fertility, foster biodiversity and recharge groundwater in addition to providing a vast array of useful goods and services. The human civilization has gradually come to understand the need to protect natural ecosystems and expand its food supply by utilizing edible forest products.

Due to the presence of many climatic zones and biological diversity, which provides a foundation for rich phytodiversity, India has one of the oldest, richest and most complex cultural traditions associated to the use of wild edible plant species (WEPS). In India there are over 53 million tribal people who live in 550

communities and make up 227 different ethnic groups. About 60% of rural communities directly rely on forest resources for their daily needs. Wild edible plants are one of the most significant types of forest resources. They are naturally resilient to rapid climate change, which is sometimes lacking in exotic species and can withstand water stress better than domesticated types. About 1,000 plant species fall into wild edible category which includes different types such as tubers, vegetables, fruits, roots, leaves etc (Vinayak *et al.*, 2019).

The Jammu and Kashmir UT has a rich natural history of forest abundance with culinary, medicinal and aromatic properties. The rural residents of the Himalayan state of Jammu and Kashmir rely primarily on wild plants for food due to their availability, religious preferences and the lack of fundamental services because many of the region's villages are cut off from the major towns during the winter. However, due to ignorance and the lack of initiatives the majority of the species of wild plants here that produce such valuable goods are lost, making any attempt to save such unheard of flora a faraway dream. Communities living in forests have relied on wild plants for food and medicines for a long time and some of these plants have long played a significant role in folklore. It is due to the fact that ethno-directed research is particularly beneficial in the production of novel foods and medicines. It is crucial to gather information about common applications of wild edible plant species before this knowledge is lost.

The improvement of the natural food resources that have been utilized is significantly aided by the documentation of wild edible plant species. The introduction of wild edible plant species for cultivation is necessary because they can provide food for the world's expanding population. This necessitates identifying and safeguarding regional indigenous knowledge systems that guide the gathering and utilization of wild food plants (Vinayak *et al.*, 2019). The documentation of wild food plant species used by indigenous peoples can help with planning, conservation and future research, particularly in domestication, reproduction and nutritional profile analysis to determine nutritional composition.

Keeping in view the necessity and importance of wild edible plant species in sustaining local life and to recognize and highlight the forest resources being used by the communities living in the forest and other ethnic groups, study “Ethnobotanical study of Wild Edible Plant Species in South Kashmir” was conducted in Southern districts of Jammu and Kashmir with the following objectives:

1. To identify plant species that provides wild edible products and to identify the plant part used.
2. To study the biotic pressure on mostly consumed wild edible plant species (WEPs).

Chapter 2

REVIEW OF LITERATURE

For the cohesiveness in representation, the pertinent information related to present investigation entitled, “Ethnobotanical study of Wild Edible Plant Species in South Kashmir” has been reviewed under following headings:

2.1 Study on wild edible plant species and plant part used

Wild edible plants are significant non-timber forest products (NTFPs) for tribal and rural communities as well as significant forest resources that help to supply the global demand for food. The tribal communities have inherited traditional knowledge of eating wild edible plants and plant parts since they live in close proximity to nature. Even though these untamed edible plants are crucial for maintaining food security, nobody pays them any attention. India’s numerous tribal communities are the source of extensive expertise on the diverse applications of plant genetic resources. Up to 50 million households are thought to supplement their diets with fruits picked from nearby bushes and woodlands. Wild edible plants are low input and low cost solution for meeting the growing demand of nourishment (Jama *et al.*, 2008). They can withstand conditions of water stress better than their domesticated relatives (Humphry *et al.*, 1993 Addis *et al.*, 2005).

In an effort to better understand the traditional knowledge of wild edible plants used by residents of Lawat, District Neelum, Azad Jammu and Kashmir, Pakistan, Ijaz *et al.* (2022) made an investigation. Thirty families of wild food plants totaling sixty one (61) species in number were gathered and identified. All reported species edible component were consumed as fruits, cooked as vegetables, added to herbal tea or just consumed raw. There were thirty-two (32) species utilized as vegetable, thirteen (13) species as fruits, ten (10) species in herbal tea and six (6) species as sauces. Trees and shrubs each supplied 11%, while fern gave 4.91%, with 72% of the total going to herbs. Most species juvenile components including aerial parts and leaves are utilized as vegetables. Rosaceae

(9 species) made up the majority of the wild edible plants that were identified, followed by Polygonaceae (8 species), Lamiaceae (5 species), Brassicaceae and Amaryllidaceae (4 species each).

A study on Patterns of traditional and contemporary usage of wild edible native plants of Chile: Challenges and Future perspective was conducted by Lobos *et al.* (2022). 330 native species or 7.8% of Chile's total flora were identified as food plants. These species are members of 84 families and 196 genera. Asteraceae (34), Cactaceae (21), Fabaceae (21), Solanaceae (20) and Apiaceae (19) are the families with the most diversity. The most common type of life (40%) is perennial herbs, followed by shrubs (35%), trees (14%) and annual and biennial herbs (11%). The most consumed plant parts are fruits (35.8%), roots (21.5%) and leaves (20%). There were found to be nine different categories of food preparation. The grouping of raw foods was the largest (43%), followed by beverages (27%), savory preparation (27%) and sweet (13%). Few native Chilean WEPs have reported modern food uses and the majorities of them sell their food products in regional and niche markets. Nearly all of them have reported traditional food uses.

A study on edible ferns in India and their therapeutic properties was led by Giri and Uniyal (2022). The study listed fifty pteridophyte species that are edible. They are utilized in bhajii, stewed vegetable soup, bhajii sauce and herbal tea/chai. To make sauce, different combinations of dry fermented fish, such as *Puntius sophore* (Hamilton) are combined with boiling or raw vegetables. Vegetable salad is a required dish for all village festivals and is made by combining a variety of vegetables, roasted fermented dried fish, red pepper and spice.

A study on the use of wild edible plants for human nutrition during Syrian crisis was done by Sulaiman *et al.* (2022). Seventy five (75) wild plant species that are used to make food and drink were identified. Nearly two-thirds (64%) of the interview claimed that throughout the conflict, their reliance on foraging for

wild plants increased. Among the most often mentioned species by informants *Origanum syriacum*, *Rhus coriaria*, *Eryngium creticum* and *Cichorium intybus*. The most well-liked dishes made from wild plants were Sleeq (steamed leafy vegetable), Zaatar (breakfast/dinner fare) and Louf (soup).

In the Kupwara district of Jammu and Kashmir, India, Abdulla and Andrabi (2021) did a study on the wild edible plants and fungi used by the inhabitants. The research identified 70 different types of wild edible plant species that are primarily consumed by them in different various ways. Due to overuse, the diversity of wild edible plants and fungi is currently declining. Therefore appropriate awareness should be raised among the general public in order to conserve and sustainably use such fundamental natural resources. From the study region, a total of 70 such plant species from 38 families have been identified. Rosaceae had the most species (8) among 38 families followed by Polygonaceae (7), Asteraceae (6), Amarathaceae (4), Brassicaceae (4), plantaginaceae (3), Caryophyllaceae (3) and families like Moraceae, Malvaceae and Berberidaceae have (2). Perennial herbs made up 37.14% of the wild edible plant species and fungi, biennial herb made 2.86%, annual herbs 27%, fungi made up 10%, ferns 2.86%, shrubs 8.57%, trees made 7.14% and aquatic herbs made 1.42%. Similar to this, Majeed *et al.* (2021) conducted research on the gathering of wild food plants by various religious groups in Punjab, Pakistan's Jhelum District. The local populace consumed a total of 77 wild food plants and one species of fungus, primarily as cooked vegetables and raw snacks. Shias and Sunnis, two Muslim groups displayed a high degree of use uniformity in the cross religious comparison six groups, while the other four religious groups displayed less broad but varied used that stayed within the range of taxa utilized by Islamic groups.

According to Motti's inquiry of the wild plants used as herbs and spices in Italy (2021), 78 wild taxa are used there as herbs or spices, enhancing the local cuisine and serving as a valuable resource for successful, integrated small-scale local business.

In the Hindu Kush Mountain range 63 wild food plants species belonging to 34 botanical families were observed by Abdulla *et al.* (2021). Of which 27 were used as vegetables, 24 as fruits, six as fresh food species. Fruits were the most utilized part (41%) followed by leaves (24%), aerial parts (24%), seeds (7%), stems (3%) and early inflorescences (1%). The findings show that wild food plants make a substantial contribution to regional food systems and help to meet human nutritional demands, which are typically not satisfied by conventional agricultural methods. In addition to its nutritional importance, the tribal inhabitants of the Kush Himalayas employ wild edible plants for cultural rituals that are an integral part of their way of life.

In an effort to explore how many wild edible plants we consume, their diversity, uses and implications for India's sustainable food system, Ray *et al.* (2020) discovered a wide range of species. India consumed 1403 species from 184 groups, while the first forty-four families (24%) made up the majority of the diversity (75%) with their contributions. The families with greatest number of species were Leguminosae, followed by Compositae, Poaceae, Malvaceae and Rosaceae. The two most consumed portions were fruits (652 spp.) and leafy shoots (722 spp.). The findings support the idea that wild edible plants have long been a staple of the diet that there is untapped potential for them to ensure easy availability and access to micronutrients for a sustainable food system and consequently social welfare.

Motti *et al.* (2020) study on the contribution of wild edible plants to the Mediterranean diet reveal that 85 species and sub species, spread throughout 29 groups are known to be used as food. Brassicaceae and Lamiaceae (both 7.2%) were the most often cited families after Asteraceae (26.5%). The current study supports the continued usage of indigenous plants in Campania.

In west Sumatra, Indonesia, Pawera *et al.* (2020) conducted a study on trends in the use of wild food plants from knowledge and perception to drivers of change. They documented 106 wild food plants and they found that Minangkabau

were the guardians of more extensive traditional knowledge than Mandailing. Although both populations had favorable perceptions of wild food plants, intake has decreased over the past generation. The main factors cited by respondents were a lack of time, decline in availability and a lack of understanding of their nutritional benefits.

In an effort to examine traditional knowledge of wild edible plants in Hasankeyf (Batman province, Turkey), Yesil and Inal (2019) collected data on 86 different species of wild edible plants from 32 different families. These were reportedly utilized as green veggies (45 taxa), ripe fruits and seeds (25 taxa), seasoning and preservatives (16 taxa), beverages (9 taxa) and kid's snacks, according to those who participated in the interviews (7 taxa). To ascertain the cultural relevance of these wild edible plants and the informant's awareness of them, the data was further examined based on the cultural importance index. *Mentha longifolia*, *Polygonum cognatum*, *Rosa canina*, *Chenopodium album*, *Urtica dioica*, *Amaranthus retroflexus* and *Malva neglecta* were among the species with the greatest cultural significance.

Using semi-structured interviews and group discussions with 52 informants, Fayaz *et al.* (2019) conducted an ethnobotanical study in the Daksum forest of the Anantnag district of Jammu and Kashmir state of India to chronicle the traditional knowledge of its community. With a focus on Asteraceae and Rosaceae, 108 plant species were identified along with their specific functions. Of the species, about 51 were employed as medical treatments for various illnesses, 65 were used as fruits and vegetables and 21 were utilized in religious ceremonies.

In an effort to better understand how the Vasavas of Gujrat, India, consume wild edibles, Chauhan *et al.* (2018) conducted a study. From 46 botanical families, 90 species of wild foods were identified together with their Vasavasi names, plant part used, habitats and cooking techniques. 60 of these were also utilized medicinally while 15 had monetary worth. This study has shown how the

Vasavas have a broad collective knowledge of wild edibles and how these species contribute to their year round nutritional diversity.

The J&K district of Udhampur's traditionally used wild edible plants was studied by Bhatia *et al.* (2018). In the current study 90 plant species from 45 families and 78 genera served as wild phyto-foods and were all edible. Vegetables (46 species) followed by fruits (37 species) and medicinal plants (36 species) had the highest species richness of wild edible plants. *Diplazium esculentum*, *Fumaria indica*, *Taraxacum campyloides*, *Urtica dioica*, *Phyllanthus emblica*, *Punica granatum*, *Cordia dichotoma*, *Syzygium cumini*, *Ficus palmata* etc. were the most important vegetable and fruit species in term of culture (based on CI). Fruits had the highest mean use-report (14.8) and veggies had the highest average use-report (626). Per informant, an average of 21 edible wild species was consumed. For raw vegetables and preserved vegetables, the informant census index (Fic) ranged from 0.83 to 0.94 respectively.

The Sheena tribe in Kashmir consumed 42 raw edible plants, according to Singh and Bedi's (2018) observations. The majority of these species are eaten raw or infrequently boiled as tubers, although some are consumed as green salads or ingredients for regional chutney (15 species, 5 species). These uncooked meals are offered for sale by locals as a form of additional money and are thought to be a good source of vitamins and minerals. In addition to their usefulness as food, some of the species under investigation have additional uses as NTFPs and medical treatments.

According to Showkat and Akhtar (2018), 33 edible wild plant species belonging to 17 families were found in the Baramulla district of Jammu and Kashmir. Asteraceae was the most used families with 4 species in the study area followed by Rosaceae, Amaranthaceae, Apiaceae and Brassicaceae each with 3 number of species.

In the Bandipora district of Kashmir Himalaya, Singh *et al.* (2016) conducted a study that examined the variety of traditional knowledge, gathered information on use and identified and studied the region's wild edible plants and fungi (India). 113 people from nine rural and mountainous locations were interviewed from 2012 to 2014 for the purpose of gathering information. Cooked vegetables, salads, spices, chutneys, herbal tea, homemade alcoholic beverages, soups, raw fruits and snacks were all categories for the data. Utilizing metrics for usage reports (UR), use values (UV) and cultural important index (CI), data was evaluated. 111 phytotaxa in all, broken down into 87 genera and 43 families, were recognized as native food sources. Overall it was reported 94.25% of angiosperms, 3.45% gymnosperms and 2.30% of cryptogams were historically used. Young leaves (19.82%), fruits (15.32%), young twig (9.01%), roots (8.11%) and tubers (6.31%) were frequently used portions. Leafy vegetables (27.93%), and raw fruits (22.52%) were the food most frequently used, followed by herbal teas (14.41%), salads (9.91%), alcoholic drinks (6.31%) and snacks (4.50%). A future search for producing new nutraceutical products may be guided by ethnobotanical knowledge, according to the high fidelity scores and informant consensus elements.

In Obalanga sub-county, Amuria district, Uganda, Ojelel and Kakudidi (2015) made an effort to investigate the wild edible plant species used by a subsistence farming population. Thirty two families and fifty one species were found in forty three genera. The respondent's knowledge of wild edible plant species was significantly influenced by their gender. Herbs made up the bulk of edible wild plant species (47.1%), while grasses made up the least (3.9%). The majority of food consumed was fruit (51.0%), with tubers and roots making up just 2.0 each. When compared to roasting (2.0%), eating uncooked foods as snacks was preferred by 43.1% of consumers. Solar drying was the principal method of preservation. Only 15.7% of the wild edible plants traded within and beyond the Obalanga community. 94.1 percent of the wild edible plant species

lack explicit bylaws for their conservation. Only three species totaling 5.9 % of the species, *Mangifera indica*, *Tamarandus indica* and *Vitllaria paradoxa* are legally protected. Through value addition and trade under the banner of organic products, the marketable plant species in Oblanga can present a chance for household income and work towards alleviating hunger and extreme poverty. Thus, it is essential to record indigenous knowledge to prevent its loss as a result of extinction of plant species caused by environmental deterioration.

A total of 58 wild edible plant species from 50 genera and 39 families were discovered by Dangwal *et al.* (2014) during their exploration of the wild edible plants used by Gujjar and Bakerwal tribes in District Rajouri, J&K. Rosaceae was the most represented family with 7 taxa, followed by Brassicaceae, Fabaceae, Moraceae and Poaceae with 3 each and remaining 33 families with less representation. The biggest percentage of the 28 edible species was found in trees (41%) followed by 26 herbs (38%) and 14 were shrubs species (21%). According to the requirements and edibility, the majority of plant species (26 spp.) are typically used as fruits, 14 species as vegetables. 1 species as flavoring agents, roots and tubers of 3 species are eaten raw, seeds from 8 species are used to make various food substitutes and 2 species are used to make specialty drinks.

The identification, documentation and ethnobotanical examination of the food value of wild edible plant species from certain locations of Kupwara (Budnamel, Keran, Karnah and Jumgand) were the subjects of an investigation by Mir (2014). A total of 31 wild edible plants were counted. The main sources of vitamins, minerals and proteins can be found in the edible portions of wild plants (flowers, leaves, flowers, rhizomes and tubers), which are also delicious and reviving. Cattle grazers and woodland cultures typically eat the natural plants that are edible. In the Irula tribes of Pillur Valley, Coimbatore district, Tamil Nadu, India, a total of 74 plant species have been recorded as wild edibles. Of these, fruit yielding plants ranked first with 42 species, followed by green leaves, tubers, young shoots and flowers with 26, 7, 4 and 2 species respectively. According to

this study, the Adivasi population in the Pillur valley still possesses and makes use of traditional knowledge about wild edible plants including information on their habitats, collecting season, sustainable harvesting practices, methods of preparation and consumption.

On the Korean island of Jeju, Song *et al.* (2013) studied local's traditional knowledge of foraged food plants. This analysis found that 164 species from 127 genera and 57 families of 124 informants were used in 471 feasible ways. In terms of the distribution of the families that were recorded, 12 species of Poaceae made up 16.7% of the overall use-report. In total, 31 different plant parts were chosen as edible resources, necessitating 68 different preparation techniques. All varieties of fermented soya bean, cut noodles and uncooked were the categories of preparatory techniques that garnered the most agreement from informants.

A total of 88 wild plant species, 25 family members and 52 genera were found to be edible plants, according to Nedelcheva's 2013 ethnobotanical research on wild edible plants in Bulgaria. Rosaceae, Amaranthaceae, Amaryllidaceae, Brassicaceae, Compositae and Polygonaceae are the most prevalent plant families. The species utilized for leaves (43) and fruits (38) which are similar in quantity are followed by young shoots (9), seeds (7), roots (4), bulbs (4) and inflorescences (2). The majority of the category is composed of plants whose underground sections are primarily harvested in the spring and utilized as vegetables. *Urtica dioica*, *Rumex acetosa*, *Rumex Patientia* and *Chenopodium album* are significant species. The Rosaceae, Adoxaceae, Ericaceae and Vitaceae plants and trees provide the majority of the fruits. Eight key food types were identified by the study, including fresh fruits and vegetables, stuffed pies, stewed and boiling greens, boiled cereals, sweets, dried fruits and snacks.

Ladio and Molares (2013) made an effort to assess Patagonian instructor's knowledge of traditional wild edible plants. A total of 96 native and foreign species were listed, comprising 39 species of plants from the immediate area, 9 species from a more remote woodland environment and cultivars 48 species. The

most frequently mentioned species are cosmopolitan plants with edible aerial portions that have contributed significantly to past and contemporary world economies.

A study on the ethnobotany of wild and semi-wild edible plants from the Konsa ethnic group in South Ethiopia was conducted by Addis *et al.* (2013). 127 plant species produced a total of 154 edible components, the majority of which were fruits (71), leaves (35) and tubers/roots (18). The most sought-after items were the fruits of *Opuntia*, *ficus-indica* and the leaves and young shoots of *Leptadenia hastate*.

In their examination of the wild edible macro-fungal species that the Khasi tribe of Meghalaya, India, consumes, Khaund and Joshi (2013) found that there was a wide variety of these species available in the local markets. On the basis of their morphology, 11 distinct species belonging to 9 genera and 8 families were recognized over the study period. The species of *Clavulina* were the most widely distributed, but the species of *Albatrellus* were scarce in the local markets.

A study on the documentation and ethnobotanical survey of wild edible plants from the Kolhapur district was conducted by Jadhav *et al.* (2012). 50 different wild edible plants were surveyed for this inquiry. The main source of vitamins, mineral and protein can be found in the edible parts of wild plants (fruits, leaves, flowers, tubers and inflorescences) which are also delicious and refreshing. Cattle grazers and the forest tribes normally eat the wild edible plants. Even though these wild fruits, flowers and tubers are less common, it is thought that great care should be taken to preserve and enhance this significant source of food supply.

In the Irula tribes of Pillur Valley, Coimbatore district Tamil Nadu, India (2012), a total of 74 plant species have been documented as wild edible by Rasingam. Of these, 42 species produces fruits came in first, followed by 26, 7, 4 and 2 species of green leaves, tubers, young shoots and flowers. According to this

study, Adivasi population in the Pillur valley still possesses and makes use of traditional knowledge about wild edible plants, including information on their habitats, collecting seasons, sustainable harvesting practices and methods of consumption.

Using data from three ethnic communities- Bakerwals, Gujjars and Puhloos, from three alpine grasslands in the previously unexplored Gurez valley in Kashmir, Dad and Khan (2011) conducted a study on the abundance, distribution, use, mode of use and frequency of edible wild plants. From the surveyed grasslands, 26 plants belonging to 21 genera and 14 families are documented to be used as wild foods. The findings showed that whereas local names for several species varied between communities, folkloric applications were widespread. Additionally, the use of the species differed amongst the populations with Bakerwals and Gujjars utilizing them most frequently and the semi-sedantary puhloos using them less frequently. Similar efforts were conducted by Sasi *et al.* (2011) to investigate the diversity of wild edible plants in the Kotagiri hills, which are located in Southern India's Nilgiri Biosphere Reserve. The tribe Irulas of Kotagiri in the Nilgiri Hills provided information for this study about the traditional knowledge of wild food plant resources. They rely entirely or largely on wild resources to meet their nutritional needs. There were 50 recognized plants in all, grouped into 31 families and 43 genera. The current study found that the tribal tribes in the study region supplemented their daily diets with wild food plants to address their food insecurity. Out of 31 families identified, the most widely utilized species belonged to Amaranthaceae (5), Solanaceae (4), Euphorbiaceae (4) and Passifloraceae (3). Out of 50 plants documented, 17- plant parts were used as leafy vegetables either uncooked (fruit primarily) or cooked like veggies. About 50 wild edible plants have been counted in this study; 21 of them are herbs, 7 are shrubs, 11 are climbers, 2 are stragglers and 9 are trees.

In a research on gathering and using wild food plants in the Nhema communal region of Zimbabwe's Midlands's province, Mayori (2011) identified

67 wild edible plant species that belonged to 45 genera and 30 families. With six species, Anacardiaceae and Moraceae were the two major plant families. Of the food plants that were reported, 67.7% were fruits, 14.9% were vegetables and the remaining plants were edible roots, inner bark, seed kernels, juice and gums. 79.1% of food plants have additional uses, including timber for building and medicines. Of the species only 20.9 were used for food. Because they provide an identifiable source of revenue, especially for women, wild edible plants significantly contribute to the socio economic well- being of the local population.

In total, 55 plant species from 35 families were identified in Srinagar and its surrounding area in the Alaknanda valley of the Garwal Himalaya, according to Tiwari *et al.* (2010). Amaranthaceae, Lamiaceae and Moraceae held the majority of the species with 4 each, followed by Anacardiaceae, Fabaceae, Rosaceae and Rutaceae with 3 species and the remaining families were represented by one species. Herbs, shrubs, climbers and trees comprised the four primary living forms. The majority of edible species (18) were made up of herbs, followed by trees (17), shrubs (13) and climbers (7). Plant species were separated into two categories; those eaten raw and those cooked into vegetables. The former group included 32 species whereas the latter included 23 plants.

Bandyopadhyay and Mukherjee (2009) conducted research on wild edible plants in the Koch Bihar area of West Bengal. This study showed that the local residents, including various ethnic groups, had a wealth of traditional knowledge regarding the use of wild food plants. 125 plant species from 102 genera and 54 families that are frequently used as wild foods by the local population and ethnic communities have been identified during the field survey.

In a similar vein, Ali- Shtayeh *et al.* (2008) conducted a study on wild edible plants used in Palestine (Northern West Bank). Of the 100 wild edible plant species identified 76 were spread across 26 families and 70 genera. *Majorana syriaca*, *Foeniculum vulgare*, *Malva sylvestris*, *Salvia fruticosa*, *Cyclamen persicum*, *Micromeria fruticosa*, *Arum palaestinum*, *Trigonella foenum-graecum*,

Gundelia tournefortii and *Matricaria aurea* were amongst the most important species. All five areas cited the ten species with the greatest mean cultural important value (mCI). *Majorana syriaca*, one taxon in particular was discovered to be amongst the most frequently mentioned species in nearly all places investigated. For edible plants in somewhat remote and isolated places (Qalqilia and Salfit), CI values were typically greater than for the same species in other areas, serving as a gauge of traditional knowledge. This can be linked to the fact that in rural or isolated places, indigenous knowledge of edible wild plants and plant collection is more widespread.

A study on the consumption of wild and semi-domesticated food plants in even circum-Mediterranean regions was done by Hadjichambis *et al.* (2008). They claimed that 294 wild food taxa have been identified in the research region. A comparative analysis of the data revealed that each country's traditions, environment and cultural legacy are directly tied to the quality and quantity of traditional knowledge, which differs among the various study areas. More parallel between the popular utilization of wild foods in the eastern and western Mediterranean were found.

A study on wild edible plants in Meghalaya northeastern India was conducted by Sawian *et al.* (2007). They claim to have inventoried 249 species of wild edibles, distributed among 153 genera and 82 families. There are 129 of them including trees 54 shrubs, 37 herbs and 29 climbers. The vast majority of the species produced fruits (125). A handful of these species might to be put into agroforestry systems, where they could serve as genetic resource for tree breeding initiative's in other parts of nation as well as plant resources for local communities and a photosynthetic pool to fight environmental degradation.

In an effort to study the traditional knowledge of wild edible plants used in the northwest of the Iberian Peninsula (Spain and Portugal), Pardo-de-Santayana *et al.* (2007) came to the conclusion that many wild berries and nuts (such as *Castanea sativa*, *Rubus ulmifolius* and *Fragaria vesca*) and the most well-liked

species in each food category are among the most significant species in that region (e.g. Fruits or herbs used to prepare liquors such as *Prunus spinosa*, vegetable such as *Rumex acetosa*, condiments such as *Origanum vulgare* or plants used to produce herbal tea such as *Chamaemelum nobile*. At five or six of the survey locations, the most significant species in the research areas as a whole are consumed.

According to Kayang (2007) documentations of tribal knowledge on Meghalays's wild edible plant species has made a number of untamed plant species that are edible more well known. The plant's components, including roots, tubers, stems, leaves, flowers, fruits and seeds can be consumed raw or cooked. This study lists 110 naturally growing plants that the locals eat either whole or in part.

Jman Redzic (2006) oversaw a study on Bosnia-Herzegovina's use of wild edible plants for human nourishment. Through years of study on Bosnia and Herzegovina's edible wild flora, 308 species from 73 families that are employed in the diet and nutrition of the local population were discovered. Wild plants that are edible can be used in fresh, raw or dried form to make delectable veggies, fruits and spices. Cooked food is made from plants (3350 as are fresh salads (19%), mush and bread (17%), as well as fresh, wild fruits and beverages (13%) and spices and ethno-pharmacological concoctions (10%). According to World Health Organization (WHO) rukes, the majority of identified wild edible plants may be sufficient to meet the daily needs of humans for basic nutrients, particularly those of vitamin C and A and some minerals.

In their evaluation of the ethnobotanical information on wild plants that have historically been consumed by humans in Spain, Tardio *et al.* (2006) recorded a total of 419 plant species from 67 families. Green vegetables (49%) accounted for the largest group of the seven main food groups, followed by plants used to make beverages (31%), wild fruits and plants for seasoning (14%), sweets, preservatives and other applications (5%). According to the number of reports,

significant species include *Foeniculum vulgare*, *Rorippa nasturtium-aquaticum*, *Origanum vulgare*, *Rubus ulmifolius*, and *Asparagus acutifolius*. As a result, there were 570 plants and their associated uses in total, which is more than there were species (419).

Reyes-Garcia *et al.* (2005) conducted research on the use of wild herbs in two Tsimane villages in the Bolivian Amazon. They discovered that residents of the less accessible village knew and utilized fewer plants than those in the more remote community. Additionally, they discovered that whereas in the combined sample and isolated village, individual ethnobotanical knowledge positively co-relates with plant uses, it does not in the village that is less reliant on forested resources.

In their study of a Mapuche community from northwestern Patagonia, Ladio and Lozada (2004) attempted to understand the patterns of usage and knowledge of wild edible plants in various ecological situations. The findings showed that the Paineo dwellers still make use of a variety of ecological gathering places and had extensive knowledge of both local and foreign species. The knowledge of forested flora is the most susceptible to loss in the Paineo group and transfer of this information declines with age. The findings also revealed that the knowledge of and use of wild food plants follow a pattern in accordance with the biological circumstances of the gathering area as well as the Paineo people's cultural legacy.

2.2 Study on biotic pressure on wild edible plant species

Wild edible plants serve as a vital source of income and a substitute food source for the population. However, it is dealing with numerous issues, from regeneration to harvesting. The population structure of wild edible plants is impacted by a variety of variables, including encroachment, deforestation, forest fires, excessive grazing, inadequate rainfall and unethical harvesting.

A study of the tree flora of the Shivalik mountain ranges in the Pakistani district of Bhimber Azad Jammu and Kashmir was conducted by Khanum *et al.*

(2022). The study established that the significant biotic and abiotic pressures placed on the tree flora of the study area of Bhimber by population growth and climatic changes. According to the study, plants like *Terminalia belerica* (also known as Belerica, *Terminalia arjuna* (also known as Arjun tree) and teak (*Tectona grandis*) are threatened species with severely declining populations and if reclamation measures for their conservation are not taken, it could result in their complete eradication from the area.

Verma (2020) investigated the issues with wild fruit tree regeneration and how they affected Himalayan langurs. He found that locals over-harvest wild fruit trees from their natural habitats and sell them on the local market to make a living. Fruits became insufficient for langur's diet due to the effect on the regeneration of the majority of wild tree species that are edible.

In Burji District, Segan region zone of Southern Nations, Nationalities and Peoples Region, Ethiopia, Ashagre *et al.* (2016) conducted an ethnobotanical study on wild edible plants and documented 46 species dispersed in 37 genera and 29 families based on indigenous claims of use as food. Most of these plants are harvested from the wild by locals. The common plant families that have the greatest variety of wild edible plant species are Anacardiaceae (five species), Boraginaceae, Fabaceae and Solanaceae each of which contributed three species. The study demonstrated the presence of several edible wild plants that help locals during challenging periods when they experience food insecurity. According to informants, unstable climatic conditions and rising anthropogenic pressure are endangering wild growing food plants.

In Poba Reserved Forest, Assam, India Pegu *et al.* (2013) conducted an ethnobotanical research of wild food plants and identified 122 species, which were divided into 89 genera, 52 families and 2 varieties. Additionally, they list the fern species *Cyclosorus extensa* and *Diplazium esculentum*. Everyone in the area recognizes and values the ecological importance of the Poba Reserve Forest as a natural defense against erosion by the Laly river. However the overuses of

resources, illicit logging for timber and poaching have all posed dangers to the forests. To preserve the sustainability of the forests, resource consumption needs to be optimized.

In their study Sher *et al.* (2011) they found 89 families of plants in the Chagharzai valley, district Buner, Pakistan, of which 77 were dicots, 7 were monocots and 3 were pteridophytes. Asteraceae has the most species with 21, followed by Papilionaceae (12), Lamiaceae (10), Poaceae and Rosaceae (9 each), Ranunculaceae (7), Moraceae (6) and Salicaceae (3). There were fewer species in the remaining families. According to the study, there is significant overgrazing, biotic disturbance and deforestation in the area under investigation. As a result, the region's precious plants are disappearing.

The Gujjar tribe lives in the hilly regions of Rajouri, which is a part of J&K. Rashid *et al.* (2008) carried out an investigation on ethnobotanical exploration, identification, concerns, conservational aspects and future potentialities of the wild edible plant species consumed by this tribe. A total of 57 plant species from 33 families have been identified in the area. The major botanical families were Rosaceae and Polygonaceae (Five taxa) with Rhamnaceae coming in the second place with four taxa, three individuals represent the Violaceae. Shrubs, herbs, trees and climbers were the four main documented life forms. The majority of edible species are herbs, followed by trees, shrubs and climbers. Unplanned construction projects and human influences have led to a severe ecological imbalance and the deterioration of the diversity in this region.

In Derashe and Kucha Districts of South Ethiopia, Balemie and Kebebew (2006) conducted an investigation on ethnobotanical study of wild edible plants. The study listed 66 edible plant species from 54 genera and 34 families. 83.3% of the edibles that were reported fall under more than one use category. Wood had been used for 79% of all purposes including food, medicines, construction and fuel. In both normal and food shortage circumstances 78.8% of the wild plant

species were reported to be edible. The majority of edibles were found to be age and gender specific in their procurement and utilization. However, there are no differences amongst communities in the way that different species are used. According to the survey, the majority (62.1%) of the species were gathered from vegetation types such as woodland, grassland or bush lands. The main hazards to wild edible plants in the research region, according to pair-wise ranking results, were agricultural development, excessive grazing, fuel wood gathering and uncontrolled fire settings.

In the study on underutilized food plants in the Sikkim Himalaya, Sundriyal and Sundriyal (2003) found that there are up to 190 food plants that grow naturally in those regions. The six most widely consumed fruit species were *Baccaurea sapida*, *Diploknema butyracea*, *Elaeagnus latifolia*, *Spondias axillaris*, *Machilus edulis*, *Eriolobus indica* that experience the most strain on their native habitats as a result of increasing local demand- were thoroughly examined. All species densities were low in forest stands and the method of gathering fruit was very erratic, endangering its existence in the near future. The amount of fruit produced by each tree might potentially rival that of commercial fruit producing species. Such fruit trees should therefore receive special attention for domestication in farmer's fields and protection in natural forest stands.

Chapter 3

MATERIAL AND METHODS

The present investigation entitled “Ethnobotanical Study of Wild Edible Plants Species” was carried out in South Kashmir (Anantnag, Pulwama, Shopian and Kulgam). The material and technique used during the course of this investigation are elucidated in this chapter.

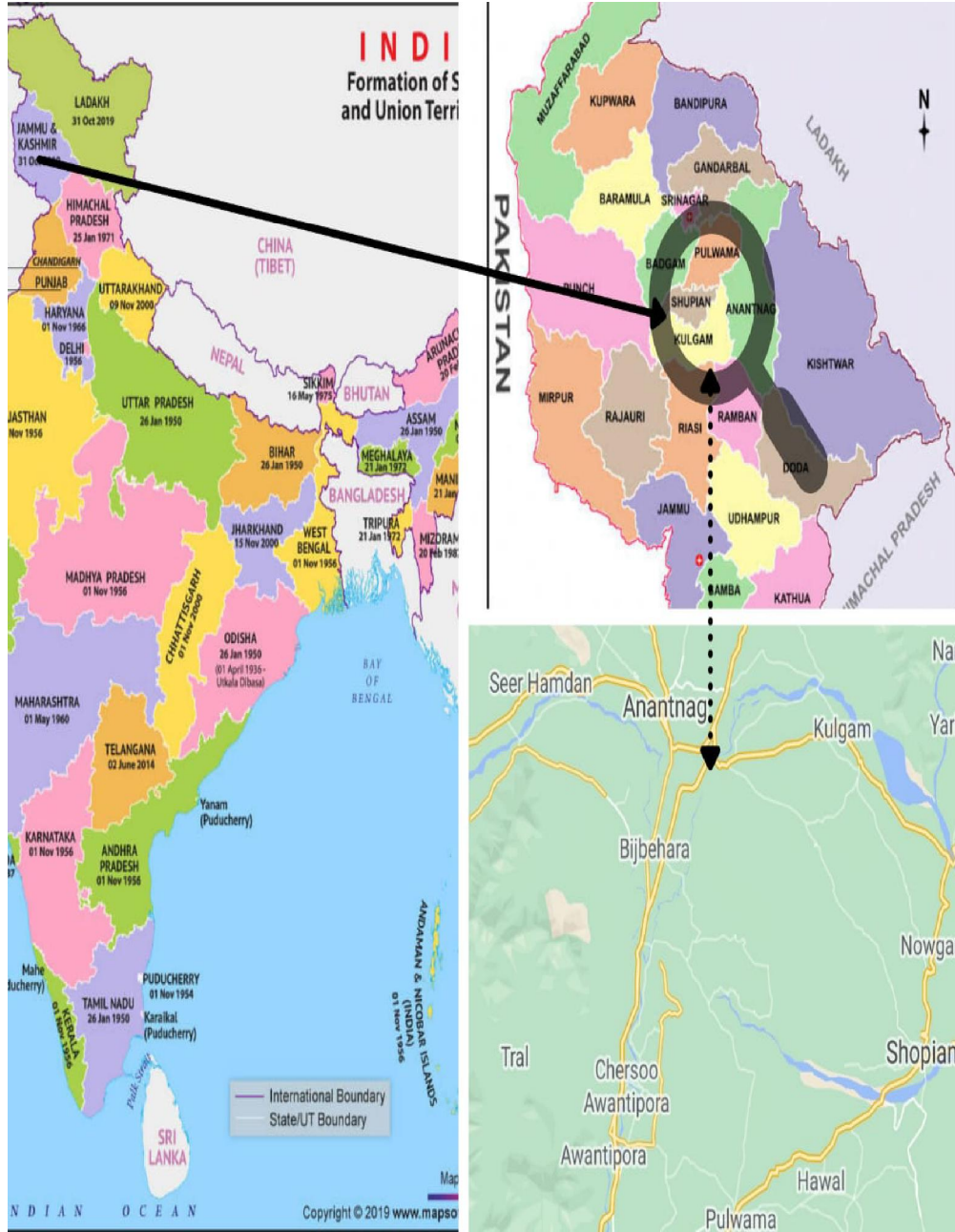
3.1 Description of the study area

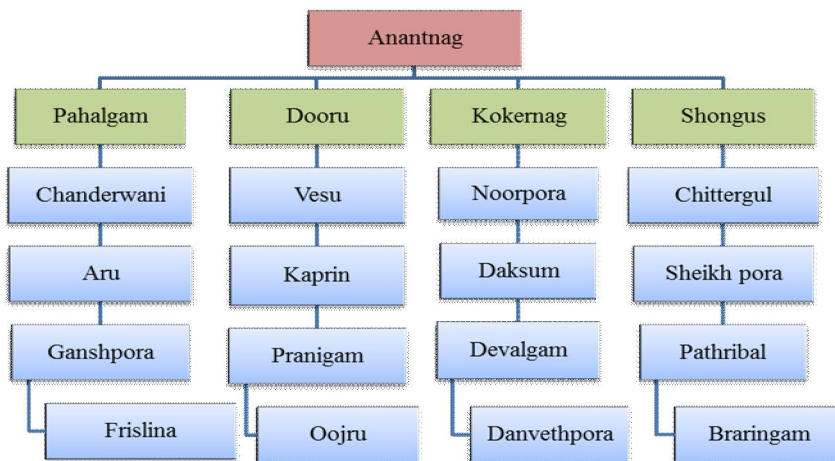
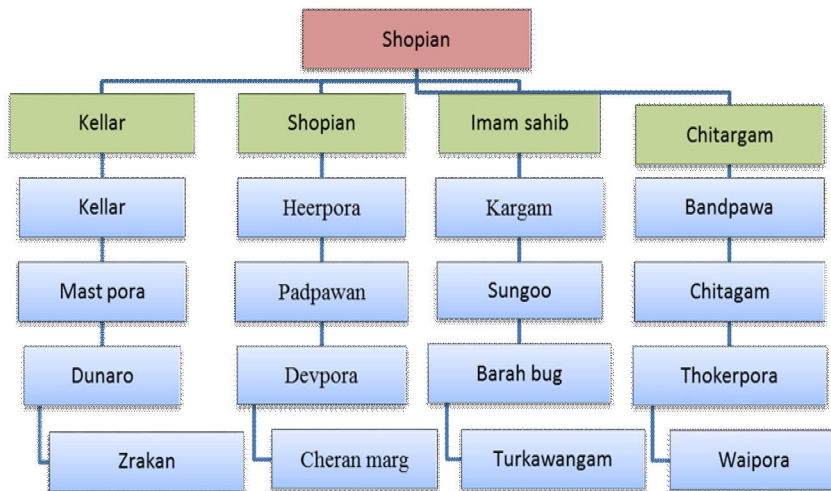
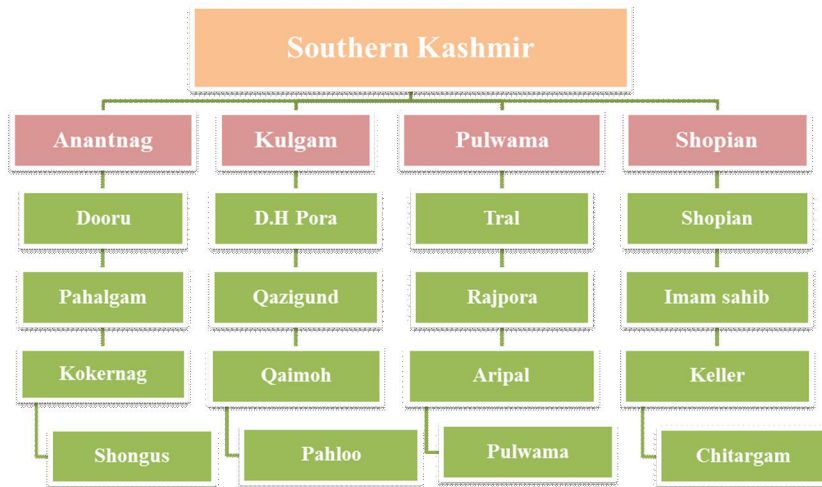
3.1.1 Location

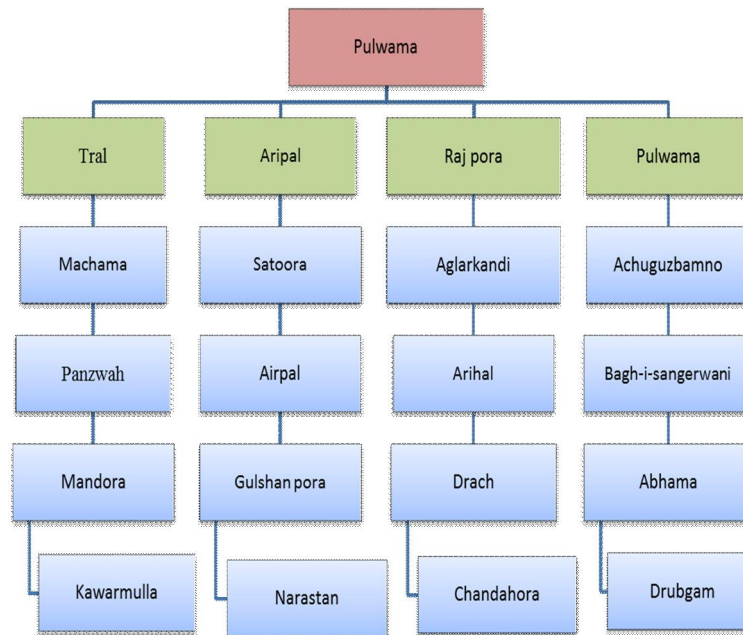
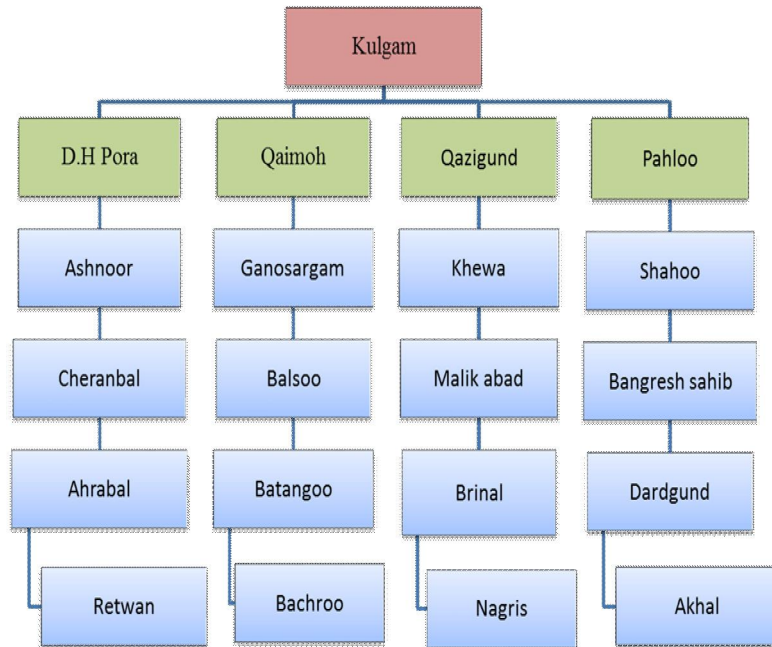
The study was conducted in various district of Southern Kashmir valley’s fringe forests, which are located roughly 40-60 kilometers south of the UT’s summer capital Srinagar. The geographic coordinates of Anantnag, Pulwama, Kulgam and Shopian are 33.5° and 75.1°, 33.8° and 75°, 33.6° and 75°, 33.7° and 74.9° respectively. The region is located in India’s north-western agro-climatic zone and is on average 1650 meters (5410 feet) above mean sea level. This study compared traditional knowledge of wild edible plants in the Southern Kashmir districts of Anantnag, Pulwama, Kulgam and Shopian. In the four districts, sixty four villages made it out alive.

3.1.2 Climate and Weather conditions

With the massive Karakoram Range in the north, PirPanjal Range in the south and west and Zaskar Range in the east, Kashmir valley has a mild climate that is mostly determined by its position. In general, it can be characterized as cool in the spring and the fall, mild in the summer and frigid in the winter. The weather is frequently cooler in steep places compared to the lower, flat part of the valley because of the substantial changes in geo-location across distinct districts. Although the climate in Kashmir Valley is more temperate, the weather can change quickly. The amount of rainfall varies greatly amongst the state’s various areas. The Kashmir valley receives 670 mm of rain on average each area. The coldest months are December and January (mean minimum temperature -15°C, mean maximum temperature 0°C), while July has the highest average low and maximum temperatures (6°C and 32°C, respectively).







Districts

Tehsils

Villages

3.2 Study population

Interviews were conducted in four districts with four tehsils in each district. Four villages in each tehsil were surveyed in 2021-2022 with about 120-160 informants in each district. Interviews with both literate and illiterate men and women were undertaken. Informants were chosen without the use of any unique selection criteria. 64 villages were used for the fieldwork, which included 560 informants of all ages.

3.3 Ethnobotanical methods

Information on ethnobotany was gathered using a semi-structured questionnaire. The questions largely centered on the local name of the plant, understanding of how plants have been utilized historically and currently, consumption habits, the biggest risks to these plants and conservation. Semi-structured interviews with local informants were used to gather data on the utilization of various species. To show the many criteria for consuming wild food species in the researched locations and to establish the relative value of each species, the majority of quantitative methodologies were applied.

3.4 Taxonomic diversity of plants

The flora of the study area was studied and divided into:

- Species
- Families
- Genera

3.5 Plant part used and mode of consumption and categories of Wild edible plant species based on folk perception.

Different plant parts used in wild edible plants, such as leaves, roots and foliage have been recognized. Their eating habits, including whether they are eaten raw or cooked were also noted. Based on common perceptions, the study's use categories were broken down into the following groups: Vegetables, fruits,

seasoning, beverages and others. One use report was tallied for each plant species that an informant brought up under a given use category.

3.6 Estimation of cultural significance of each species (Cultural importance index, CI).

This index is calculated by the sum of the proportion of informants mentioning each species use (i.e. the sum of the number of participants who mention the use of each species divided by the total number of informants (N).

$$CI = \sum_{i=1}^{i=nu} \frac{UR_i}{N}$$

(Pardo *et al.*, 2007)

The additive index takes into account the spread of the use (number of informants) for each species along with its versatility i.e. diversity of its application. The total number of various food use categories is the index's theoretical maximum value. The overall assessment of the applications of wild food plants in the Southern Kashmir region under study was done using a mean cultural importance index (mCI). All the localities were taken into account when calculating it.

3.7 Estimation of cultural importance of families (CIF)

The cultural index (CI) of the species from each family was summed up to determine the cultural value of each plant family (CIF) (Galeano, 2000).

3.8 Most sighted plant

The study survey was conducted to identify the plants that were used in every district with the help of cultural index.

3.9 Threats to wild edible plants

Several threats were identified with the community in order to learn how locals perceived activities endangering wild edible plants. Informants were shown

these variables so they may choose the most crucial ones. The factor with the highest overall score was then ranked first after the scores from each respondent were added up (Balemie and Kebebew, 2006).

3.10 Plant preservation methods

In order to keep and use plants for longer periods of the year, the most popular plant preservation techniques adopted by the local peoples were observed.

3.11 Estimation of the Area selection index

For each food group, an area selection index was determined by adding number of informants that use wild plants for a particular food category (Hinnawi, 2010).

Chapter 4

EXPERIMENTAL FINDINGS

4.1 Study population

Old people in these places still hold onto the traditional knowledge of edible wild plants because the people of this region relied heavily on forest foods. The data revealed that the maximum numbers of informants i.e. 300 were over fifty years old, 190 informants were between the age of 25-50 years and 70 informants were below the age of 25 years (Fig 1). Figure 2 shows the gender structure of the respondents in which maximum numbers of respondents were females i.e. 370 while as males constitute lesser proportion i.e.190. The data pertaining to the distribution of study population by education level ranges from illiterate to university level. The observation recorded that 215 of the respondents were illiterate, 197 were primary educated, 93 were secondary educated, 37 were diploma holding and 16 were educated at university level (Fig 3) (Plate 1 and 2).

4.1.1 Taxonomic diversity of plants

The flora of the study area is abundant and home to many different valuable species. The study identified 96 wild edible plant species (WEPs) from 44 families and 77 genera that are used by informants in the study region for a variety of purposes like vegetables, fruits, food seasoning (Table 1). These are wide dispersed among various life types 58 herbs (60%), 19 trees (20%), 15 shrubs (16%) and 4 fungus (4%) (Fig 4). The study revealed that out of the total families recorded, Rosaceae was the dominant family represented by 14 species followed by Asteraceae with 8 species, Lamiaceae 7 species, Polygonaceae 6 species, Amaranthaceae and Apiaceae 5 species (Fig.5). Other families are Brassicaceae, Moraceae and Amaryllidaceae with 3 species each followed by Agaricaceae, Malvaceae, Berberidaceae, Umbelliferaceae, Ranunculaceae, Plantaginaceae with 2 species each and Caryophyllaceae, Primulaceae, Fabaceae, Portulacaceae, Morchellaceae, Pyronmataceae, Asphodelaceae, Caprofoliaceae,

Dioscoraceae, Athyriaceae, Aspleniaceae, Sapindaceae, Batulaceae, Ebenaceae, Elegendaceae, Juglandaceae, Podophyllaceae, Solenaceae, Vibuenaceae, Vitaceae, Acoraceae, Brassicaceae, Ericaceae, Cannabinaceae, Saxiferaceae, Boriginaceae, Papaveraceae and Rhamnaceae with only 1 species.

Table 1: List of Wild Edible Plant Species (WEPs), their families used by local people of the study area

S. No.	Botanical name	English name	Vernacular name	Family
1.	<i>Asplenium falcatum</i>	Spleenwort	Dade	Aspleniaceae
2.	<i>Agaricus bisporus</i>	Button mushrooms	Hend	Agaricaceae
3.	<i>Amaranthus caudatus</i>	Amaranth	Leesa	Amaranthaceae
4.	<i>Amaranthus cruentus</i>	Red Amaranth	Wazig lessa	Amaranthaceae
5.	<i>Amaranthus dubius</i>	Spleen amaranth	Ganhar	Amaranthaceae
6.	<i>Achellia millefolium</i>	Common yarrow	Pahel gasse	Asteraceae
7.	<i>Acorus calamus</i>	Sweet flag	Vai	Acoraceae
8.	<i>Angelica glauca</i>	Angelica	Choru	Apiaceae
9.	<i>Artemisia absinthium</i>	Wormwood	Tethwan	Asteraceae
10.	<i>Allium humile</i>	Small alpine onion	Mali piaz	Amaryllidaceae
11.	<i>Allium Carolinianum</i>	Wild garlic	Jungli rohan	Amaryllidaceae
12.	<i>Allium seminovii</i>	Wild onion	Jungli pran	Amaryllidaceae
13.	<i>Aesculus indica</i>	Indian horse chesnut	Handoon	Sapindaceae
14.	<i>Arnebia benthami</i>	Himalyan arnebia	Kahjawain	Boraginaceae
15.	<i>Bunicum persicum</i>	Black cumin	Kalazeera	Umbelliferae
16.	<i>Bergenia ciliate</i>	Fringed bergenia	Pahand/Batweyaa	Saxifragaceae
17.	<i>Bistorta amplexicaulis</i>	Red bistort	Machean	Polygonaceae
18.	<i>Berberis lyceum</i>	Indian barberry	Kaodach	Berberidaceae
19.	<i>Berberis aristata</i>	Indian barberry	Kaodach/ Dandlidar	Berberidaceae
20.	<i>Beta vulgaris</i>	Beet	Van palak/Palakya	Amaranthaceae
21.	<i>Cichorium intybus</i>	Chicory	Handi posh	Asteraceae
22.	<i>Capsella bursa pastoris</i>	Shepherds purse	Kral mund	Brassicaceae

Contd...

Table 1: contd....

S. No.	Botanical name	English name	Vernacular name	Family
23.	<i>Centaurea iberica</i>	Iberian thistle	Kreaxch	Asteraceae
24.	<i>Craetagus songarica</i>	Hawthorn	Ringe	Rosaceae
25.	<i>Chenopodium album</i>	White goosefoot	Bathua	Amaranthaceae
26.	<i>Cydonia oblonga</i>	Quince apple	Bamtsunt	Rosaceae
27.	<i>Cannabis sativa</i>	Marijuana	Bhang	Cannabinaceae
28.	<i>Chaerophyllum acuminatum</i>	Western Himalayan Chervil	Neocha	Apiaceae
29.	<i>Clinopodium vulgare</i>	Wild basil	Shyul	Lamiaceae
30.	<i>Corylus jacquemonti</i>	Hazelnut	Jamun / Virin	Batulaceae
31.	<i>Diplazium esculentum</i>	Fiddlehead fern	Kasrode	Athyriaceae
32.	<i>Dioscorea melanophyma</i>	Blackbulb yam	Yam	Dioscoraceae
33.	<i>Dipsacus innermis</i>	Teasel	Wopalhakh	Caprifoliaceae
34.	<i>Diospyrous lotus</i>	Date plum	Amlok	Ebenaceae
35.	<i>Elaeagus umbellate</i>	Oleaster berry	Oleaster berry/ silver berry	Elaeagnaceae
36.	<i>Eremurus himalicus</i>	Himalayan foxy tail	Wull/ Shil hakh	Ephedraceae
37.	<i>Eryngium caeruleum</i>	Blue blooming umbellifer	Umbellifer	Umbelliferaceae
38.	<i>Foeniculum vulgare</i>	Fennel	Sonf	Apiaceae
39.	<i>Fragaria nubicola</i>	Wild strawberry	Ashtabar	Rosaceae
40.	<i>Ficus palamta</i>	Fig	Phagwara	Moraceae
41.	<i>Geopora arenicola</i>	Cup fungus	Shajkan	Pyronemataceae
42.	<i>Juglans regia</i>	Walnut	Dun	Juglandaceae
43.	<i>Jurinea himalaica</i>	Jurinea	Thendi-Jeri/Dhup	Asteraceae
44.	<i>Lactuca serriola</i>	Pricky lettuce	Dodhkandicj	Asteraceae
45.	<i>Malva neglecta</i>	Dwarf mallow	Sochal	Malvaceae
46.	<i>Morchella esculenta</i>	Yellow morel	Guchi	Morchellaceae
47.	<i>Malva sylvestris</i>	Cheeses	Boate sochal	Malvaceae
48.	<i>Mentha arvensis</i>	Wild mint	Pudina	Lamiaceae
49.	<i>Morus alba</i>	Mulberry	Tul	Moraceae
50.	<i>Malus sieversii</i>	Wild Apple	Choont	Rosaceae
51.	<i>Mega carpaea polyandra</i>	Benth	Chhatrak/Barmola	Brassicaceae

Contd...

Table 1: contd....

S. No.	Botanical name	English name	Vernacular name	Family
52.	<i>Morus nigra</i>	Mulberry	Shah tul	Moraceae
53.	<i>Nasturtium officinale</i>	Indian cress	Aabhak / Nagbabbar	Brassicaceae
54.	<i>Nepeta cataria</i>	Catnip	Gandsoi	Lamiaceae
55.	<i>Origanum vulgare</i>	Oregano	Van Baber	Lamiaceae
56.	<i>Ocimum basilicum</i>	Basil	Babriboel	Lamiaceae
57.	<i>Oxyria digyna</i>	Mountain sorrel	Chaksin	Polygonaceae
58.	<i>Prunus domestica</i>	Wild Plum	Aer	Rosaceae
59.	<i>Prunus cornuta</i>	Bird cherry	Zumb	Rosaceae
60.	<i>Prunus pashia</i>	Wild pear	Tang	Rosaceae
61.	<i>Prunus amygdalus</i>	Wild almond	Aurni/ Jungli badam	Rosaceae
62.	<i>Phytolacca acinosa</i>	Indian poke weed	Hapat makai	Phytolaccaceae
63.	<i>Plantago major</i>	Broad leaf plantin	Budgul	Plantainaceae
64.	<i>Prunus bokharensis</i>	Bokhara plum	Aloo Bukhara	Rosaceae
65.	<i>Prunus avium</i>	Wild cherry	Glass	Rosaceae
66.	<i>Prunus armeniaca</i>	Wild apricot	Cxenun	Rosaceae
67.	<i>Podophyllum hexandrum</i>	Sinopodophyllum	Wanwagun	Podophyllaceae
68.	<i>Polygonum aviculare</i>	Knot grass	Drubhak	Polygonaceae
69.	<i>Primula vulgaris</i>	Primrose	Kalewouth	Primulaceae
70.	<i>Papaver rhoeas</i>	Red poppy	Gul-e-tala	Papaveraceae
71.	<i>Plantago lanceolata</i>	Narrow leaf plantin	Gul sag	Plantaginaceae
72.	<i>Portulaca oleraceae</i>	Common purslane	Nunar	Portulacaceae
73.	<i>Pleurotus ostreatus</i>	Oyster musroom	Khakdi	Agaricaceae
74.	<i>Rumex acetosa</i>	Garden sorrel	Ubu	Polygonaceae
75.	<i>Rubus ulmifolius</i>	Black berry	Chansh	Rosaceae
76.	<i>Rubus niveus</i>	Raspberry	Chansh	Rosaceae
77.	<i>Ranunculus arvensis</i>	Corn butter cup	Cherim	Ranunculaceae
78.	<i>Ranunculus muricatus</i>	Spiny fruit/ rough-fruited buttercup	Thul hakh	Ranunculaceae

Contd...

Table 1: contd....

S. No.	Botanical name	English name	Vernacular name	Family
79.	<i>Rheum austral</i>	Himalayan rhubarb	Chotail	Polygonaceae
80.	<i>Rosa webbiana</i>	Wild rose	Shingai	Rosaceae
81.	<i>Rhododendron arboretum</i>	Rhododendron	Surang	Ericaceae
82.	<i>Rheum webbianum</i>	Small rhubarb	Pambhaak	Polygonaceae
83.	<i>Salvia rosmarinus</i>	Rosemarry	Gulmehendi	Lamiaceae
84.	<i>Solanum nigrum</i>	Black night shade	Kambai	Solenaceae
85.	<i>Stellaria media</i>	Chick weed	Nick hakh	Caryophyllaceae
86.	<i>Scandix pecten veneris</i>	Shepherd's needle	Kachkagin	Apiaceae
87.	<i>Saussurea lappa</i>	Costus	Kuth	Asteraceae
88.	<i>Sileane vulgaris</i>	Bladder campion	Watkram	Caryophyllaceae
89.	<i>Thymus serpyllum</i>	Thyme	Javaind	Lamiaceae
90.	<i>Torilis scabra</i>	Rough hedge parsley	Moharmund	Apiaceae
91.	<i>Taraxaccum officinale</i>	Dandelion	Handh	Asteraceae
92.	<i>Urtica dioica</i>	Stinging neetle	Soi	Urticaceae
93.	<i>Viburnum grandiflorum</i>	Cranberry	Kulmansh/ Kiflu	Viburnaceae
94.	<i>Vitis vinifera</i>	Grape vine	Dachh	Vitaceae
95.	<i>Vicia sativa</i>	Common vetch	Hibill hamb	Fabaceae
96.	<i>Ziziphus jujube</i>	Jijube	Brey/ Ber	Rhamnaceae

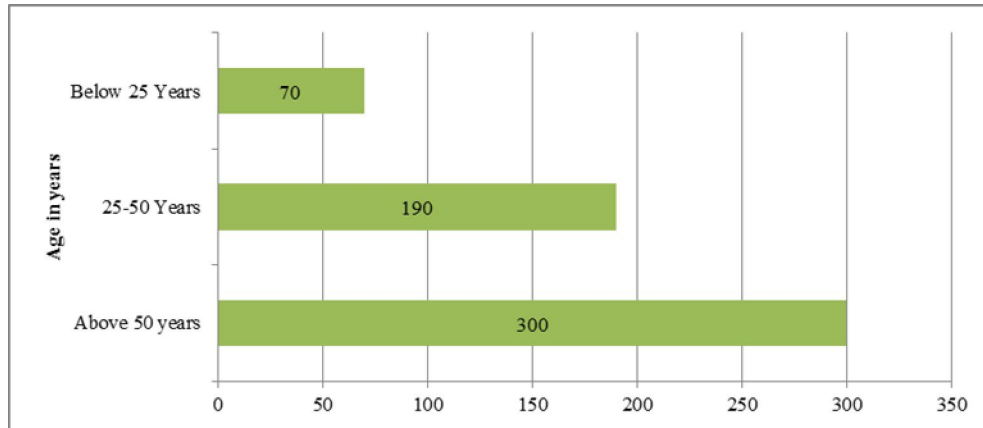


Fig. 1: Age structure of the respondents

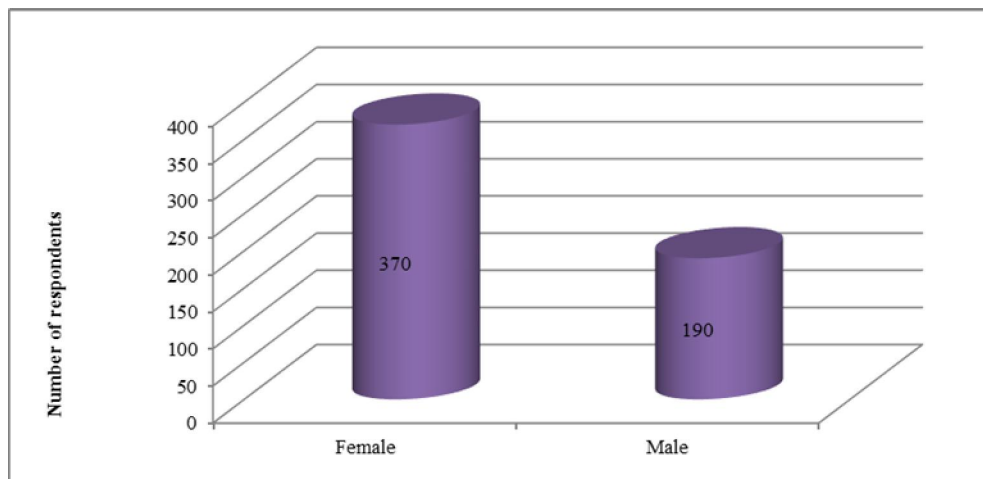


Fig. 2: Gender structure of the respondents

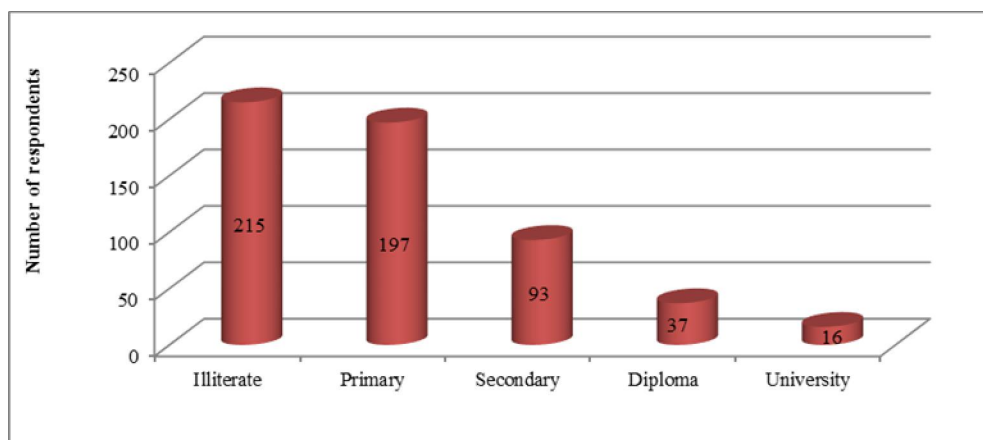


Fig. 3: Distribution of study population by educational level

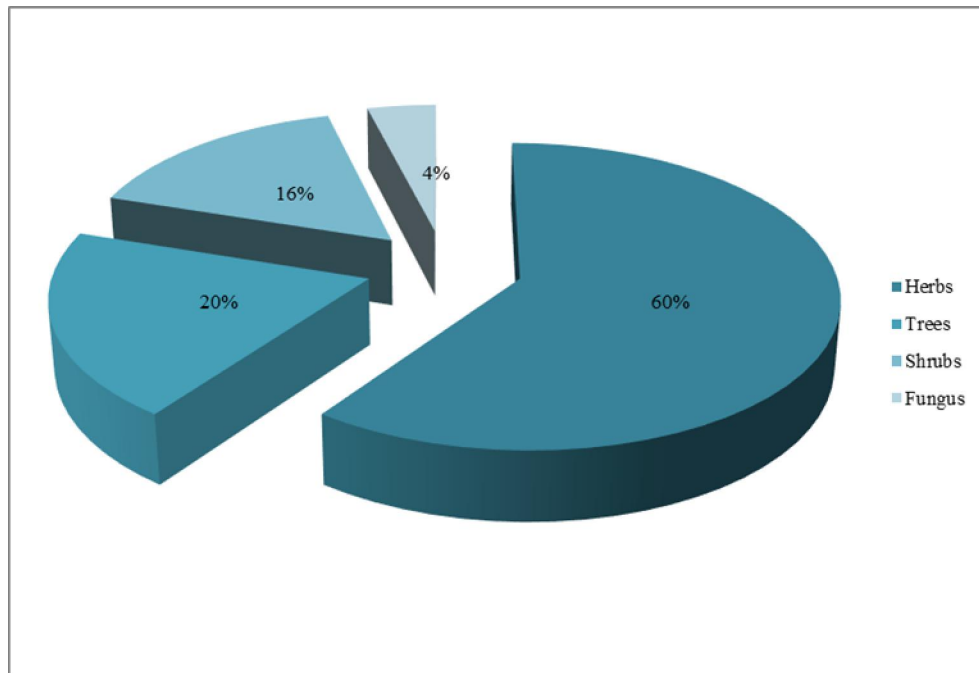


Fig. 4: Different life forms of WEPs

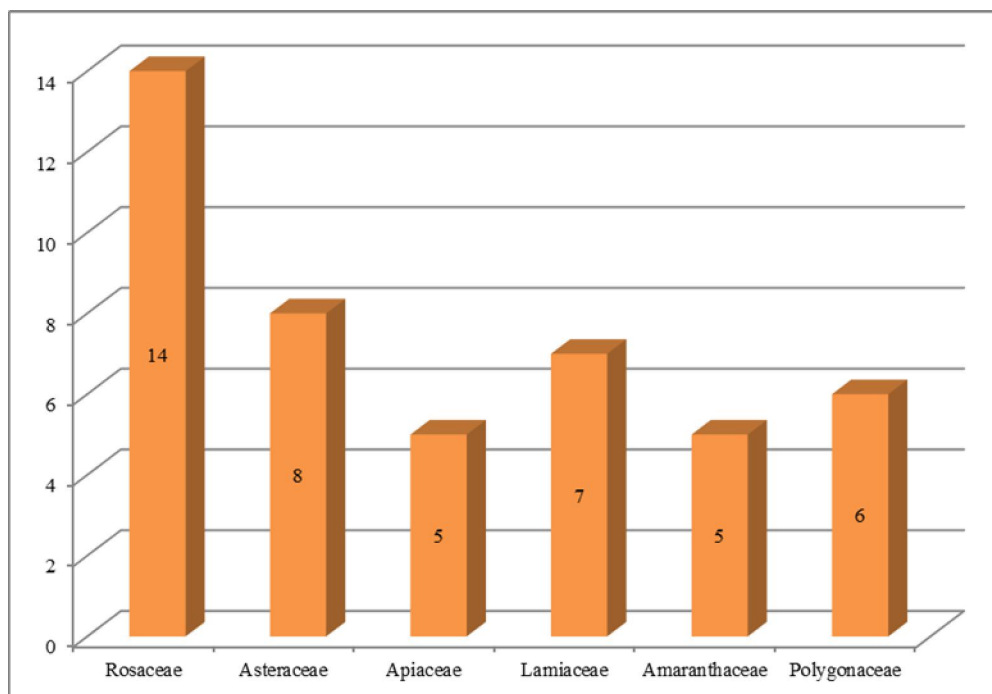


Fig. 5: Most represented wild plant families and number of species in Southern Kashmir



Plate 1: Interviewing informants in different villages



Plate 2: Interviewing informants in different districts

4.2 Categories of wild edible plants based on folk perceptions, mode of consumption and plant part used

According to popular belief, wild edible plant species (WEPs) can be classified as vegetables, fruits, food seasoning, beverages and others (Fig 6). According to regional custom, the edible wild plants are prepared using a variety of recipes and consumed in a variety of ways. Some of them are prepared in a more or less complex manner because some eaten raw while others cooked.

The data tabulated in Table 2 revealed that 52 species which constitute 54% of the total wild edible plants used in the study area were used as vegetables belonging to 28 families i.e. Aspleniaceae, Agaricaceae, Amaranthaceae, Amaryllidaceae, Umbelliferaceae, Polygonaceae, Asteraceae, Brassicaceae, Rosaceae, Athyriaceae, Dioscoraceae, Caprifoliaceae, Apiaceae, Asphodelaceae, Moraceae, Pyronemataceae, Malvaceae, Morchellaceae, Brassicaceae, Lamiaceae, Phytolaccaceae, Plantaginaceae, Portulacaceae, Primulaceae, Ranunculaceae, Caryophyllaceae, Fabaceae and Urticaceae (Plate 3).

The data in Table 3 shows that 29 species which constitute 30% of the total wild edible plants used in southern Kashmir were used as fruits belonging to 13 families i.e. Rosaceae, Moraceae, Batulaceae, Ebenaceae, Sapindaceae, Berberidaceae, Elaeagnaceae, Juglandaceae, Solenaceae, Viburnaceae, Vitaceae, Rhamnaceae and Podophyllaceae Rosaceae (Plate 4).

Table 2: List of Wild Edible Plant Species (WEPs) and their part used for vegetables in the study area

S. No.	Botanical Name	Vernacular Name	Family	Part used	Uses	Reported
1.	<i>Asplenium falcatum</i>	Dade	Aspleniaceae	Fronds	Fronds are consumed as vegetable.	Giri and Uniyal (2022)
2.	<i>Agaricus bisporus</i>	Hend	Agaricaceae	Fruit body	Used as salad in raw form or cooked with scrambled eggs	Ali- Shtayeh <i>et al.</i> (2008)
3.	<i>Amaranthus caudatus</i>	Leesa	Amaranthaceae	Whole plant	Herb is used as vegetable, seeds in sattoo.	Showkat and Akhter (2018)
4.	<i>Amaranthus cruentus</i>	Wazig lessa	Amaranthaceae	Leaves	Leaves are used as vegetable.	Showkat and Akhter (2018)
5.	<i>Amaranthus dubius.</i>	Waste hakh	Amaranthaceae	Leaves	Leaves are used as vegetable.	Not reported yet
6.	<i>Allium humile</i>	Mali piaz	Amaryllidaceae	Bulb, leaves	It is used as vegetables.	Ijaz <i>et al.</i> (2022)
7.	<i>Allium Carolinianum</i>	Jungli rohan	Amaryllidaceae	Bulb, leaves	It is used as vegetable.	Bandey <i>et al.</i> (2021)
8.	<i>Bunicum persicum</i>	Kalazeera	Umbelliferaceae	Root	Root is eaten raw or cooked.	Sharma and Rashid (2015)
9.	<i>Bistorta amplexicaulis</i>	Machean	Polygonaceae	Leaves	Leaves as vegetable.	Sharma and Rashid (2015)
10.	<i>Beta vulgaris</i>	Van palak	Amaranthaceae	Leaves, stalks	The leaves can be eaten raw or cooked, but stalks are best eaten after cooking.	Not reported yet
11.	<i>Centaura iberica</i>	Kreacx	Asteraceae	Leaves	Leaves are cooked as vegetable.	Mir (2014)

Contd...

Table 2: contd....

S. No.	Botanical Name	Vernacular Name	Family	Part used	Uses	Reported
12.	<i>Chichorium intybus</i>	Handi posh	Asteraceae	Leaves	Leaves are used as vegetable.	Mir (2014)
13.	<i>Capsella bursa pastoris</i>	Kral mund	Brassicaceae	Leaves, roots	Leaves are cooked and used in salad.	Bhatia <i>et al.</i> (2018)
14.	<i>Chenopodium album</i>	Bathua	Amaranthaceae	Leaves	Leaves are consumed as vegetable, seeds as fermented alcoholic beverage.	Bhatia <i>et al.</i> (2018)
15.	<i>Cydonia oblonga</i>	Bamtsunt	Rosaceae	Fruit body	It is cooked	Bhatia <i>et al.</i> (2018)
16.	<i>Diplazium esculentum</i>	Kasrode	Athyriaceae	Fronds	Tender fronds are cooked as vegetables.	Bhatia <i>et al.</i> (2018)
17.	<i>Dioscorea melanophyma</i>	Yam	Dioscoraceae	Tubers	Tubers are cooked	Sharma and Rashid (2015)
18.	<i>Dipsacus innermis</i>	Teasel	Caprifoliaceae	Leaves	Dried leaves are used as vegetables.	Sharma and Rashid (2015)
19.	<i>Diospyros kaki</i>	Moharmund	Apiaceae	Roots	Roots are cooked as vegetables.	Ali- Shtayeh <i>et al.</i> (2008)
20.	<i>Eremurus himalicus</i>	Shil hakh	Asphodelaceae	Leaves	Leaves are used as vegetable.	Bhatia <i>et al.</i> (2018)
21.	<i>Ficus palamta</i>	Phagwara	Moraceae	Leaves	Young leaves are cooked with diluted yogurt to make curry, Leaves are also cooked with meat	Bhatia <i>et al.</i> (2018) Not reported yet

Contd...

Table 2: contd....

S. No.	Botanical Name	Vernacular Name	Family	Part used	Uses	Reported
22.	<i>Geopora arenicola</i>	Shajkan	Pyronemataceae	Fruiting body	It is an edible mushroom which is consumed after cooking. Another way of preparing this mushroom is by making gravy (oam doad yakhni).	Abdullah and Andrabi (2021) Not reported yet
23.	<i>Lactuca serriola</i>	Dodhkandicj	Asteraceae	Leaves	Leaves are consumed as vegetable.	Mir (2014)
24.	<i>Malva neglecta</i>	Sochal	Malvaceae	Leaves	Leaves can be cooked.	Showkat and Akhter (2018)
25.	<i>Morchella esculenta</i>	Guchi	Morchellaceae	Whole body	Fruiting body is used as vegetable.	Showkat and Akhter (2018)
26.	<i>Malva sylvestris</i>	Boate sochal	Malvaceae	Whole plant	Young leaves, shoots, flowers and fruits are consumed in salad, soups and boiled root vegetables.	Bandey <i>et al.</i> (2021)
27.	<i>Morus alba</i>	Tul	Moraceae	Leaves	Leaves are cooked.	Not reported yet
28.	<i>Mega carpea polyandra</i>	Chhatrak	Brassicaceae	Leaves	Dried for winter use.	Not reported yet
29.	<i>Nasturtium officinale</i>	Aabhak/ Nagbabbar	Brassicaceae	Leaves	It is cooked as vegetable.	Showkat and Akhter (2018)
30.	<i>Nepeta cataria</i>	Gandsoi/ catnip	Lamiaceae	Leaves	Leaves are used as vegetable	Showkat and Akhter (2018)

Contd...

Table 2: contd....

S. No.	Botanical Name	Vernacular Name	Family	Part used	Uses	Reported
31.	<i>Origanum vulgare</i>	Van Baber	Lamiaceae	Leaves	Leaves are used as vegetable	Mir (2014)
32.	<i>Phytolacca acinosa</i>	Hapat makai	Phytolaccaceae	Twigs	Tender twigs are cooked as vegetable.	Sharma and Rashid (2015)
33.	<i>Plantago major</i>	Budgul	Plantaginaceae	Whole plant	Used as a vegetable in the juvenile stage.	Showkat and Akhter (2018)
34.	<i>Prunus bokharensis</i>	Aloo Bukhara	Rosaceae	Fruit	It can be cooked.	Not reported yet
35.	<i>Polygonum aviculare</i>	Drubhak	Polygonaceae	Leaves	Leaves are used as vegetables.	Sharma and Rashid (2015)
36.	<i>Plantago lanceolata</i>	Gul sag	Plantaginaceae	Leaves	Fresh leaves are cooked.	Showkat and Akhter (2018)
37.	<i>Portulaca oleraceae</i>	Nunar	Portulacaceae	Leaves	Cooked as vegetables	Bandey <i>et al.</i> (2021)
38.	<i>Pleurotus ostreatus</i>	Khakdi	Agaricaceae	Fruit body	This mushroom is eaten after cooking.	Not reported yet
39.	<i>Primula vulgaris</i>	Primrose	Primulaceae	Leaves	Leaves are cooked.	Not reported
40.	<i>Rumex acetosa</i>	Ubuji	Polygonaceae	Leaves,	Leaves are used as vegetable	Sharma and Rashid (2015)
41.	<i>Ranunculus arvensis</i>	Cherim	Ranunculaceae	Whole plant	The green part of the plant before flowering is cooked and used as vegetable.	Mir (2014)
42.	<i>Ranunculus muricatus</i>	Thul hakh	Ranunculaceae	Whole plant	Before flowering the plant is used as vegetable.	Mir (2014)
43.	<i>Rheum austral</i>	Chotail	Polygonaceae	Leaves	Leaves are used as vegetable.	Mir (2014)

Contd...

Table 2: contd....

S. No.	Botanical Name	Vernacular Name	Family	Part used	Uses	Reported
44.	<i>Rheum webbianum</i>	Pambhaak	Polygonaceae	Leaves	Leaves are consumed as vegetable.	Sharma and Rashid (2015)
45.	<i>Stellaria media</i>	Nick hakh	Caryophyllaceae	Whole plant	Whole plant is used as vegetable at tender stage.	Mir (2014)
46.	<i>Scandix pecten veneris</i>	Kachkagin	Apiaceae	Leaves	Leaves are used as vegetable.	Showkat and Akhter (2018)
47.	<i>Saussurea lappa</i>	Kuth	Asteraceae	Leaves	Leaves are used as vegetable.	Mir (2014)
48.	<i>Sileane vulgaris</i>	Watkram	Caryophyllaceae	Leaves	Leaves are cooked as vegetable	Not reported yet
49.	<i>Torilis scabra</i>	Moharmund	Apiaceae	Roots	Roots are cooked as vegetables.	Showkat and Akhter (2018)
50.	<i>Taraxaccum officinale</i>	Handh	Asteraceae	Leaves	Cooked as vegetable	Mir (2014)
51.	<i>Urtica dioica</i>	Soi	Urticaceae	Leaves	Leaves are main ingredient of nettle soup.	Bandey <i>et al.</i> (2021)
52.	<i>Vicia sativa</i>	Hibill hamb	Fabaceae	Fruits	Beans are cooked as vegetable and raw beans are also eaten.	Showkat and Akhter (2018)



Amaranthus caudatus



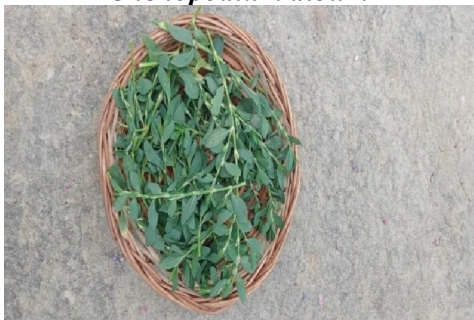
Portulaca oleraceae



Chenopodium album



Asplenium falcatum



Polygonum aviculare



Sileane vulgaris



Dipsacus innermis



Rumex acetosa

Plate 3: Wild edible vegetable species used by ethnic communities in Southern Kashmir

Contd...

Plate 3: Contd...



Taraxacum officinale



Malva neglecta



Eremurus himalicus



Diplazium esculentum



Amaranthus creuntus



Morchella esculenta



Urtica dioica

Table 3: List of Wild Edible Plants and their part used for fruits in study area

S.no	Botanical name	Vernacular name	Family	Part used	Uses	Reported
1.	<i>Aesculus indica</i>	Handoon	Sapindaceae	Fruit	Used as famine food.	Sharma and Rashid (2015)
2.	<i>Berberis lyceum</i>	Kaodach	Berberidaceae	Fruit	Fruit is edible.	Showkat and Akhter (2018)
3.	<i>Berberis aristata</i>	Kaodach/ Dandlidar	Berberidaceae	Fruit	Fruit is eaten.	Srivastava 1998
4.	<i>Craetagus songarica</i>	Ringe	Rosaceae	Fruit	Fruit is edible.	Sharma and Rashid (2015)
5.	<i>Cydonia oblonga</i>	Bamtsunt	Rosaceae	Fruiting body	It is sometimes eaten raw.	Bhatia <i>et al.</i> (2018)
6.	<i>Corylus jacquemonti</i>	Jamun/ Virin	Batulaceae	Nuts	Edible nuts.	Sharma and Rashid (2015)
7.	<i>Diospyrous lotus</i>	Amlok	Ebenaceae	Fruit	Pulpy fruit is edible	Not reported yet
8.	<i>Elaeagus umbellate</i>	Oleaster berry	Elaeagnaceae	Fruits	Fruits are eaten.	Sharma and Rashid (2015)
9.	<i>Fragaria nubicola</i>	Ashtabar	Rosaceae	Fruits	Fruits are eaten	Bandey <i>et al.</i> (2021)
10.	<i>Ficus palamta</i>	Phagwara	Moraceae	Fruits	Fruits and eaten raw.	Bhatia <i>et al.</i> (2018)
11.	<i>Juglans regia</i>	Dun	Juglandaceae	Fruit	Edible fruit	Bhatia <i>et al.</i> (2018)
12.	<i>Morus alba</i>	Tul	Moraceae	Fruit	Fresh fruit is eaten.	Mir (2014)

Contd...

Table 3: contd....

S.no	Botanical name	Vernacular name	Family	Part used	Uses	Reported
13.	<i>Malus sieversii</i>	Choont	Rosaceae	Fruit	Fruit is edible	Not reported yet
14.	<i>Morus nigra</i>	Shah tul	Moraceae	Fruit	Edible fruits	Sharma and Rashid (2015)
15.	<i>Prunus pashia</i>	Tang	Rosaceae	Fruits	Fruits are edible.	Not reported yet
16.	<i>Prunus domestica</i>	Aero	Rosaceae	Fruits	Fruits are consumed	Not reported yet
17.	<i>Prunus amygdalus</i>	Aurni	Rosaceae	Fruits	Fruits are eaten.	Not reported yet
18.	<i>Prunus bokharensis</i>	Aloo Bukhara	Rosaceae	Fruits	It can be consumed directly or added to salad.	Not reported yet
19.	<i>Prunus avium</i>	Glass	Rosaceae	Fruit	Fruit is eaten	Ali- Shtayeh <i>et al.</i> (2008)
20.	<i>Prunus armeniaca</i>	Cxenun	Rosaceae	Fruits	Fresh fruits are eaten.	Bhatia <i>et al.</i> (2018)
21.	<i>Prunus cornuta</i>	Zumb	Rosaceae	Fruits	Fresh fruits are eaten	Sharma and Rashid (2015)
22.	<i>Prunus domestica</i>	Aeru	Rosaceae	Fruits	Fresh fruits are eaten	Not reported yet
23.	<i>Podophyllum hexandrum</i>	Wanwagun	Podophyllaceae	Fruit	Fruits can be eaten when ripe.	Sharma and Rashid (2015)
24.	<i>Rubus ulmifolius</i>	Chansshh	Rosaceae	Berries	Fresh berries are edible.	Bandey <i>et al</i> (2021)

Contd...

Table 3: contd....

S.no	Botanical name	Vernacular name	Family	Part used	Uses	Reported
25.	<i>Rubus niveus</i>	Chansh	Rosaceae	Berries	Fresh berries are consumed.	Showkat and Akhter (2018)
26.	<i>Solanum nigrum</i>	Kambai	Solenaceae	Fruits	Fruit is edible	Sharma and Rashid (2015)
27.	<i>Viburnum grandiflorum</i>	Kulmansh/ Kiflu	Viburnaceae	Fruits	Edible fruit	Sharma and Rashid (2015)
28.	<i>Vitis vinifera</i>	Dachh	Vitaceae	Pulpy fruit	Fruit is consumed when ripe.	Sharma and Rashid (2015)
29.	<i>Ziziphus jujube</i>	Brey/ Ber	Rhamnaceae	Fruit	Edible fruit	Sharma and Rashid (2015)



Morus alba



Morus nigra



Morus rubra



Prunus domestica



Prunus armeniaca



Ficus palmata



Rubus ulmifolius



Rubus niveus



Crataegus songarica

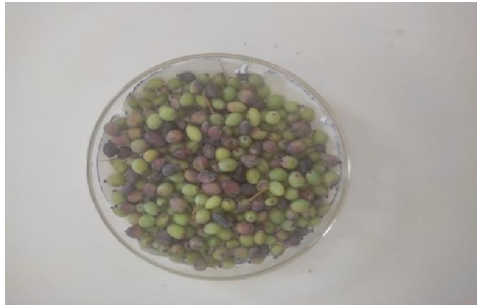


Fragaria nubicola

Plate 4: Wild edible fruit species used by tribal's in the study area

Contd.....

Plate 4 Contd...



Berberis lyceum



Solanum nigrum



Prunus avium



Vitis vinifera



Ziziphus jujube



Juglans regia



Diospyros lotus



Malus siversii

From the data in Table 4, 21 plants species constituting 22% of the total wild edible plants used in the study area were used for beverages belonging to 12 families i.e. Acoraceae, Asteraceae, Polygonaceae, Berberidaceae, Brassicaceae, Rosaceae, Amaranthaceae, Malvaceae, Lamiaceae, Urticaceae, Ericaceae and Plantaginaceae (Plate 5).

The data in Table 5 revealed that 14 species constituting 15% of total wild edible plant species used in the study area were used for food seasoning belonging to 6 families i.e. Asteraceae, Apiaceae, Amaryllidaceae, Umbelliferaceae, Cannabinaceae and Lamiaceae (Plate 6).

From the data in Table 6, a total of 12 (13%) wild edible plant species found in the study area are used for other purposes like pickles, salads, snacks etc. belonging to 8 families i.e. Asteraceae, Malvaceae, Boraginaceae, Saxifragaceae, Athyriaceae, Polygonaceae, Papaveraceae and Rhamnaceae.

The data revealed that the maximum of 44 species which constitute 39.8% of the total, were found to be used as leafy greens. The fruits constitute 30.5 % with 33 species followed by roots (13 species), seeds (8 species), the entire plant (7 species), flowers (6 species) and stem (4 species) which made 12%, 7.4%, 6.4%, 5.5% and 3.7% respectively (Fig 7).

Table 4: List of wild plants and their part used for Tea/Beverages in Southern Kashmir.

S.no	Botanical name	Vernacular name	Family	Part used	Uses	Reported
1.	<i>Acorus calamus</i>	Vai	Acoraceae	Rhizomes	Rhizomes are used to make herbal tea.	Sharma and Rashid (2015)
2.	<i>Artemisia absinthium</i>	Tethwan	Asteraceae	Leaves	Herbal tea is prepared from leaves	Sharma and Rashid (2015)
3.	<i>Bistorta amplexicaulis</i>	Machean	Polygonaceae	Rhizomes	Rhizomes boiled into herbal tea	Sharma and Rashid (2015)
4.	<i>Berberis lyceum</i>	Kaodach	Berberidaceae	Leaves	Raw leaves are used as tea substitute.	Showkat and Akhter (2018)
5.	<i>Capsella bursa pastoris</i>	Kral mund	Brassicaceae	Leaves and roots	Tea is prepared from leaves, roots as ginger substitute	Not reported yet
6.	<i>Craetgus songarica</i>	Ringe	Rosaceae	Leaves	Leaves are used to prepare herbal tea.	Sharmaand Rashid (2015)

Contd...

Table 4: contd....

S.no	Botanical name	Vernacular name	Family	Part used	Uses	Reported
7.	<i>Chenopodium album</i>	Bathua	Amaranthaceae	Seeds	Seeds as fermented alcoholic beverage. The water in which tender greens are cooked can be saved and drunk as a nutritional broth	Bhatia <i>et al.</i> (2018) Not reported yet
8.	<i>Fragaria nubicola</i>	Ashtabar	Rosaceae	Roots	Roots are brewed to get herbal tea.	Bandey <i>et al.</i> (2021)
9.	<i>Malva sylvestris</i>	Boate sochal	Malvaceae	Leaves	Leaves can be steeped in tea.	Not reported yet
10.	<i>Mentha arvensis</i>	Pudina	Lamiaceae	Leaves	Herbal tea is made from leaves	Thawkar <i>et al.</i> (2016)

Contd...

Table 4: contd....

S.no	Botanical name	Vernacular name	Family	Part used	Uses	Reported
11.	<i>Nepeta cataria</i>	Gandsoi	Lamiaceae	Leaves	Leaves are brewed into herbal tea.	Showkat and Akhter (2018)
12.	<i>Ocimum basicilum</i>	Babreboel	Lamiaceae	Seeds	Seeds are used in sherbats.	Sharm and Rashid (2015)
13.	<i>Origanum vulgari</i>	Van baber	Lamiaceae	Leaves	Leaves are used in tea.	Sharma and Rashid (2015)
14.	<i>Polygonum aviculare</i>	Drubhak	Polygonaceae	Leaves	Tea from leaves	Sharmaand Rashid (2015)
15.	<i>Plantago lanceolata</i>	Gul sag	Plantaginaceae	Leaves	Fresh leaves are used to prepare tea.	Showkat and Akhter (2018)

Contd...

Table 4: contd....

S.no	Botanical name	Vernacular name	Family	Part used	Uses	Reported
16.	<i>Rumex acetosa</i>	Ubuji	Polygonaceae	Roots	The roots are brewed into herbal tea	Not reported yet
17.	<i>Rosa webbiana</i>	Shingai	Rosaceae	Fruit, petals	Rose hips can be used to prepare herbal tea. Rose petals to flavor herbal tea	Sharma and Rashid (2015)
18.	<i>Rhododendron arboretum</i>	Surang	Ericaceae	Flowers	Flower juice is used to make drink commonly called sherbet.	Sharma and Rashid (2015)
19.	<i>Salvia rosmarinus</i>	Gulmehendi	Lamiaceae	Leaves	Leaves are used in preparation of tea.	Ali- Shtayeh <i>et al.</i> (2008)
20.	<i>Taraxacum officinale</i>	Handh	Asteraceae	Roots	Tea is made from roots.	Mir (2014)
21.	<i>Urtica dioica</i>	Soi	Urticaceae	Flowers and leaves	Leaves are main ingredient of nettle tea. Tea is also prepared from flowers.	Bandey <i>et al.</i> (2021) Not reported yet



Origanum vulgare



Rosa canina



Ocimum basilicum

Plate 5: Wild edible plant species used for beverages in the study area

Table 5: List of wild plants and their part used for food seasoning in the study area.

S.no	Botanical name	Vernacular name	Family	Part used	Uses	Reported
1.	<i>Achellia millefolium</i>	Pahel gasse	Asteraceae	Entire plant	It is used to add flavor to soups, stews and curries. It can be added to salads	Not reported yet
2.	<i>Angelica glauca</i>	Choru	Apiaceae	Roots	Roots employed as spice	Sharma and Rashid (2015)
3.	<i>Allium humile</i>	Mali piaz	Amaryllidaceae	Bulb	It is used as condiment	Ijaz <i>et al.</i> (2022)
4.	<i>Allium Carolinianum</i>	Jungli rohan	Amaryllidaceae	Bulb	It is used as condiment	Bandey <i>et al.</i> (2021)
5.	<i>Allium seminovii</i>	Jungli pran	Amaryllidaceae	Bulb, leaves and flowers	Bulb, leaves and flowers are used as condiment.	Bandey <i>et al.</i> (2021)
6.	<i>Bunicum persicum</i>	Kalazeera	Umbelliferaceae	Seeds, Fruit	Seeds as flavoring agent and essential oil of the fruit is widely used for seasoning pickles and meat.	Sharma. and Rashid (2015)
7.	<i>Cannabis sativa</i>	Bhang	Cannabinaceae	Seeds	Roasted seeds are eaten as culinary by local people, chutney known as bhang chutney is also prepared.	Not reported yet
8.	<i>Chaerophyllum acuminatum</i>	Neocha	Apiaceae	Seeds	Seeds are used as condiment.	Not reported yet

Contd...

Table 5: contd....

S.no	Botanical name	Vernacular name	Family	Part used	Uses	Reported
9.	<i>Clinopodium vulgare</i>	Shyul	Lamiaceae	Seeds	The seeds are cracked and used in various recipes	Ali- Shtayeh, <i>et al.</i> (2008)
10.	<i>Eryngium caeruleum</i>	Blue blooming umbellifer	Umbelliferaceae	Leaves	Leaves are used as spice.	Sharma and Rashid (2015)
11.	<i>Foeniculum vulgare</i>	Sonf	Apiaceae	Seeds	Fennel seeds are used in aroma.	Ali- Shtayeh <i>et al.</i> (2008)
12.	<i>Mentha arvensis</i>	Pudina	Lamiaceae	Leaves	Used in seasoning of food.	Thawkar <i>et al.</i> (2016)
13.	<i>Salvia rosmarinus</i>	Gulmehendi	Lamiaceae	Leaves	Leaves are used in seasoning of various dishes.	Ali- Shtayeh <i>et al.</i> (2008)
14.	<i>Thymus serpyllum</i>	Javaind	Lamiaceae	Leaves, flowers	Leaves and flowering tops used in salad and used as a garnish or added as a flavoring agent to cooked food.	Ali- Shtayeh <i>et al.</i> (2008)



Thymus serpyllum



Foeniculum vulgare



Achillea millefolium



Mentha arvensis

Plate 6: Wild edible plant species used for food seasoning in southern Kashmir

Table 6: List of wild plants and their part used for other purposes in Southern Kashmir.

S.no	Botanical name	Vernacular name	Family	Uses	Part used	Reported
1.	<i>Achellia millefolium</i>	Pahel gasse	Asteraceae	Entire plant	It is consumed as salad.	Not reported yet
2.	<i>Artemisia absinthium</i>	Tethwan	Asteraceae	Leaves	Leaves are added to pulao.	Sharmaand Rashid (2015)
3.	<i>Arnebia benthami</i>	Kahjawain	Boraginaceae	Roots	Coloring agent to colour food stuffs.	Sharmaand Rashid (2015)
4.	<i>Bergenia ciliate</i>	Pahand/Battmewa	Saxifragaceae	Leaves	Leaves can be fried in dal paste to have pakaudas.	Sharmaand Rashid (2015)
5.	<i>Diplazium esculentum</i>	Kasrode	Athyriaceae	Fronds	Tender fronds are pickled.	Bhatia <i>et al.</i> (2018)
6.	<i>Jurinea himalaica</i>	Thendi-Jeri	Asteraceae	Roots	Uncooked roots are chewed which become chewingum like after chewing.	Mir (2014)
7.	<i>Malva neglecta</i>	Sochal	Malvaceae	Flowers and buds	Flowers and buds are pickled.	Showkat and Akhter (2018)
8.	<i>Oxyria digyna</i>	Chaksin	Polygonaceae	Leaves	Sour sauce can be prepared of its leaves.	Sharmaand Rashid (2015)
9.	<i>Papaver rhoeas</i>	Gul-e-tala	Papaveraceae	Seeds	Seeds are used for topping of local bread (Kulcha).	Bandey <i>et al.</i> (2021)
10.	<i>Portulaca oleraceae</i>	Nunar	Portulacaceae	Leaves	Bread is made from flour of leaves	Not reported yet
11.	<i>Rumex acetosa</i>	Ubuj	Polygonaceae	Leaves	Leaves are made into abuj pakora. The juice of leaves, a curdling agent in milk to convert it into cheese (due to lemon taste).	Sharma and Rashid (2015) Not reported yet
12.	<i>Ziziphus jizuba</i>	Brey/ Ber	Rhamnaceae	Fruits	Fruits are made into pickle.	Sharma and Rashid (2015)

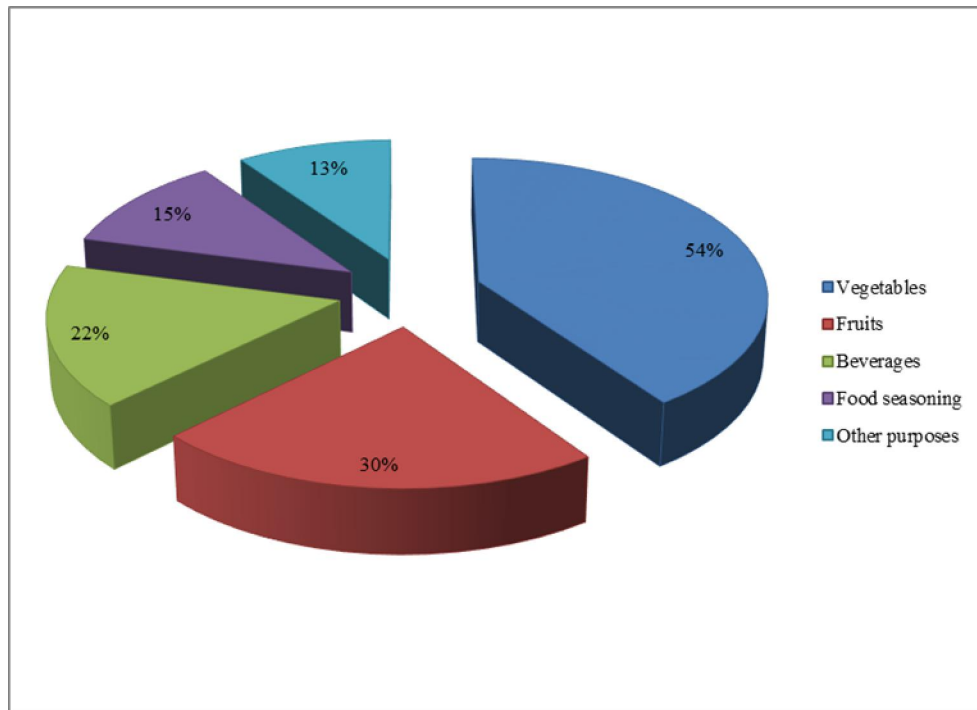


Fig. 6: Categories of Wild Edible Plants species

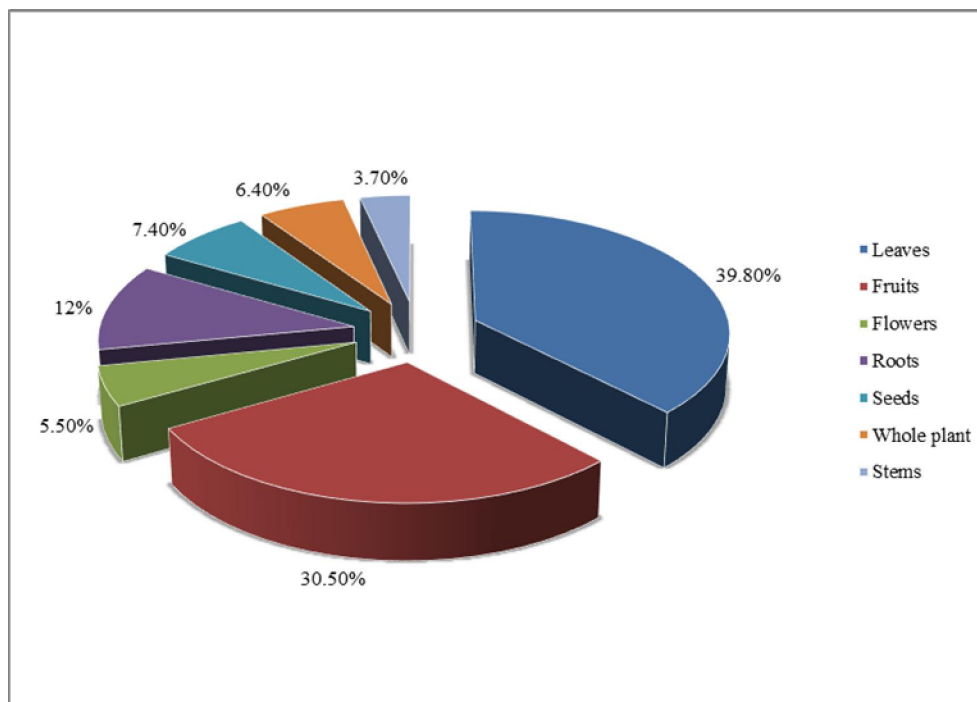


Fig. 7: Diagram showing % age share of plant part used

4.3 Species cultural importance

Table 7 displays the cultural importance index (CI) for the significant species in the study area. The CI of the species that were distributed in the study area showed significant variances. It revealed that in Anantnag district the cultural index ranged from 1.16-0.01 where highest value of cultural index for *Malva neglecta* 1.16 and least for *Salvia rosmarinus* 0.01 while as in district Pulwama the cultural index ranged from 0.97-0.22 with the value of 0.97 for *Juglans regia* and 0.22 for *Primula vulgaris*. Similarly, in Kulgam district the cultural index ranged from 0.95-0.11 with highest value of cultural index recorded for *Rumex acetosa* 0.95 and least for *Aesculus indica* 0.11 furthermore in district Shopian the value of cultural index ranged from 1.00-0.17 with value of 1.00 obtained for *Rumex acetosa* and 0.17 obtained for *Acorus calamus*. It is evident from the data in Table 7 that the maximum mean cultural index of 0.95 was recorded for *Rumex acetosa* followed by *Juglans regia* with mCI of 0.94 and lowest for *Salvia rosmarinus* 0.01.

Table 7: Cultural importance of most relevant species in the study area in the descending order by mean value

S. no	Botanical name	A	P	K	S	Mci
1.	<i>Rumex acetosa</i>	0.95	0.90	0.95	1.00	0.95
2.	<i>Juglans regia</i>	1.00	0.97	0.89	0.93	0.94
3	<i>Foeniculum vulgare</i>	0.85	0.89	0.84	0.82	0.85
4.	<i>Cydonia oblonga</i>	0.82	0.92	0.71	0.92	0.84
5.	<i>Prunus avium</i>	0.82	0.92	0.71	0.92	0.84
6.	<i>Prunus armeniaca</i>	0.92	0.89	0.84	0.67	0.83
7.	<i>Agaricus bisporus</i>	0.89	0.82	0.92	0.73	0.84
8.	<i>Clinopodium vulgare</i>	0.89	0.92	0.73	0.82	0.84
9.	<i>Malva neglecta</i>	1.16	0.75	0.65	0.80	0.84
10.	<i>Asplenium falcatum</i>	0.9	0.75	0.85	0.84	0.83
11.	<i>Lactuca serriola</i>	0.85	0.78	0.85	0.72	0.80
12.	<i>Rubus ulmifolius</i>	0.85	0.72	0.78	0.85	0.80
13.	<i>Rubus niveus</i>	0.72	0.85	0.85	0.85	0.80
14.	<i>Prunus avium</i>	0.85	0.78	0.77	0.80	0.80
15.	<i>DiospyrousLotus</i>	0.70	0.90	0.75	0.85	0.80
16.	<i>Taraxaccum officinale</i>	0.85	0.90	0.75	0.70	0.80
17.	<i>Nepeta cataria</i>	0.85	0.75	0.90	0.70	0.80
18.	<i>Fragaria nubicola</i>	0.85	0.95	0.57	0.78	0.79
19.	<i>Allium seminovi</i>	0.75	0.71	0.82	0.82	0.77
20.	<i>Berberis aristata</i>	0.75	0.82	0.71	0.82	0.77
21.	<i>Mentha arvensis</i>	0.82	0.75	0.70	0.78	0.76
22.	<i>Morus serrate</i>	0.67	0.97	0.60	0.78	0.76
23.	<i>Malus siversii</i>	0.78	0.60	0.67	0.97	0.76
24.	<i>Amaranthus caudatus</i>	0.72	0.64	0.71	0.85	0.75
25.	<i>Diplazium esculentum</i>	0.71	0.72	0.85	0.64	0.75
26.	<i>Amaranthus dubius</i>	0.65	0.90	0.76	0.64	0.74
27.	<i>Malva slyvestris</i>	0.83	0.85	0.64	0.66	0.74
28.	<i>Jurinera</i>	0.61	0.76	0.72	0.89	0.74
29.	<i>Plantago lanceolata</i>	0.89	0.72	0.76	0.61	0.74
30.	<i>Chenopodium album</i>	0.76	0.65	0.90	0.64	0.74
31.	<i>Morus alba</i>	0.90	0.76	0.64	0.65	0.74
32.	<i>Ocimum basilicum</i>	0.64	0.76	0.65	0.90	0.74
33.	<i>Morchella esculenta</i>	0.75	0.76	0.71	0.66	0.72
34.	<i>Amaranthus creuntus</i>	0.66	0.82	0.65	0.72	0.71
35.	<i>Craetgus songarica</i>	0.82	0.66	0.65	0.72	0.71
36.	<i>Oxyria digyna</i>	0.85	0.90	0.67	0.40	0.70
37.	<i>Ziziphus jujube</i>	0.80	0.70	0.65	0.66	0.70
38.	<i>Beta vulgaris</i>	0.66	0.71	0.65	0.64	0.66

Contd....

Table 7: contd...

S.no	Botanical name	A	P	K	S	mCI
39.	<i>Allium coralinianum</i>	0.71	0.65	0.64	0.66	0.66
40.	<i>Artemisia absinthum</i>	0.53	0.85	0.53	0.78	0.67
41.	<i>Allium humile</i>	0.66	0.40	0.95	0.65	0.66
42.	<i>Capsella bursa pastoris</i>	0.95	0.66	0.40	0.65	0.66
43.	<i>Prunus cornuta</i>	0.95	0.66	0.65	0.40	0.66
44.	<i>Prunus domestica</i>	0.66	0.40	0.65	0.95	0.66
45.	<i>Berberis lyceum</i>	0.60	0.85	0.64	0.53	0.65
46.	<i>Dipsacus innermis</i>	0.75	0.72	0.41	0.64	0.63
47.	<i>Rheum webbiana</i>	0.571	0.67	0.78	0.50	0.63
48.	<i>Podophyllum hexandrum</i>	0.60	0.67	0.50	0.71	0.62
49.	<i>Ficus palmate</i>	0.30	0.46	0.84	0.75	0.60
50.	<i>Prunus amygdalus</i>	0.30	0.75	0.84	0.46	0.60
51.	<i>Achellia melifolium</i>	0.42	0.51	0.60	0.75	0.57
52.	<i>Centaura iberica</i>	0.42	0.60	0.75	0.51	0.57
53.	<i>Scandix pectin veneris</i>	0.60	0.42	0.51	0.75	0.57
54.	<i>Urtica dioica</i>	0.70	0.50	0.75	0.30	0.56
55.	<i>Thymus serpyllum</i>	0.65	0.70	0.37	0.50	0.55
56.	<i>Torilis scabra</i>	0.70	0.50	0.65	0.37	0.55
57.	<i>Prunus bokharensis</i>	0.48	0.62	0.57	0.50	0.54
58.	<i>Rheum austral</i>	0.48	0.50	0.62	0.57	0.54
59.	<i>Portulaca oleracea</i>	0.48	0.62	0.57	0.50	0.54
60.	<i>Angelica glauca</i>	0.39	0.25	0.75	0.65	0.51
61.	<i>Primula vulgaris</i>	0.30	0.22	0.50	0.66	0.42
62.	<i>Bistorta amplexicaulis</i>	0.39	0.75	0.52	-	0.41
63.	<i>Cichorium intybus</i>	0.42	0.37	0.25	0.35	0.41
64.	<i>Sassurea lappa</i>	0.51	0.30	0.37	0.51	0.41
65.	<i>Chaerophyllum acuminatum</i>	0.51	0.37	0.30	0.51	0.41
66.	<i>Polygonum aviculare</i>	0.30	0.46	0.51	0.37	0.41
67.	<i>Vibrumun grandifolium</i>	0.50	0.40	-	0.60	0.37
68.	<i>Rosa webbiana</i>	0.40	0.50	0.60	-	0.37
69.	<i>Rosa canina</i>	0.21	0.30	0.50	0.22	0.29
70.	<i>Bergenia ciliate</i>	-	-	-	0.28	0.28
71.	<i>Origanum vulgare</i>	0.42	0.29	-	0.20	0.22
72.	<i>Solanum nigrum</i>	0.14	-	0.37	0.31	0.20
73.	<i>Acorus calamus</i>	0.35	-	0.17	0.17	0.17
74.	<i>Arnebia benthami</i>	0.25	-	0.14	0.25	0.16
75.	<i>Aesculus indica</i>	-	-	0.11	-	0.11
76.	<i>Salvia rosmarinus</i>	0.01	-	-	-	0.01

A: Anantnag, P: Pulwama, S:Shopian, K: Kulgam

4.4 Cultural importance of the families

The significant families documented in each area are shown in Table 8 along with their cultural significance. Malvaceae had the highest mCIF of 0.795 followed by Amaranthaceae with mCIF 0.725, Berberidaceae with mCIF of 0.715, Amaryllidaceae with mCIF of 0.704, Rosaceae with mCIF of 0.678, Asteraceae with mCIF of 0.625, Moraceae with mCIF of 0.601, Apiaceae with mCIF of 0.581. Other families are Polygonaceae with 0.579 mCIF and Lamiaceae 0.559 mCIF.

Table 8: Cultural importance index (CI) of some of the important families in each of the surveyed areas, in the descending order of the mean estimated for the Southern Kashmir

S.no	Family	No. of species	mCIF
1.	Malvaceae	2	0.795
2.	Amaranthaceae	5	0.725
3.	Berberidaceae	2	0.715
4.	Amaryllidaceae	3	0.704
5.	Rosaceae	14	0.678
6.	Asteraceae	8	0.625
7.	Moraceae	3	0.601
8.	Apiaceae	5	0.581
9.	Polygonaceae	6	0.579
10.	Lamiaceae	7	0.559

4.5 Most sighted wild edible plant species

The data collected on most sighted wild edible plants from southern Kashmir in Table 9 revealed that the maximum of 16 species belonging to 12 families of wild edible plants are used as food in all the four districts of Southern Kashmir. The most often sighted wild plants are *Malva neglecta*, *Rumex acetosa*, *Plantago lanceolata*, *Agaricus bisporus*, *Foeniculum vulgare*, *Cydonia oblonga*, *Fragaria nubicola*, *Taraxacum officinale*, *Mentha arvensis*, *Allium seminovii*, *Prunus avium*, *Thymus serpyllum*, *Diplazium esculentum*, *Rubus ulmifolius*, *Ziziphus jujuba* and *Juglans regia*.

Table 9: Most sighted Wild Edible Plant Species (WEPs) and their families in each of four districts of Southern Kashmir

S.no.	Botanical name	Common name	Family
1.	<i>Malva neglecta</i>	Dwarf mallow	Malvaceae
2.	<i>Rumex acetosa</i>	Sorrel	Polygonaceae
3.	<i>Plantago lanceolata</i>	Ribwort Plantain	Plantaginaceae
4.	<i>Agaricus bisporus</i>	Button mushroom	Agaricaceae
5.	<i>Foeniculum vulgare</i>	Sweet fennel	Apiaceae
6.	<i>Cydonia oblonga</i>	Quince apple	Rosaceae
7.	<i>Fragaria nubicola</i>	Wild strawberry	Rosaceae
8.	<i>Taraxacum officinale</i>	Dandelion	Asteraceae
9.	<i>Mentha arvensis</i>	Mint	Lamiaceae
10.	<i>Allium seminovii</i>	Wild onion	Amaryllidaceae
11.	<i>Prunus avium</i>	Wild cherry	Rosaceae
12.	<i>Thymus serpyllum</i>	Wild thyme, wild thyme, mother of thyme	Lamiaceae
13.	<i>Diplazium esculentum</i>	Fiddlehead fern	Aspleniaceae
14.	<i>Rubus ulmifolius</i>	Blackberry	Rosaceae
15.	<i>Juglans regia</i>	Walnut	Juglandaceae
16.	<i>Ziziphus jujuba</i>	Jijube	Rhamnaceae

4.6 Preferences among five wild plants most often consumed as vegetable in each of four districts

Data pertaining to the Table 10 revealed that the most frequently used plant species in all the four districts were *Rumex acetosa*, *Taraxacum officinale*, *Malva neglecta*, *Agaricus bisporus*, and *Asplenium falcatum*. The consumption of these widely used vegetables is highly dependent on districts in which they are used. Chi square was significant for all the five species, highest value of chi-square was recorded for *Malva neglecta* 23.759 followed by *Agaricus bisporus*, *Taraxacum officinale*, *Rumex acetosa* 23.23, 22.686, 20.11 respectively and least value was recorded for *Asplenium falcatum* 14.139.

According to the data in Table 10, in Anantnag 95% of the respondents were using *Rumex acetosa* and 5% of the respondents were not using this species. Similar results were observed for *Agaricus bisporus*, *Asplenium falcatum*, *Malva neglecta* and *Taraxacum officinale* with positive response of 89%, 90%, 89% and 86% and negative response of 11%, 10%, 11% and 14% respectively.

In Pulwama district 126 (90%) of the respondents were using *Rumex acetosa* and 14 (10%) were not using. Similar results were observed for *Agaricus bisporus*, *Asplenium falcatum*, *Malva neglecta* and *Taraxacum officinale* with positive response of 82%, 93%, 75% and 90% and negative response of 18%, 7%, 25% and 10% respectively.

In Shopian district, 133 (95%) respondents were using *Rumex acetosa* and 7 (5%) were not using it at all. Similar results were observed for *Agaricus bisporus*, *Asplenium falcatum*, *Malva neglecta* and *Taraxacum officinale* with positive response of 93%, 86%, 66% and 75% and negative response of 7%, 14%, 34% and 25% respectively.

Similarly in district Kulgam, 120(86%) of the respondents were using *Rumex acetosa* and 20 (14%) were not using it. Similar results were recorded for *Agaricus bisporus*, *Asplenium falcatum*, *Malva neglecta* and *Taraxacum officinale* with positive response of 74%, 79% 81%, 70% and negative response of 26%, 21%, 19% and 30% respectively.

Table 10: Preferences among five wild plants most often consumed as vegetable in each of four districts

Districts	<i>Rumex acetosa</i>		<i>Agaricus bisporus</i>		<i>Asplenium falcatum</i>		<i>Malva neglecta</i>		<i>Taraxacum officinale</i>	
	Y	N	Y	N	Y	N	Y	N	Y	N
A	133 (95%)	7 (5%)	125 (89%)	15 (11%)	126 (90%)	14 (10%)	125 (89%)	15 (11%)	120 (86%)	20 (14%)
P	126 (90%)	14 (10%)	115 (82%)	25 (18%)	130 (93%)	10 (7%)	105 (75%)	35 (25%)	126 (90%)	14 (10%)
S	133 (95%)	7 (5%)	130 (93%)	10 (7%)	120 (86%)	20 (14%)	92 (66%)	48 (34%)	105 (75%)	35 (25%)
K	120 (86%)	20 (14%)	103 (74%)	37 (26%)	110 (79%)	30 (21%)	113 (81%)	27 (19%)	98 (70%)	42 (30%)
χ^2 test	$\chi^2= 20.11$		$\chi^2=23.23$		$\chi^2= 14.139$		$\chi^2= 23.759$		$\chi^2= 22.686$	
(p≤0.05)	p.value = 0.0004366		p.value =3.617e-05		p.value = 0.002722		p.value = 0.2.804e-05		p.value = 4.695e-05	

N = 140

Y = Used by respondents N = Not used by respondents

A:Anantnag, P:Pulwama, K:Kulgam S:Shopian

4.7 Preferences among five wild plants most often consumed as vegetable in each of four districts

Data pertaining to the Table 11 revealed that the most frequently used plant species in all the four districts were *Juglans regia*, *Cydonia oblonga*, *Prunus armeniaca*, *Prunus avium* and *Rubus ulmifolius*. The consumption of these widely used vegetables is highly dependent on districts in which they are used. The value of Chi-square was different for different species and highest value of Chi-square was recorded for *Prunus armeniaca* 35.729 followed by *Cydonia oblonga* and *Prunus avium*, *Rubus ulmifolius* 32.805, 32.805, 28.744 respectively and least value was recorded for *Juglans regia* 15.759.

According to the data in Table 11, in Anantnag 120 (86%) of the respondents were using *Juglans regia* and 20 (14%) respondents were not using this species. Similar results were observed for *Cydonia oblonga*, *Prunus armeniaca*, *Prunus avium* and *Rubus ulmifolius* with positive response of 82%, 92%, 82%, 86% and negative response of 18%, 8%, 18% and 14% respectively.

In district Pulwama 136 (97%) of the respondents were using *Juglans regia* and 4 (3%) respondents were not using this species. Similar results were observed for *Cydonia oblonga*, *Prunus armeniaca*, *Prunus avium* and *Rubus ulmifolius* with positive response of 93%, 89%, 93%, 73% and negative response of 7%, 11%, 7% and 27% respectively.

In district Shopian 125 (89%) of the respondents were using *Juglans regia* and 15 (11%) respondents were not using this species. Similar results were observed for *Cydonia oblonga*, *Prunus armeniaca*, *Prunus avium* and *Rubus ulmifolius* with positive response of 71%, 84%, 71%, 79% and negative response of 29%, 16%, 29% and 21% respectively.

In district Shopian 131 (94%) of the respondents were using *Juglans regia* and 9 (6%) respondents were not using this species. Similar results were observed for *Cydonia oblonga*, *Prunus armeniaca*, *Prunus avium* and *Rubus ulmifolius* with positive response of 92%, 68%, 92%, 86% and negative response of 8%, 32%, 8% and 14% respectively.

Table 11: Preferences among five wild plants most often consumed as vegetable in each of four districts

Districts	<i>Juglans regia</i>		<i>Cydonia oblonga</i>		<i>Prunus armeniaca</i>		<i>Prunus avium</i>		<i>Rubus ulmifolius</i>	
	Y	N	Y	N	Y	N	Y	N	Y	N
A	120 (86%)	20 (14%)	115 (82%)	25 (18%)	129 (92%)	11 (8%)	115 (82%)	25 (18%)	120 (86%)	20 (14%)
P	136 (97%)	4 (3%)	130 (93%)	10 (7%)	125 (89%)	15 (11%)	130 (93%)	10 (7%)	102 (73%)	38 (27%)
S	125 (89%)	15 (11%)	100 (71%)	40 (29%)	118 (84%)	22 (16%)	100 (71%)	40 (29%)	110 (79%)	30 (21%)
K	131 (94%)	9 (6%)	129 (92%)	11 (8%)	95 (68%)	45(32%)	129 (92%)	11 (8%)	120 (86%)	20 (14%)
χ^2 test (p≤0.05)	$\chi^2= 15.759$ p.value = 0.001362		$\chi^2= 32.805$ p.value = 3.54e-07		$\chi^2= 35.729$ p.value = 8.543e-08		$\chi^2= 32.805$ p.valu e= 3.54e-07		$\chi^2= 28.744$ p.value = 2.534e-06	

N = 140

Y = Used by the respondents N = Not used by respondents

A:Anantnag, P:Pulwama, K:Kulgam S:Shopian

4.8 Threats to wild edible plant species and ranking of factors of threats

The investigation of the research area revealed that there are seven biotic stressors on wild food plants in their habitats. These factors are primarily brought on by human activities. Depending on the area, these actions had varying degrees of impact. Overharvesting, overgrazing, agricultural land expansion, fuel wood gathering, uncontrolled fire, climate change and insecticides are a few of these practices.

Table 12 displays the number of informants who listed each factor. In Anantnag district, the overgrazing was observed as major factor with 78 responses followed by overharvesting, climate change, agricultural expansion, insecticides and fuel wood collection with 66, 59, 50, 43 and 35 responses respectively. The minimum of 22 responses were obtained for uncontrolled fire factor. In district Pulwama, overharvesting was observed as a major factor with 78 responses, followed by climate change, agricultural expansion, over grazing, fuel wood collection with 66, 59, 50 and 43 responses. The minimum of 22 responses were obtained for insecticides. In district Kulgam climate change was observed as major factor with 78 responses followed by agricultural expansion, fuel wood collection, over harvesting, uncontrolled fire and over grazing with 66, 59, 50, 43 and 35 responses respectively. The minimum of 22 responses was obtained for insecticides. Similarly in district Shopian, over grazing was observed as major factor with 78 responses, followed by over harvesting, uncontrolled fire, climate change, agricultural expansion and insecticides with 66, 59, 50, 43 and 35 responses. The minimum of 22 responses was obtained for fuel wood collection. The mean score of these factors ranged from 65.00 to 30.50 with highest value obtained for overharvesting and least for insecticides. The incidence of overgrazing is higher in Anantnag and Shopian it may be because of lack of proper animal and wildlife feeding management on the available pastures. The reason for higher incidence of over harvesting in Pulwama might be increase in the human population, increasing demand and expanding markets and higher

incidence of climate change in Kulgam might be because of cutting down of forests and burning of fossil fuels.

The data in Table 12 revealed that over harvesting and climate change ranked 1st and 2nd, over grazing and agricultural expansion ranked 3rd and 4th, uncontrolled fire and fuel wood collection both ranked 5th and insecticides ranked 6th.

Table 12: Results of the ranking of factors considered as threats to wild edible plants (Garrett's Ranking)

Factors	A	P	K	S	Mean Score	Rank
Over harvesting	66	78	50	66	65.00	1
Climate change	59	66	78	50	63.25	2
Over grazing	78	50	35	78	60.25	3
Agriculture expansion	50	59	66	43	54.50	4
Uncontrolled fire	22	35	43	59	39.75	5
Fuel wood collection	35	43	59	22	39.75	5
Insecticides	43	22	22	35	30.50	6

N = 140

A: Anantnag, P: Pulwama, K: Kulgam, S: Shopian

4.9 Plant preservation methods

The data collected revealed that most plants are harvested and conserved so they can be used throughout the year for longer lengths of times sometimes all year round. The most popular methods for preserving plants are air and sun drying, followed by storage in appropriate containers (glass containers) (Fig. 8). The data revealed that 65% of the informants claimed that natural woods were the places from where the wild edibles plant species were collected followed by agricultural fields, alpine pastures and roadsides 20%, 10% and 5% respectively (Fig 9).

Table 13: Plant preservation methods used by local people in the study area

S.no	Latin name	Common name	Ways of preservation
1.	<i>Taraxacum officinale</i>	Dandelion	Leaves are sun dried for some days and then kept in suitable jars.
2.	<i>Rumex acetosa</i>	Sorrel	Leaves are dried in the sun for 3-4 days and then kept in bags or in glass containers.
3.	<i>Portulaca oleraceae</i>	Purslane	Leaves are sundried for many days and then kept in glass.
4.	<i>Agaricus bisporus</i>	Mushroom	Fruiting body is dried and then kept in suitable jars.
5.	<i>Centaurea iberica</i>	Iberian star thistle	Leaves are placed in boiling water for 20 minutes and after settling placed inside bags of frozen in the fridge.
6.	<i>Foeniculum vulgare</i>	Sweet fennel	Leaves are sundried for 5 days and kept in glass.
7.	<i>Thymus serpyllum</i>	Wild thyme, mother of thyme	Leaves are dried in sun for 4-5 days and kept in bags
8.	<i>Malva neglecta</i>	Common mallow	Leaves are sundried for 2-4 days and then placed in bags. Leaves are washed and then kept in fridge.
9.	<i>Mentha arvensis</i>	Wild mint	Leaves are sundried for 2 days and after drying they are kept in bags.
10.	<i>Nasturtium officinale</i>	Watercress	Leaves are sundried for many days and then kept in bags.
11.	<i>Asplenium falcatum</i>	Spleenwort	Fronds are sundried for 4 days and then kept in bags.
12.	<i>Plantago major</i>	Broad leaf plantain	Leaves are sundried for 5 days and kept in glass.
13.	<i>Berginia ciliate</i>	Fringed bergenia	Leaves are dried in sun for some days and kept in bags or in glass jars.

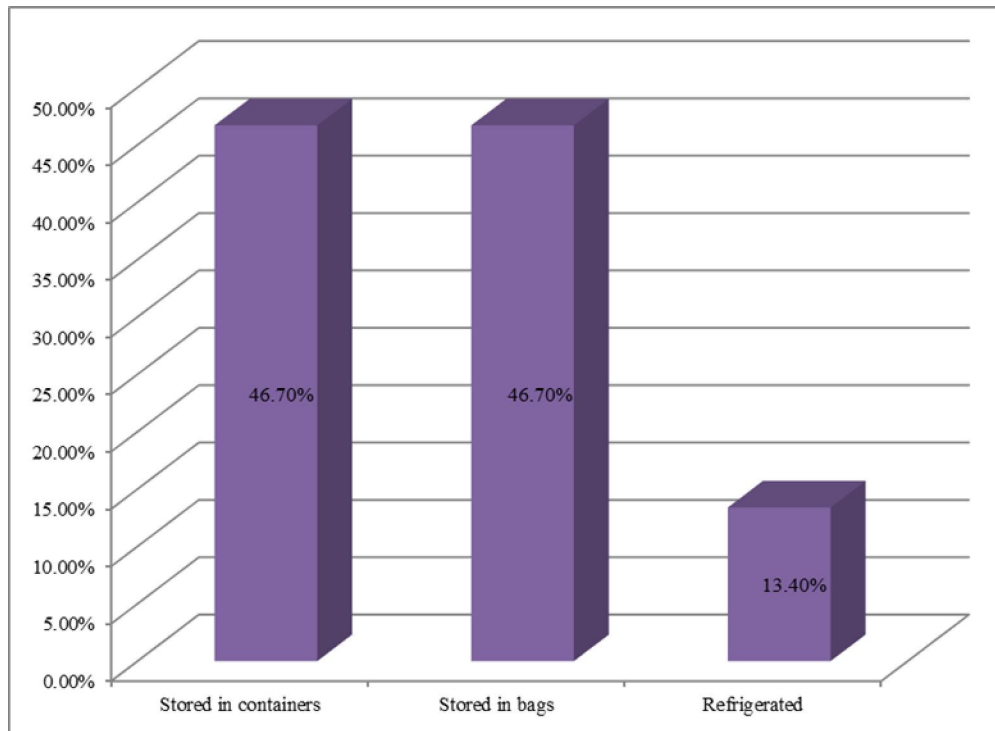


Fig. 8: Storage type for Wild Edible Plant Species (WEPs)

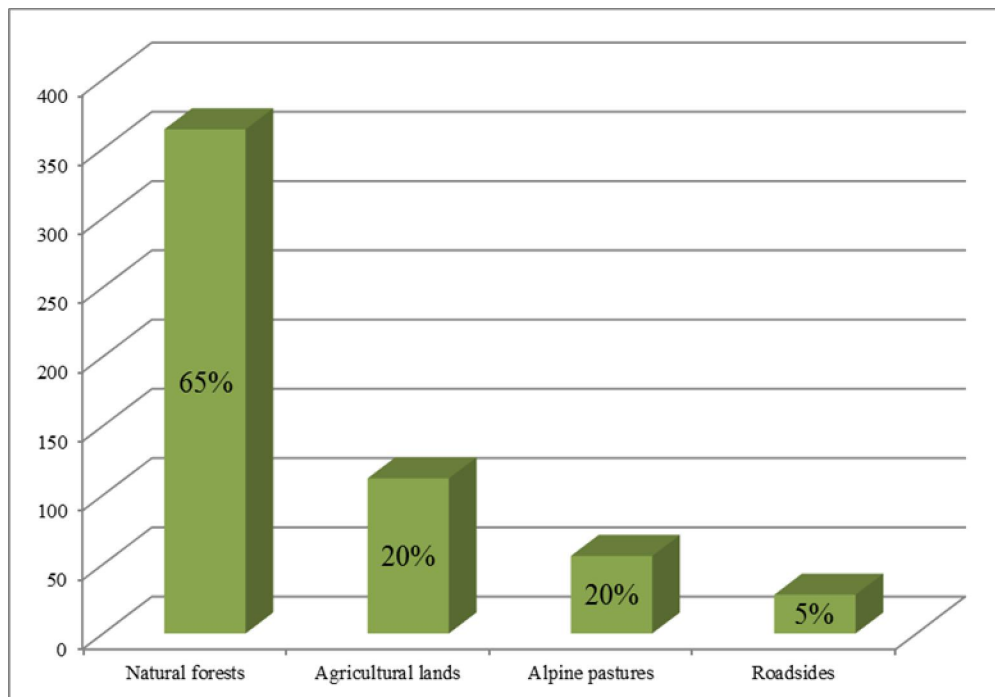


Fig. 9: Wild edible plants collection habitats

4.10 Area selection index

Table 14 shows the Area selection index for each food category, significant differences appear in the value of area selection index (ASI). It was observed that food categories (Vegetables, Fruits, Spices and Beverages) have a strong dependency on all the four districts of Southern Kashmir.

In district Anantnag the maximum of 110 (56%) respondents were using wild plants species for vegetables, followed by 45 (47%) respondents for beverages, 2(26%) for food seasoning 15(8%) for fruits. In Pulwama district 79 (68%) of the respondents were using wild plants for vegetables followed by 20 (17%) for fruits, food seasoning 9 (8%) and beverages 8 (7%). Similarly in Kulgam district 117 (86%) of the respondents were utilizing wild edible plants for vegetables, 26 (19%) for food seasoning, 16 (11%) for beverages and 10 (7%) for fruits In Shopian district 36 (45%) of the respondents use these plant species for vegetables, 20 (25%) for fruits, 18 (23%) for food seasoning and 6 (8%) for beverages.

Table 14: Area Selection index for each food category

Districts Food category	Anantnag	Pulwama	Kulgam	Shopian
Vegetables	110 (56%)	79 (68%)	117 (86%)	36 (45%)
Fruits	15 (8%)	20 (17%)	10 (7%)	20 (25%)
Food seasoning	25 (26%)	9 (8%)	26 (19%)	18 (23%)
Herbal tea/ Beverages	45 (47%)	8 (7%)	16 (11%)	6 (8%)
Chi-Square (p≤0.05)	$\chi^2= 19.472$ p.value= 0.008159			

Chapter 5

DISCUSSION

In order to meet the objectives of the study entitled “Ethnobotanical study of Wild Edible Plant Species in South Kashmir”, survey was carried out in Southern Kashmir in four districts, Anantnag, Kulgam, Pulwama and Shopian with four tehsils in each district and four villages in each tehsil during year 2021-2022. Random sampling was used to select households inside the villages. The results of the investigation have been summarized in this chapter under the following headings:

- 5.1 Wild edible plants, their diversity, plant part used and modes of consumption
- 5.2 Cultural importance index of species and families
- 5.3 Biotic pressure on Wild Edible Plants and modes of preservation of these plants.
- 5.4 Area selection index

5.1 Wild edible plants species, their diversity, Plant part used and mode of consumption

Wild edible plant species (WEPs) are a priceless natural gift and majority of tribal people rely on them for daily sustenance. Wild edible plant species not only add to the food supply but also provide a crucial means of survival during times of scarcity, enhancing human nutrition all year long.

5.1.1 Study population

The current study reveals that with 370, out of total 560 respondents women were more heavily represented in the samples than men, who constitute 190 of the total respondents. This is so because women are crucial in the use and management of natural resources and frequently possess in-depth knowledge of

the current state of nature. The majority of the informants were over 50 years old; this may be because older individuals typically have better knowledge of tradition and culture. The majority of the sample population is made up of illiterate individuals followed by those one with elementary education and lastly those with a university degree. There may be a variety of socio-cultural reasons that contribute to the greater incidence of illiteracy among older persons. According to Hinnawi, 2010, women in Palestine are more closely associated with food and food preparation; meals in rural areas frequently include wild edible plants. The results of Mago and Gunwal 2019 women are crucial to protect environment and natural resources such as fuel, food, fodder, forest land, water all are accessible to women, particularly in rural areas where 70% of Indians live and are reliant upon natural resources.

5.1.2 Taxonomic diversity

According to Table 1, 96 wild edible plant species, belonging to 44 families and 77 genera are illustrated in Table 1. The study revealed that maximum of 14 species belong to family Rosaceae followed by Asteraceae with 8 species, Lamiaceae 7 species, Polygonaceae 6 species Apiaceae and Amaranthaceae both with 5 species, Brassicaceae, Moraceae and Amaryllidaceae 3 species each followed by Agaricaceae, Malvaceae, Berberidaceae, Umbelliferaceae, Ranunculaceae, Plantaginaceae with two species each and Caryophyllaceae, Primulaceae, Fabaceae, Portulacaceae, Morchellaceae, Pyronmataceae, Asphodelaceae, Caprofoliaceae, Dioscoraceae, Athyriaceae, Aspleniaceae, Sapindaceae, Batulaceae, Ebenaceae, Elegendaceae, Juglandaceae, Podophyllaceae, Solenaceae, Vibuenaceae, Vitaceae, Acoraceae, Brassicaceae, Ericaceae, Cannabinaceae, Saxiferaceae, Boriginaceae, Papaveraceae and Rhamnaceae with only 1 species. These are well distributed in different life forms 58 herbs (60%), 19 trees (20%), 15 shrubs (16%) and 4(4%) fungus. This diversity of wild edible plants can be attributed to adequate temperature, precipitation, altitude, soils, geography and presence of other species. The traditional knowledge and practice

of the inhabitants of Southern Kashmir in using such a vast range of wild edible plants demonstrates their enduring reliance on wild plants. The findings are in line with Singh *et al.* (2016) who documented 111 species classified into 87 genera and 43 families as locally available food resources in Bandipora. The findings concur with those of Showkat and Akhtar 2018 who listed 33 plants species from 17 families that rural inhabitants in the Baramulla district have historically used as a source of sustenance in their daily lives. Additionally, Manduna and Vibran discovered that 26 wild edible plant species from 15 different families were consumed in Zimbabwe. The results are in conformity with the results of Bhatia *et al.* (2018) in Udhampur they identified 47.8% of herbs, 32.2% trees, 14.4 % shrubs and 5.6% climbers. The findings are also in line with Khanum *et al.* (2022).

5.1.3 Categories of Wild Edible Plant Species

Out of the total 96 species identified, 52 species which constitute 54% of total wild edible plant species were used for vegetables belonging to 28 families i.e. Aspleniaceae, Agaricaceae, Amaranthaceae, Amaryllidaceae, Umbelliferaceae, Polygonaceae, Asteraceae, Brassicaceae, Rosaceae, Athyriaceae, Dioscoraceae, Caprifoliaceae, Apiaceae, Asphodelaceae, Moraceae, Pyronemataceae, Malvaceae, Morchellaceae, Brassicaceae, Lamiaceae, Phytolaccaceae, Plantaginaceae, Portulacaceae, Primulaceae, Ranunculaceae, Caryophyllaceae, Fabaceae and Urticaceae (Table 2, Plate 3), 29 species which constitute 30% of the total wild edible plants used in southern Kashmir were used as fruits belonging to 13 families i.e. Rosaceae, Moraceae, Batulaceae, Ebenaceae, Sapindaceae, Berberidaceae, Elaeagnaceae, Juglandaceae, Solenaceae, Viburnaceae, Vitaceae, Rhamnaceae and Podophyllaceae (Table 3, Plate 4) followed by 21 species which constitute 22% for herbal tea/beverages belonging to 12 families Acoraceae, Asteraceae, Polygonaceae, Berberidaceae, Brassicaceae, Rosaceae, Amaranthaceae, Malvaceae, Lamiaceae, Urticaceae, Ericaceae and Plantaginaceae (Table 4, Plate 5). 14 species constituting 15% of total wild edible plant species used in the study area were used for food seasoning belonging to 6

families i.e. Asteraceae, Apiaceae, Amaryllidaceae, Umbelliferaceae, Cannabinaceae and Lamiaceae (Table 5, Plate 6) and 12 species which constitute 13% of total wild edible plant species found in the study area are used for other purposes like pickles, salads, snacks etc. belonging to 8 families i.e. Asteraceae, Malvaceae, Boraginaceae, Saxifragaceae, Athyriaceae, Polygonaceae, Papaveraceae and Rhamnaceae (Table 6) (Fig 6). The reason for consumption of large number of wild edible plant species might be due to that vegetables and leafy greens are priority however fruits, spices and beverages are optional. This outcome is consistent with Maduna and Vibrans's (2019) findings in Zimbabwe, which showed that 47% of all species were used as fruits, 44% as vegetables, 9% as beverages, 8% as snacks and 1 plant for seed oils. Additionally they discovered that Amaranthaceae, Malvaceae and Solenaceae supplied the majority of vegetable species. This conclusion is also in line with that of Bhatia *et al.* (2018) who found that 46 species of vegetables were utilized, followed by 37 species of fruits in Udhampur.

5.1.4 Plant part used

The data revealed that the maximum of 44 species which constitute 39.8% of the total, were found to be used as leafy greens. The fruits constitute 30.5 % with 33 species followed by roots (13 species), seeds (8 species), the entire plant (7 species), flowers (6 species) and stem (4 species) which made 12%, 7.4%, 6.4%, 5.5% and 3.7% respectively (Fig 7). This may be because many wild greens have significant iron contents, which contributes to the fact that they increase the volume of blood in the body. Hinnawi (2010) provides strong support for that. In Palestine the majority of wild plant parts consumed are leaves (66%), followed by foliage (15%), stems and inflorescence components respectively by 7% and 5%. According to Bhatia *et al.* (2018) fruit accounted for 35.5% of the total, followed by leaves 26.4%, seeds 10%, shoots 8.9%, flowers 5.5%, roots 2.7% tubers 4.6%, pods 1.8% and other 4.5% in Udhampur.

5.1.5 Modes of consumption

The study's findings revealed that most plant portions are eaten after being cooked. According to the regional customs, there are numerous various ways to consume the wild edible plants. They require various preparation procedures because they are typically either eaten raw or cooked. People no longer have enough free time to walk outside and eat edible vegetation, since they frequently eat cooked food, edible wild plants are picked and brought home to be employed in more complex cooking techniques (Ali- shtayeh *et al.*, 2008).

The informants used a variety of cooking techniques, for example various plants like *Malva neglecta* are typically cut and washed and fried in oil. Making gravy (oamdoad yakhni) is how *Geopora arenicola* is prepared and *Ficus palmata* leaves are chopped into smaller pieces, rinsed and cooked into a curry using diluted yoghurt. Most of the plants that have edible leaves and fruits are consumed uncooked, most of these plants are consumed fresh as soon as they are harvested like the fruits of *Cydonia oblonga*, *Prunus avium*, *Foeniculum vulgare*, *Origanum vulgare*, *Vitis vinifera* etc. The results of Ali-Shtayeh *et al.* (2008) are compatible with the findings of this study. They claim that a variety of wild edible plants are used in old recipes. For instance, *Majorana syriaca* is used to prepare a traditional cuisine known as "Za tar" and the leaves of *Rumex acetosa* are used as the filling for a classical pie called "Sambossek".

5.2 Cultural index of species and families

5.2.1 Cultural index of species

Cultural importance index (CI) considers each species's diversity of off usage as well as show how widely it is used (the number of informants). The entire number of various food use categories makes up the index's theoretical maximum value. The results of CI value demonstrate that most plant species with high CI values were consumed as food. In Anantnag district the cultural index ranged from 1.16-0.01 where highest value of cultural index for *Malva neglecta*

1.16 and least for *Salvia rosmarinus* 0.01 while as in district Pulwama the cultural index ranged from 0.97-0.22 with the value of 0.97 for *Juglans regia* and 0.22 for *Primula vulgaris*. Similarly, in Kulgam district the cultural index ranged from 0.95-0.11 with highest value of cultural index recorded for *Rumex acetosa* 0.95 and least for *Aesculus indica* 0.11 furthermore in district Shopian the value of cultural index ranged from 1.00-0.17 with value of 1.00 recorded for *Rumex acetosa* and 0.17 obtained for *Acorus calamus*. It is evident from the data in Table 7 that the maximum mean cultural index of 0.95 was recorded for *Rumex acetosa* followed by *Juglans regia* with mCI of 0.94 and lowest for *Salvia rosmarinus* 0.01. The reason for higher value of cultural index for some species might be due to their easy accessibility, wide distribution, taste and ease of preparedness.

Another set of species have mCI value ranging between 0.1-0.50 this includes: *Acorus calamus*, *Aesculus indica*, *Arnebia benthami*, *Angelica glauca*, *Bistorta amplexicaulis*, *Bergenia ciliate*, *Chicorium intybus*, *Rosa canina*, *Diospyros lotus*, *Polygonum aviculare*, *Salvia rosmarinus*, *Solanum nigrum*, *Sassurea costus*, *Rheum emodi*, *Viburnum grandifolium* etc. The other listed plant species have an mCI between 0.50-1.0 including *Asplenium falcatum*, *Angelica glauca*, *Agaricus bisporus*, *Artemisia absinthium*, *Amaranthus caudatus*, *Allium coralnianum*, *Allium seminovi*, *Berberis lycium*, *Chenopodium album*, *Cydonia oblonga*, *Foeniculum vulgare*, *Fragaria nubicola*, *Taraxacum officinale*, *Malva sylvestris*, *Malva neglecta*, *Morchella esculenta*, *Prunus fasciculata*, *Plantago lanceolata*, *Plantago major*, *Portulaca oleraceae*, *Prunus avium*, *Prunus tomentosa*, *Vitis vinifera*, *Ziziphus jujuba* etc. The findings are consistent with those of Hinnawi (2010), which determined that *Majorana syriaca* had the highest cultural index with a mCI value of 1.96 in Palestine. *Arum palestinum*, *Rumex acetosa*, *Rumex patientia*, *Salvia fruticosa*, *Centaurea dumulosa*, *Cichorium pumilum* jacq, *Gageach lorantha*, *Gudelia tournefortii*, *Malva sylvestris* and other plants with mCI of 0.50-0.90. Another set of plant species have a mCI between 0.1-0.5, these include; *Agaricus bisporus*, *Coriandrum*

sativum, *Craetaegus aronia*, *Mentha longifolia*, *Lactca saligna*, *Sinapis arvensis*, *Silybum marianum*, *Trigonella foenum*, *Micromeria fructicosa*, *Portula oleraceae*, *Nasturtium officinale*, *Urtica pilulifera* etc. The findings are also in conformity with Bhatia *et al.* (2018) who found that the cultural index value for vegetables was 34.9% of the total CI and that fruits were closely behind 30.5 % in Udhampur. *Diplazium esculentum* (0.52), *Fumaria indica* (0.51), *Taraxacum campylodes* (0.50), *Urtica dioica* (0.49) and other were the most significant species in terms of cultural index. *Phyllanthus emblica* (0.94), *Punica granatum* (0.68), *Cordia dichotoma* (0.60), *Syzygium cumini* (0.57), *Ficus palmate* (0.51), *Berberis lycium* (0.43), *Prunus armeniaca* (0.33), *Prunu persica* (0.31), *Prunus pashia* (0.22) and *Rubus ellipticus* (0.18) were the most commonest fruits eaten by the local people.

5.2.2 Cultural index of families

The value of the cultural importance index of the species within a certain family was added to estimate its cultural importance (Table 8). Malvaceae had the highest mCIF of 0.795 followed by Amaranthaceae with mCIF 0.725, Berberidaceae with mCIF of 0.715, Amaryllidaceae with mCIF of 0.704, Rosaceae with mCIF of 0.678, Asteraceae with mCIF of 0.625, Moraceae with mCIF of 0.601, Apiaceae with mCIF of 0.581. Other families are Polygonaceae with 0.579 mCIF and Lamiaceae 0.559 mCIF. Higher values of cultural index recorded for a particular family is because species in that particular family are widely distributed hence widely used. Labiatae was the most important family (8 species; mCIF 4.953) in Palestine according to Hinnawi (2010). Other significant families include Asteraceae (10 species, mCIF 3.19), Polygonaceae (3 species mCIF 1.64), Araceae (2 species; mCIF 0.926), Primulaceae (1 species; 0.92), Papilionaceae (7 species; 0.61) and Brassicaceae with (3 species and mCIF of 0.81).

5.2.3 Most sighted species

The data collected on most sighted wild edible plants from southern Kashmir in Table 9 revealed that the maximum of 16 species belonging to 12 families of wild edible plants are used as food in all the four districts of Southern Kashmir. The most sighted wild edible plant species are *Malva slyvestris*, *Rumex acetosa*, *Plantago lanceolata*, *Agaricus bisporus*, *Foeniculum vulgare*, *Cydonia oblonga*, *Fragaria nubicola*, *Taraxacum officinale*, *Mentha arvensis*, *Allium seminovii*, *Prunus avium*, *Thymus serpyllum*, *Asplenium falcatum*, *Rubus ulmifolius* and *Juglans regia*. This is because people only consume only a small portion of the flora, as it is to be expected and do not consume all of the wild edible plants that are found in their region. The cultural choice made by each group of harvested food plant is what distinguishes them. Data pertaining to the Table 10 revealed that the most frequently used plant species used in all the four districts were *Rumex acetosa*, *Taraxacum officinale*, *Malva neglecta*, *Agaricus bisporus* and *Asplenium falcatum*. According to the Table 11 *Prunus armeniaca*, *Juglans regia*, *Rubus ulmifolius*, *Prunus avium* and *Ziziphus Jujuba* were the most frequently consumed fruits. The consumption of these vegetables and fruits are highly dependent on districts in which they are used because in a particular district that species might be easily available and because of their taste preferences. The outcomes are consistent with those of Hinnawi (2010). *Malva neglecta*, *Majorana syriaca*, *Mentha spicata*, *Cichorium pumilumjacq*, *Salvia hierosolymitana*, *Cyclamen persicum*, *Gundelia tournefortii*, *Teucrium polium* and *Arum palaestinum* were the most often cited species. Thyme was the primary staple food consumed throughout all locations.

5.3 Threats to Wild Edible Plant Species (WEPs) and preservation of these plants

5.3.1 Threats to wild edible plants

The study demonstrated that wild food plants are in grave danger. This is mainly due to over harvesting, excessive grazing, uncontrolled fires, climate

change, the collection of fuel wood, the development of agricultural land and insecticides. The study revealed that over harvesting and climate change ranked first and second, over grazing and agricultural expansion ranked third and fourth, uncontrolled fire and fuel wood collection both ranked fifth and insecticides ranked sixth. Therefore, a number of steps are required to safeguard these plants in their natural environments. According to Hinnawi (2010), excessive collection and other human activities like as over grazing, agricultural land development, uncontrolled fire settings, fuel wood collection and pesticide use may be to blame the wild edible plant species demise in Palestine. The findings are consistent with Khanum *et al.* (2022) according to them plant biodiversity is declining due to reasons like habitat loss, silvicultural techniques, building of houses and other domestic use of wild land by clearing wild lands. Ashagre *et al.* (2022) and Sher *et al.* (2011) got the same results.

Wild edible plants need to be conserved and managed because they are a unique and irreplaceable resource that will be needed for future environmental adaptation, sustainable economic development and growth. The conservation of these species has significant challenges, primarily as a result of human activity and natural causes. These plant species can be preserved using a variety of ex-situ and in-situ procedures. On-farm conservation is an alternative conservation strategy that might be taken into account to protect wild edible plant species. In addition to these techniques, the conservation of wild edible plant species also include the priority of species, selection of site specific species and local community involvement in conservation activities. Promotion and domestication of these plant species will benefit local communities' nutritional status and way of life while also preventing them from being extinct in the wild and preserving the ecosystem (Halewood *et al.*, 2014).

5.3.2 Preservation of wild edible plant species

For longer periods of time and for usage outside of the growing season, people preserve plants and foods in various methods. The most popular methods

in Kashmir are air and sun drying before sealing in bags because these methods are simple, effective, inexpensive solution and the fact that these are environment friendly, makes it an ideal method of preserving wild edible plants. Plus, it is a great way to preserve food during situations of emergency when no other method is available. Additionally, freezing is a method of preservation because lack of electricity in rural areas. However, the method of preservation chosen depends on the specific wild edible plants. For example the leaves of *Taraxacum officinale* are sun dried for a few days before being stored in suitable airtight containers. *Asplenium falcatum* fronds are sun-dried for 4 days before being stored in bags. For *Centaurea iberica*, the leaves are blanched in water for 20 minutes before putting inside freezer bags and stored in refrigerator. The findings of this study are consistent with those of Hinnawi (2010), who discovered that drying, freezing and refrigeration are the most popular methods of preservation of wild edible plants in Palestine.

5.3.3 Collection of wild edible plant species

In Kashmir, wild edible plant species (WEPs) are collected from a variety of habitats, including natural forests, agricultural fields and human disturbed regions like roadside ditches (Tiwari *et al.*, 2010). The entire study region was divided into four key habitats for the current study:

1. Forests
2. Agricultural fields
3. Alpine meadows
4. Roadside

Forests produced the most wild edible plant species (WEPs), followed by agricultural lands, alpine pastures and roadside vegetation because forests are storehouse of these wild species. The study's findings are consistent with that of Kiran *et al.* (2016), who divided the entire study region into eleven habitats and these habitats include forest area, waste lands, village, roadsides, kitchen garden,

field boundaries, marshy areas, water bodies, pond boundary, agricultural field and densely forested area.

5.4 Area selection index (ASI)

The relationship between species availability and consumption revealed regional variation. There are various reasons for this, which include the fact that Anantnag and Kulgam are regarded to have more traditional ecological knowledge due to bigger populations of people with a variety of traditional knowledge. The low area selection index (ASI) for Shopian and Pulwama, on the other hand suggest that a great understanding of wild edible plants is still in use. The answer is primarily attributable to cultural factors like the appreciation of species, vegetables or edible plants used in herbal teas. The ASI for each food category further helps to understand the observed differences. Understanding the variations that have been noticed is further aided by the ASI for each meal type. The results are in line with Hinnawi (2010) according to him Salfit and Tubas are two small remote regions with extensive traditional ecological knowledge. The low RSI (regional selection index) values for Nablus and Jenin show that a great understanding of wild edible plants is still in use.

Chapter 6

SUMMARY AND CONCLUSION

The present investigation entitled “Ethnobotanical study of Wild Edible Plant Species in South Kashmir” was conducted in the Southern districts of Kashmir valley during 2021-2022. The results of the investigations are summarized and concluded here as under:

6.1 Identification of plant species that provide wild edible products and to identify plant part used

Interviews were conducted during different seasons of 2021-2022 within four districts of Kashmir valley with four tehsils in each and four villages in each tehsil. Field work was carried in 64 villages with 560 informants of different age group. The study documented 96 wild edible plant species belonging to 44 families and 77 genera. These are well distributed in different life forms 58 herbs (60%), 19 trees (20%), 15 shrubs (16%) and 4(4%) fungus. The study revealed that maximum of 14 species belong to family Rosaceae and lowest number of species (1 species) belong to family Caryophyllaceae, Primulaceae, Fabaceae, Portulacaceae, Morchellaceae, Pyronmataceae, Asphodelaceae, Caprofoliaceae, Dioscoraceae, Athyriaceae, Aspleniaceae, Sapindaceae, Batulaceae, Ebenaceae, Elegnaceae, Juglandaceae, Podophyllaceae, Solenaceae, Vibuenaceae, Vitaceae, Acoraceae, Brassicaceae, Ericaceae, Cannabinaceae, Saxiferaceae, Boriginaceae, Papaveraceae and Rhamnaceae.

On the basis of folk perceptions wild edible plant species (WEPs) are divided into vegetables, fruits, food seasoning, beverages and others, their mode of consumption (raw or after cooking) was also reported. In the study it was identified that 52 species which constitute 54% of all species were used as vegetables. 29 species which constitute 30% of all species in the study area as fruits, 21 species which make up 22% for beverages, 14 species which constitute 15% for food seasoning and 12 species which make 13% of all wild edible plants

were used from several other purposes apart from above mentioned. The data revealed that the maximum of 44 species which constitute 39.8% of the total, were found to be used as leafy greens. The fruits constitute 30.5 % with 33 species followed by roots (13 species), seeds (8 species), the entire plant (7 species), flowers (6 species) and stem (4 species) which made 12%, 7.4%, 6.4%, 5.5% and 3.7% respectively (Fig 7).

The cultural importance index (CI) of the relevant species in the study area is shown in Table 7. The CI of The significant species that were obtained from various locations showed significant variances. With a mCI of 0.95, it showed that *Rumex acetosa* came on first rank and least value of mCI was obtained for *Salvia rosmarinus* 0.01. Malvaceae was the most significant family in terms of cultural value, according to mCIF (0.795) and Lamiaceae had lowest mCIF (0.559).

The four districts with the highest number of citations for plants include: *Malva neglecta*, *Rumex acetosa*, *Plantago lanceolata*, *Agaricus bisporus*, *Foeniculum vulgare*, *Cydonia oblonga*, *Fragaria nubicola*, *Taraxxacum officinale*, *Mentha arvensis*, *Allium seminovii*, *Prunus avium*, *Thymus serpyllum*, *Diplazium esculentum*, *Rubus ulmifolius*, *Juglans regia*, *Ziziphus jijuba*. Five plants that were preferred for use as vegetable are *Rumex acetosa*, *Asplenium falcatum*, *Malva neglecta*, *Agaricus bisporus* and *Taraxxacum officinale*. Five wild plants that were preferred for use as fruits are *Juglans regia*, *Prunus armeniaca*, *Prunus avium*, *Cydonia oblonga* and *Rubus ulmifolius*.

6.2 To study biotic pressure on mostly consumed wild edible plant species (WEPs).

The investigation of the research area revealed that there are numerous biotic stressors on wild food plants in their habitats. These factors are primarily brought on by human activities. These events have varying degree of impact depending on the locality. The aggregate assessment of all the groups revealed

that overharvesting is the biggest danger to wild edible species followed by climate change and overgrazing.

The two most popular methods for preserving plants are air and sun drying followed by storage in appropriate containers (glass containers). According to this study, natural forests accounted for 65 % of the wild edible plant species collected, followed by agricultural field, alpine pastures and roadsides 20%, 10% and 5% respectively. Food categories (vegetables, fruits, beverages, spices etc.) and their consumption in each district were statistically significant that means they were both strongly dependent on one another, according to the Area Selection Index.

CONCLUSION

- The utilization of wild edible plants in diet can supplement hunger, one of this generation's top worries to a greater level. There is a widespread tradition of collecting wild edible plant species from the edges of agricultural fields and virtually wooded sections in both industrialized and developing nations. Locals who still rely on natural resources for their daily needs use wild edible plants as a source of nourishment. In times of food shortage, the wild plants offer people nourishing leaves, delectable fruits and other portions like seeds, stems and bulbs among others.
- In the Southern areas of the Kashmir valley, there are still 96 wild edible plants in use out of which 52 species are used for vegetables, 29 as fruits, 21 for herbal tea, 14 as spices and 12 for other uses. These are not only delectable and cooling, but they are also nutrient rich in carbohydrates, proteins and lipids. Most tribal cultures rely on these wild plants for both commercial and personal uses due to their high nutritional properties.

- The data revealed that the maximum of 44 species which constitute 39.8% of the total, were found to be used as leafy greens. The fruits constitute 30.5 % with 33 species followed by roots (13 species), seeds (8 species), the entire plant (7 species), flowers (6 species) and stem (4 species) which made 12%, 7.4%, 6.4%, 5.5% and 3.7% respectively
- The most sighted plants in four districts are *Malva neglecta*, *Rumex acetosa*, *Plantago lanceolata*, *Agaricus bisporus*, *Foeniculum vulgare*, *Cydonia oblonga*, *Fragaria nubicola*, *Taraxacum officinale*, *Mentha arvensis*, *Allium seminovii*, *Prunus avium*, *Thymus serpyllum*, *Diplazium esculentum*, *Rubus ulmifolius*, *Juglans regia*, *Ziziphus jujuba*. These species are more prevalent, more easily accessible and have cultural ties to the region.
- The CI of The significant species that were obtained from various locations showed significant variances. With a mCI of 0.95, it showed that *Rumex acetosa* came on first rank and least value of mCI was obtained for *Salvia rosmarinus* 0.01. Malvaceae was the most significant family in terms of cultural value, according to mCIF (0.795) and Lamiaceae had lowest mCIF (0.559).
- According to this study, rather than biological ones, the patterns of wild edible plant use appear to be mostly influenced by socio- cultural variables. The study's findings demonstrated that the Gujjar tribe in the study area still maintains knowledge of the edibility, habitat distribution, harvesting timing and uses of wild edible plant species. Due to this tribe's continuous reliance on foraging for edible wild plants, knowledge seems to have been preserved. The indigenous knowledge about these species however may progressively disappear as the use of wild edible plants declines.

- The findings also showed that a variety of anthropogenic influences such as overharvesting, climate change, fire etc. are placing increasing pressure on wild edible plant species. Additionally, it has been observed that these priceless plants are becoming extinct as a result of over exploitation of forest resources. As a result, it is imperative to develop socioeconomic and sustainable use of their forest resources as well as agro based and silvicultural practices in the forests to ensure that this priceless natural gift does not disappear from the region of J & K.

Recommendations

1. The requirement to preserve ethnobotanical knowledge through recording and support of those engaged in extension.
2. The need to implement conservation measures in areas aimed at safeguarding endangered species and this can be done by creating reserved areas, increasing public knowledge of plant protection and maintaining these wild edible plant species.
3. To prevent problems that can arise from improper use of these wild edible plants, it is important to identify any potential negative effects of their use.
4. To promote the intake of wild edible plants, better communication and information exchange as well as daily nature contact are required.
5. The requirement for additional research on these plants, including bioassays of the key species.
6. Further research is necessary because the study found that harnessing wild edible plants for human benefits has a high potential.

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Interview Schedule

1. Name: -
2. Date of Birth:-.....
3. Gender: - F/M
4. Marital status: - Single/Married/Divorced/widow.
5. Place of residence:-.....
6. Phone No:-.....
7. Education: - Illiterate/Primary/Secondary/University.
8. Occupation:-House wife /Employee/Trade/ Jobless.
9. Number of family members: - Male.....Female.....

The second part:-

Which wild plant used as Food, flavors etc.

1. From where you get the wild plants?
The market/ the nature/you plant it/another option.....
2. How much does the wild plant used cost per Kg?
Less than Rs 100/=, Rs 100 - 500, Rs 500 -1000, Rs 1000-1500, above Rs 1500/=.
3. What is your main resource to know more about the wild plant?
Parents/Neighbors/Journals/Socialmedia/another option.....
4. Is there a wild plant you use frequently?
Yes / No, if yes then mention it

5. What wild plant you use as food?
.....
6. Which of these plants is hard to get from nature nowadays?
.....
7. How much you depend on wild plants as food?
Food for family/Revenue
8. Why do you prefer wild plants rather than other type?
Easy to prepare/Tastes great/Nutritional value
9. Is there a wild plant you used to use few years ago and disappeared now from the nature?
Yes/ No. if yes, mention it.
10. In your opinion, what threatens the wild plants which are used as food the most?
Overgrazing/Fires/ the extensions of agricultural land/using plants as energy sources/Agricultural pesticides.
11. How would you protect the wild plants from extinction?
.....
12. If an association offers you wild plants to use as food, would you accept the offer?
Yes /No
13. Which wild plant is more important for you?
.....

14. Do you feel using wild plants as food compensates you from using
Vegetables and fruits?

Yes/No

15. How much you pay for wild plants in a month?

.....

16. Which plant part do you use?

Leaves/flowers/stem/root/others

17. Do you prefer using wild plants over agriculture?

Yes/No

18. If yes, then why

Less expensive/nutritional value/easy to get/another option.

19. Mode of preparation

The method for analyzing the quantitative data collected shall be regression analysis.

Sher-e-Kashmir
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Division of Forest Products and Utilization,
Faculty of Forestry, Benhama, Ganderbal

CERTIFICATE

Certified that all the corrections/amendments as suggested by External Examiner **Prof. Mohd Afzal Zargar**, Registrar, Central University of Kashmir during Viva-Voce examination held on **17-03-2023** have been incorporated in the manuscript entitled **“Ethnobotanical Study of Wild Edible Plant Species in South Kashmir”** submitted by **Ms. Mehvish Mushtaq (Regd. No. MSF-2020-126)**.

Dr. Amerjeet Singh
Chairman
Advisory Committee