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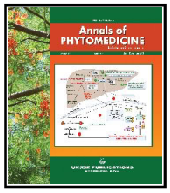

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# Non-timber forest products (NTFPs) supporting healthcare and livelihood among the Shina tribe in Gurez valley of Northwestern Himalayas

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**Abstract**

Non-timber forest products (NTFPs) serve as a pivotal reservoir of herbal remedies for both forest fringe inhabitants and the pharmaceutical sector. Simultaneously, they underpin the sustenance of indigenous communities residing in and adjacent to these forests, offering them economic solace. This study aims to describe the distribution, usage patterns and livelihood support through medicinal NTFPs among the Shina tribe in the Gurez valley of Northwestern Himalayas. To accomplish this, a multi-level random sampling technique was employed to select 10 villages and 103 households. Primary data was gathered through personal interviews with household heads using structured pre-tested interview schedules and quasi-participant observations. Results from the study indicate that the sample populace utilizes 57 NTFPs from 40 genera and 31 families for medicinal purposes. The Asteraceae family has the highest representation (nine) of medicinal NTFPs. Among the total edible NTFPs, roots have the highest representation (twenty), while basidiocarp, bulb, and resin have the lowest representation (one). Of the 57 medicinal NTFPs collected by the tribal people, the majority (82.14%) were herbs, followed by shrubs (7.14%), trees (5.35%), climbers (3.57%), and fungi (1.78%). Among the different ailments, the maximum (nine) of the medicinal NTFPs were used as an antitussive, astringent, and febrifuge. Medicinal NTFPs play a significant role in reducing income inequality, generating an annual income of Rs. 756400.00 and creating employment of 655.20 man-days per year. Therefore, a local regulatory system should be established to prevent over-exploitation and premature harvesting to ensure sustainable extraction of NTFPs, which are crucial in supporting healthcare and livelihood.

## 1. Introduction

Over two billion people inhabit forests, relying on forest resources for subsistence, income and livelihood security (Ahenkan and Boon, 2011). While in India over 100 million tribal people are dependent on NTFPs. Non-timber forest products (NTFPs) have an unbelievable history in terms of serving humanity in almost all the continents of the world. The people living in the vicinity of forests depend on non-timber forest products (NTFPs) to meet food, medicine, fodder, fiber, floss, firewood, dyes, thatch, fencing materials, utensils, brushes and brooms, weapons, ornamental and decorative materials, agricultural implements, clothing, religious and aesthetic goods *etc.* (Saha and Sundriyal, 2012; Shackleton and Pandey, 2014; Alex and Vidyasagaran, 2016; Mohamed and Tesfaye, 2020; Hido and Alemayehu, 2022; Walle and Nayak, 2022; Asamoah *et al.,* 2023; Derebe and Alemu, 2023). As per the estimates of the World Health Organization (WHO) 80% of the population in underdeveloped nations relies on NTFPs to cater to their health and nutritional needs (Olaniyi *et al.,* 2013; Lax and Köthke, 2017). Medicinal plants have long been recognized as a rich source of therapeutic substances for the treatment and prevention of myriad diseases, thus earning them a prominent position in the medicinal field (Jain *et al*., 2017). Through millennia of trial and error, tribal people have gained substantial knowledge of medicinal NTFPs which has been transmitted from generation to generation as part of oral traditions. Various studies have been reported by different authors regarding the pattern of utilization of different medicinal NTFPs for curing various ailments among rural and tribal communities all over the world. These Medicinal NTFPs besides forming the basis of an accessible and affordable healthcare system, are an important source of economic livelihood for the aboriginal population around the world (Barbhuiya *et al.,* 2009).

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The Jammu and Kashmir territory of the Indian Himalayas possesses a total forest area of 21,387 sq km (ISFR, 2021) which harbors a rich diversity of NTFP species of great scientific curiosity and economic benefits (Gangoo *et al.,* 2017). A total of 1123 plant species of medicinal value are reported in the UT of J&K which are used in the traditional system of medicine to treat several types of disease in humans (Tali *et al.,* 2019). In the past several studies have been carried out within and different parts, of the Shire which documented the ethnomedicinal knowledge (Ara and Naqashi, 1992; Khan and Khuroo, 2004; Dad and Khan, 2011; Malik *et al.,* 2011; Singh *et al.,* 2016; Chaudhary *et al.,* 2023) of the different communities. Even so, due to the tough topography, remoteness, and audacious terrain of many mountainous areas, they have largely remained cut off and isolated from the rest of the state. Therefore, this isolation has enabled the people there to retain their age-old tradition, culture and practices but of late, the advancement of modern societal ideas and practices in these areas has been so rapid that a vast body of indigenous knowledge is waning without any proper documentation and scientific reporting. Moreover, the livelihood earnings from the traditional healthcare system have owed little or no attention in the given scientific arena so far. Gurez valley of Northwestern Himalayas represents one among these areas where very limited research on such investigation has yet been carried out. Thus, the present investigation aims to explore the distribution, consumption and livelihood earnings of medicinal NTFPs in the Gurez valley of Kashmir.

## 2. Materials and Methods

### 2.1 Study area

The present study was carried out in Gurez valley of district Bandipora under Kashmir province in Jammu and Kashmir UT. The valley extends from latitude $34^0$ 23' to $34^0$41'N and longitude $74^0$37' to $74^0$ 46'E and stands at an elevation of 2370 meters above MSL. The valley consists mainly of the mountainous terrain and the Kishanganga River flowing to its east-west. (Figure 1). As fascinating as its beauty and biodiversity, is its inimitable culture as it houses a unique Shina-speaking tribe of 31912 (Census, 2011) inhabitants of Shina communities are ethnically and culturally quite distinct from Kashmiris. A typical mountainous terrain characterized by lofty hills and peaks dotted with long grasslands is used by migratory people to graze their livestock during the summers. It has a temperate climate and receives more precipitation (snow) during winters which keeps the valley snowbound for more than six months**.** As the snow melts, vegetation begins to grow in late April and comes to its full bloom from mid-June to September, and perishes by late October.

### 2.2 Sampling technique and sample

For drawing the sample, a multi-stage random sampling technique (Ray and Mondol, 2004) was used to select the blocks (3), villages (10), and households (103). In the field study, 103 households were sampled using a random sampling technique with a sampling intensity of 5 percent. The respondents interviewed were either household heads or eldest members.

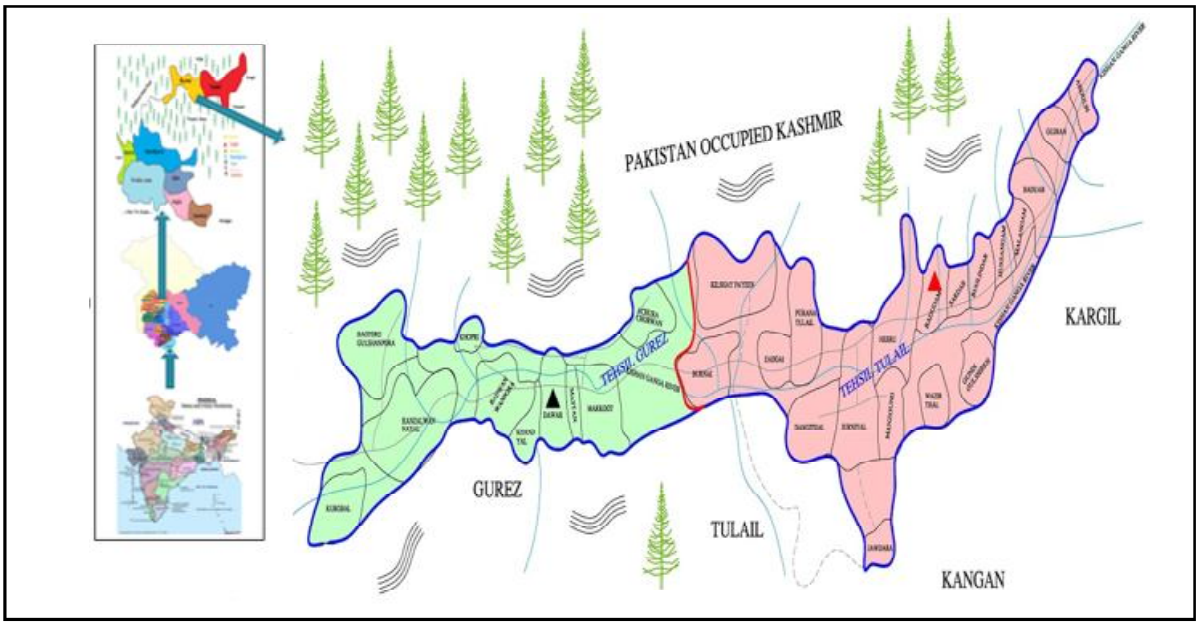


**Figure 1: Location of the study area.**

### 2.3 Data collection and analysis

The primary data was collected meticulously by Quasi-participant observation of the respondents through well-structured pre-tested interview schedules and personal observations. The interview schedules prepared in this manner were used to collect information on the diversity, distribution, utilization, collection, consumption, marketing, and livelihood support of medicinal non-timber forest products in Gurez valley. The NTFP samples from different species collected during the exploration were submitted and identified at Centre of Biodiversity and Plant Taxonomy, University of Kashmir. Descriptive statistics were used for the analysis of the data as per the standard procedure (Holcomb, 2016).

## 3. Results

### 3.1 Diversity, distribution and utilization pattern of medicinal NTFPs

The study documented 57 NTFP species belonging to 40 genera under 31 families used for the medicinal purpose by the tribal Shina community of Gurez valley (Tables1-5). The Medicinal NTFP species documented in the study are listed under plant habit type. The family Asteraceae had the highest representation (09) of medicinal NTFP species used for the healthcare purpose followed by Liliaceae (3), Apiaceae (4), Polygonaceae (4), Ranunculaceae (3), Lamiaceae (3), Boraginaceae (2), Malvaceae (2), Scrophulariaceae (2), Solanaceae (2), Asparagaceae (1), Brassicaceae (1), Caprifoliaceae (1), Celastraceae (1), Colchicaceae (1), Dioscoreaceae (1), Elaeagnaceae (1), Ericaceae (1), Fabaceae (1), Hippocastanaceae (1), Melanthiaceae (1), Morchellaceae (1), Orchidaceae (1), Orobanaceae (1), Pinaceae (1), Plantaginaceae (1), Podophyllaceae (1), Polemoniaceae (1), Rosaceae (1), Saxifragaceae (1), Taxaceae (1), Urticaceae (1) and Zygophylaceae (1) (Figure 2). Pragmatically, all the parts were widely collected and consumed for medicinal purposes by the sample households with maximum (20) as roots, followed by leaves (14), flower (06), fruit (05), seed (04), rhizome (04), entire plant (03), shoot (03), bulb (02), bark (02), tuber (02), basidiocarp (01), bulb (01), resin (01) (Figure 3). Out of the 57 medicinal NTFPs collected by the rural people, a maximum of (47), were derivatives of herbs followed by shrubs (04), trees (03), climber (02), and fungi (01). (Figure 4) while investigating a strong association was observed between NTFPs and ethnic medicinal uses of plants among the local populace. The majority of the respondents noted that medicinal NTFPs were used singly or in combination with others, to treat or cure ailments. The medicinal NTFPs were categorized into 9 therapeutic areas and 31 forms of indications or ailments (Table 6). The maximum number of medicinal NTFPs (27) were used to treat diseases related to the gastrointestinal system (this can be attributed to the fact that the area is lacking basic amenities like a proper drinking and sanitation system which leads to intestinal infection), followed by the respiratory system (16), endocrine system (11), integumentary system (09), pain (08), neurologic system (07), urogenital system (05), cardiovascular system (02) and hematopoiesis (01) (Figure 5).

**Table 1: NTFP species (bulb, corm, rhizome, root and tuber) components used for traditional medicinal purposes in Gurez valley of Northwestern Himalayas**

| S.No | Local name/common name | Scientific name (Family) | Voucher specimen No. | Plant part | Uses |
|---|---|---|---|---|---|
| **Climber** | | | | | |
| 1. | Kreensh, krits/ medicinal yam | *Dioscorea deltoidea* Wall. (Dioscoreaceae) | KASH-1048-17 | tuber | Tubers-used as oral contraceptives. |
| 2. | Majaith/ Indian madder | *Rubia cordifolia* L. (Rubiaceae) | KASH-1049-17 | root | Roots are used in stomachaches. |
| **Herb** | | | | | |
| 3. | Patress/ deadly monks hood | *Aconitum chasmanthum* Stapf ex Holmes (Ranunculaceae) | KASH-1051-17 | root | Although poisonous if consumed raw, the root portion is boiled in water for several hours and dried root powder is taken as an antidote for snake bite. |
| 4. | Patees/ aconite monks hood | *Aconitum heterophyllum* wall (Ranunculaceae) | KASH-1052-17 | root | Powdered roots in small doses are taken for stomachaches, diarrhea, and toothache. |
| 5. | Chora/ glaucous Archangel | *Angelica glauca* Edgew. (Apiaceae) | KASH-1053-17 | root | The root powder is taken to cure toothache and stomach disorders. Fresh roots are crushed and given to cattle against cold and stomach infections. |
| 6. | Fangal/ great burdock | *Arctium lappa.* L. (Asteraceae) | KASH-1054-17 | root | Roots- vegetable, diuretic and diaphoretic |
| 7. | Vir kinposh, suranjan-e-talakh/ golden collyrium | *Colchicum luteum* Baker (Colchicaceae) | KASH-1063-17 | corm | A warm decoction prepared by boiling corms in water is used for bathing by ladies immediately after childbirth to cure body pains. Fresh corms are cleaned then crushed and mixed with *gur* (local raw sugar) and fried in cow ghee is taken to cure back pain, weakness of bones, fever and cough. |

| | | | | | |
|---|---|---|---|---|---|
| 8. | Boyopush, salampanja/ marsh orchid | *Dactylorhiza hatagirea* (D.Don) Soo (Orchidaceae) | KASH-1064-17 | tuber | Tubers- medicinal. |
| 9. | Nirbish/ larkspur | *Delphinium denudatum* Wall. (Ranunculaceae) | KASH-1065-17 | root | Roots- medicine for toothache. |
| 10. | Haknoli/ lily | *Fritillaria cirrhosa* D. Don (Liliaceae) | KASH-1066-17 | bulb | Bulbs are used medicinally and eaten raw. |
| 11. | Sheetkar/ chequered lily | *Fritillaria roylei Hook.* (Liliaceae) | KASH-1067-17 | bulb | Bulbs are used in asthma and bronchitis. Also used as an antipyretic and galactagogue. |
| 12. | Poshkarmool/ horse heal | *Inula racemosa* Hook.f. (Asteraceae) | KASH-1069-17 | root | Roots are used as inflammatory, antipyretic, and antiseptic. |
| 13. | Ratanjot,loljad/ borage | *Onosma hispidum* Wallich ex. G. Don. (Boraginaceae) | KASH-1074-17 | root | Roots are useful in heart ailments and hair fall. |
| 14. | Katuki, kuru/ hellebore | *Picrorhiza kurroa* Royle ex Benth. (Plantaginaceae) | KASH-1104-17 | rhizome | The dried rhizome is made into powder, which is administered orally along with water or milk as the best home remedy against stomach disorders and intestinal infections. |
| 15. | Jeevdash/ jacobs ladder | *Polemonium caeruleum* L. (Polemoniaceae) | KASH-1107-17 | root | Roots are sedative and the plant is astringent. |
| 16. | Mirkuli, salam mishri/ whorled solomons seal | *Polygonatum verticillatum* (L.) All. (Asparagaceae) | KASH-1117-17 | rhizome | Rhizome is used as medicine for treating backache and menstrual troubles. |
| 17. | Churkee/ alpine bistort | *Persicaria vivipara* (L.) Ronse Decr. (Polygonaceae). | KASH-1118-17 | root | Roots are used to treat diarrhea and intestinal infection. The paste of the roots is applied externally to check bleeding on fresh wounds. |
| 18. | Chutiyal, pambchalan/ noble rhubarb | *Rheum moorcroftianum* Royle. (Polygonaceae) | KASH-1121-17 | root | Roots are used in wound healing, muscular swellings, and mumps. |
| 19. | Phantool, ubaji/ sorrel | *Rumex acetosa* L. (Polygonaceae) | KASH-1122-17 | root | Dried roots are used in bleeding and diarrhea. |
| 20. | Minal, kuth/ costus | *Sassurea costus* (Falc.) Lipsh (Asteraceae) | KASH-1124-17 | root | Dried roots are ground to powder and consumed with milk to cure the pain in joints and back. |
| 21. | Handri, hand/ crow parsnip | *Taraxacum officinale* (L.) Weber ex F.H.Wigg. (Asteraceae) | KASH-1126-17 | root | Roots are cooked and used as a diuretic, stomachic, hepatic stimulant and tonic. |
| 22. | Tri patr, nag chatri/ trinity flower | *Trillium govanianna* Wallich ex. D.Don (Melanthiaceae) | KASH-1127-17 | rhizome | The dried rhizome is used to treat boils, dysentery, and menstrual and sexual disorders. |
| 23. | Mushkbala, murmao/ Indian valerian | *Valeriana jatamansi* Jones (Caprifoliaceae) | KASH-1130-17 | root | Roots are used medicinally. |

**Table 2: NTFP species (more than one plant) components from single species used for traditional medicinal purposes in Gurez valley of Northwestern Himalayas**

| S. No | Local name/common name | Scientific name (Family) | Voucher specimen No. | Plant part | Uses |
|---|---|---|---|---|---|
| **Herb** | | | | | |
| 1. | Bergeur/ yarrow milfoil | *Achillea millefolium* L. (Asteraceae) | KASH-1050-17 | leaf, flower | Decoction of leaves and flower heads are used to cough, cold, and fever. |
| 2. | Jalakaffal/ belladonna | *Atropa acuminata* Royle. (Solanaceae) | KASH-1059-17 | root, leaves | Roots and leaves- antiasthmatic, antispasmodic, diuretic, febrifuge, rheumatism, inflammations. Atropine obtained is used for dilating the pupils. |

| | | | | | |
|---|---|---|---|---|---|
| 3. | Kharkochal/ rock splitter | *Bergenia stracheyi* (Hook.f. and thoms) Engl (Saxifragaceae) | KASH-1060-17 | rhizome, leaf | The dried rhizome is ground into powder and consumed to cure internal wounds. Leaves used in cosmetics. |
| 4. | Sochal posh, aarmsuchal | *Malva sylvestris* L. (Malvaceae) | KASH-1071-17 | flower, fruit | Flowers/ fruits are useful in curing whooping cough. |
| 5. | Marzanjosh/ ban tulsi/ wan babar oregano | *Origanum vulgare* L. (Lamiaceae) | KASH-1075-17 | leaf, flower | Beverage from leaves and inflorescence taken to cure the intestine infection, stomach ache, cold, flu, fever. |
| 6. | Shamadi, bankakri, wanvangun/ May apple | *Podophyllum hexandrum* Royle (Berberidaceae) | KASH-1106-17 | fruit, root | Ripe fruit juice is taken against stomach ulcers and heartburn. |
| 7. | Palanugus/ parangos fennel | *Prangos pabularia* Lindl. (Apiaceae) | KASH-1119-17 | leaf, Root | Roots are diuretics used in the treatment of skin ailments and menstrual disorders. Also useful as a liver tonic. |
| 8. | Kalveuth/ common self-heal | *Prunella vulgaris* L. (Lamiaceae) | KASH-1120-17 | leaf, flower | The aerial parts form an important part of Losse ghasa. Traditional herbal bath, the aerial parts are thoroughly boiled in water to prepare hot water extract (after dilution with more water) to cure headaches and muscular pain during pregnancy. |
| 9. | Jogi padshah, jogi phool/ phen Kamal | *Saussurea simpsoniana* (Fielding & Gardner) Lipsch. (Asteraceae) | KASH-1125-17 | leaf, root | Used in treating asthma, cuts and wounds. |
| 10. | Bataknur/ red clover | *Trifolium pratense* L. (Fabaceae) | KASH-1128-17 | flower, leaf | Flowers and leaves are used for bronchitis, burn, and sedation. |
| 11. | Rumkath/ adams flannel | *Verbascum Thapsus* L. (Scrophulariaceae) | KASH-1131-17 | Root, flower and leaf | Decoction of roots is used for cramps and migraine. Leaves and flowers are used in pulmonary diseases. |
| **Shrub** | | | | | |
| 12. | Burjeed/ sea buckthorn | *Hippophae rhamnoides* L. (Elaeagnaceae) | KASH-1159-17 | fruit, seed | Fruit pulp is rich in antioxidants, and used to make beverages well as rare palmitoleic acid known for wound healing. |

**Table 3: NTFP species leaf components used for traditional medicinal purposes in Gurez valley of Northwestern Himalayas**

| S. No | Local name/common name | Scientific name (Family) | Voucher specimen No. | Plant part | Uses |
|---|---|---|---|---|---|
| **Herb** | | | | | |
| 1. | Sotsal/ cheese cake flower | *Malva neglecta* Wallr (Malvaceae) | KASH-1070-17 | leaf | Leaves are useful in piles. |
| 2. | Bazerbhang/ henbane | *Hyoscyamus niger* L. (Solanaceae) | KASH-1068-17 | leaf | Leaves provide calming and soothing effects, as it's a good sedative drug. |
| 3. | Nag baber/water cress | *Nasturtium officinale* R.Br. (Brassicaceae) | KASH-1072-17 | leaf | The leaf juice is advised for patients suffering from stomach ulcers and intestinal infections. |
| 4. | Neel pat, shamalolo/ woolly catmint | *Nepeta floccose* L. (Lamiaceae) | KASH-1073-17 | leaf | Leaf decoction is used to cure colds and coughs. |
| 5. | Phantool/ nepal duck | *Rumex nepalensis* Sprengel (Polygonaceae) | KASH-1123-17 | leaf | Leaves-boiled and fed to cows for easy delivery. |
| **Shrub** | | | | | |
| 6. | Nichhni, talisha/ dwarf rose bush | *Rhododendron anthopogon* D. Don (Ericaceae) | KASH-1177-17 | leaf | Leaves-medicinal |

**Table 4: NTFP species (basidiocarp, flower, fruit and seed) components used for traditional medicinal purposes in Gurez valley of Northwestern Himalayas**

| S. No | Local name/common name | Scientific name (Family) | Voucher specimen No. | Plant part | Uses |
|---|---|---|---|---|---|
| **Fungi** | | | | | |
| 1. | Gucchi, kani`ghitch/ yellow morel | *Morchella esculenta* Fr. (Morchellaceae) | KASH-1047-17 | basidiocarp | Basidiocarp- has medicinal properties. |
| **Herb** | | | | | |
| 2. | Kala zeera/ black caraway | *Bunium persicum* (Boiss.) B. Fedtsch (Apiaceae) | KASH-1061-17 | seed | Seeds decoction is taken to cure respiratory congestion. |
| 3. | Phulo-zeera/ zeera | *Carum carvi* L. (Apiaceae) | KASH-1062-17 | seed | Caraway seeds are useful for relieving gas pains and bronchial spasms. Useful in Amenorrhea, blood vomiting, rheumatism and fevers. |
| 4. | Isband/ harmal, turkey red | *Peganum harmala* L. (Nitrariaceae) | KASH-1077-17 | seed | Seeds are anthelmintic. |
| 5. | Phatal Kachh/ ribwort plantain | *Plantago lanceolata* L. (Plantaginaceae) | KASH-1105-17 | seed | Seeds are taken with milk as a purgative. |
| **Shrub** | | | | | |
| 6. | Askut, shingai/ wild rose | *Rosa webbiana* Wallich ex. Royle (Rosaceae) | KASH-1179-17 | flower | Sundried flower petals mixed with Honey or some sugar diluted with water are boiled for a few minutes and then kept in a closed jar for about 10-15 days for fermentation. This fermented mixture prepared is called “Gulkand” which is consumed in winter to cure cough, cold, asthma, body muscular, and bronchitis. |
| **Tree** | | | | | |
| 7. | Goon, haandun/ Indian horse chestnut | *Aesculus indica* (Wall. ex Cambess.) Hook. (Sapindaceae) | KASH-1207-17 | fruit | Fruits- medicinal. |

**Table 5: NTFP species (entire plant, shoot, bark and resin) components used for traditional medicinal purposes in Gurez valley of Northwestern Himalayas**

| S. No | Local name/common name | Scientific name (Family) | Voucher specimen No. | Plant part | Uses |
|---|---|---|---|---|---|
| **Herb** | | | | | |
| 1. | Shamajoon/ worm wood | *Artemisia absinthium*. L. (Asteraceae) | KASH-1056-17 | entire plant | A paste of dried leaves and inflorescence blended with a glass of lukewarm milk or water is used to cure stomach pain and worm infections of the intestines. |
| 2. | Veer tethwan/ almond worm wood | *Artemisia amygdalina*. Decne (Asteraceae) | KASH-1035-17 | entire plant | Decoction of dried leaves are taken to cure stomach ache. |
| 3. | Joon/ worm wood | *Artemisia Praviflora* Roxb. (Asteraceae) | KASH-1058-17 | entire plant | Decoction of dried leaves are prescribed to expel intestinal worms. |
| 4. | Ratanjot, gaozaban/ beared borage | *Arnebia benthamii*. (Wallich ex. G.Don) I.M. Johnston. (Boraginaceae) | KASH-1074-17 | shoot | The dry flowering shoot is used in tongue and throat diseases. Also useful in cardiac ailments. |
| 5. | Lothus/ broom rape | *Orobanche alba Stephen* ex. Wild (Orobanaceae) | KASH-1076-17 | shoot | Locals use it to cure diarrhea and dysentery in cattle. |
| 6. | Zomi, Soi/ stinging nettle | *Urtica dioica* L. (Urticaceae) | KASH-1129-17 | shoot | Used to excite activity in paralyzed limbs. Also useful in rheumatism. |

| Tree | | | | | |
|---|---|---|---|---|---|
| 7. | Shookul, chhalchhattar, sakki/ spindle tree | *Euonymus hamiltonianus* Wall. (Celastraceae) | KASH-1157-17 | bark | Bark decoction is taken to cure joint paints and skin allergy. |
| 8. | Chhui, kaeur/ Himalayan blue pine | *Pinus wallichiana* A.B. Jacks. (Pinaceae) | KASH-1211-17 | resin | The resin referred to locally as Kalail and extracted from the tree trunk is use to cure cracked foot heels when aplied |
| 9. | Postul/ Himalayan yew | *Taxus wallichiana* (Zucc) Pilger (Taxaceae) | KASH-1237-17 | bark | The dried stem bark is boiled in water to prepare a special kind of tea that is taken to treat asthma, headache, and tumor growth. |

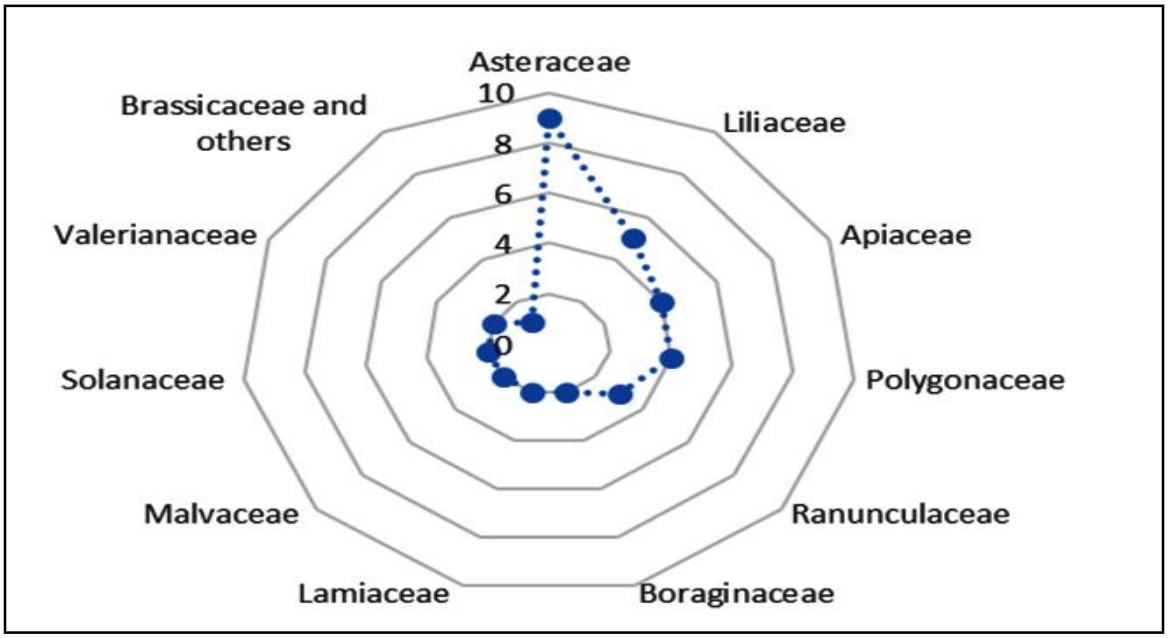


**Figure 2: Family-wise categorization of medicinal NTFPs.**

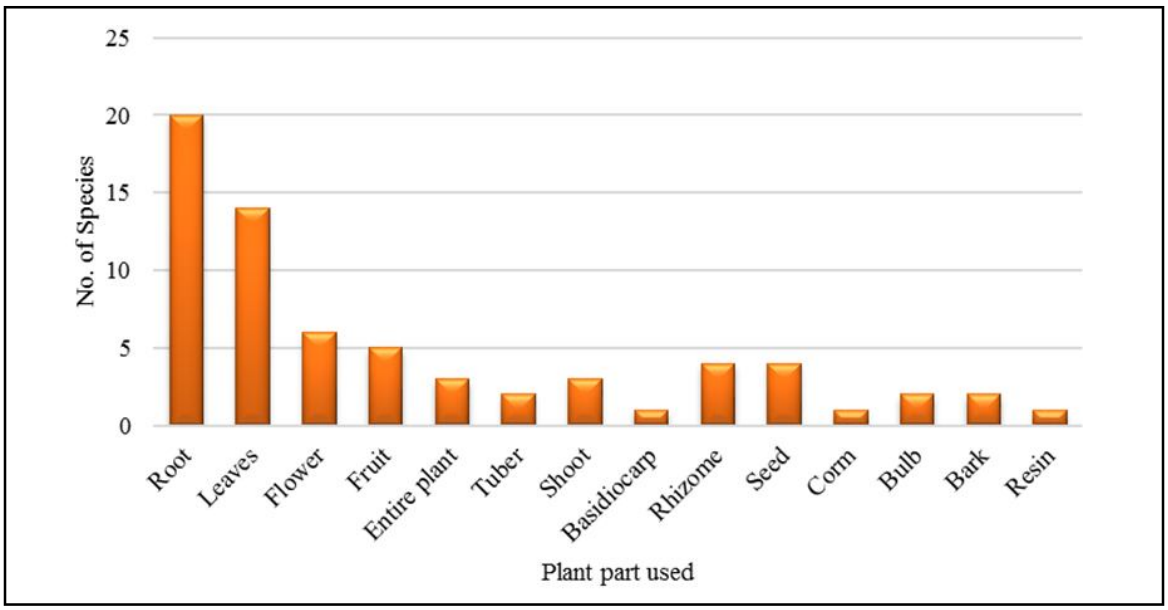


**Figure 3: Distribution of medicinal NTFPs based on parts utilized.**

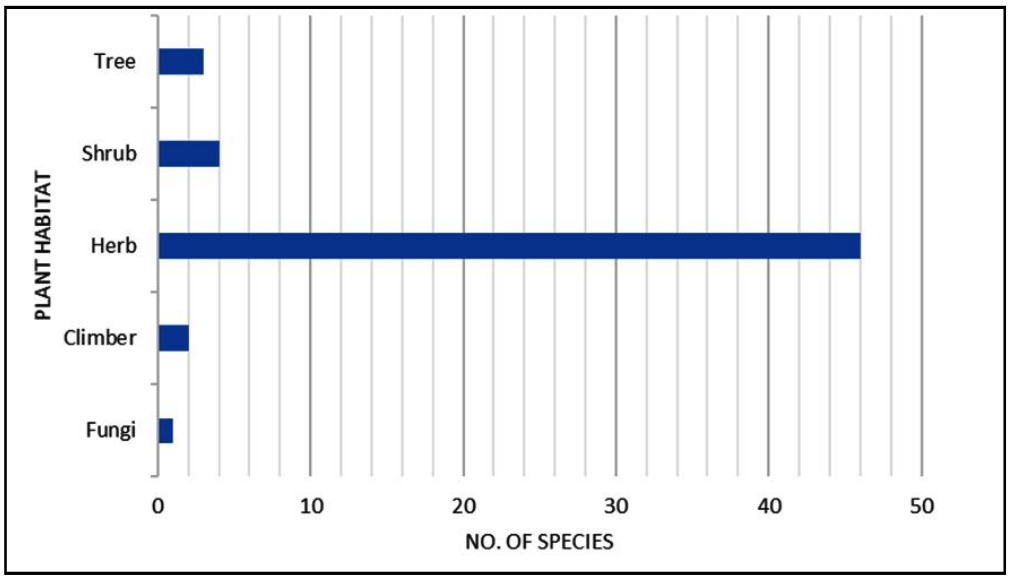


**Figure 4: Distribution of medicinal NTFP species under different Plant habits.**

**Table 6: Medicinal NTFPs used in different ailments by the Shina tribe in Gurez valley of Northwestern Himalayas**

| S.No | Categories of indication | Plant species used |
|---|---|---|
| 1 | Analgesic (f) | *Angelica glauca, Artemisia absinthium, Delphinium denudatum* |
| 2 | Antiallergic (h) | *Morchella esculenta* |
| 3 | Antiasthmatic (h) | *Atropa acuminata, Fritillaria roylei, Verbascum thapsus, Saussurea simpsoniana, Taxus wallichiana* |
| 4 | Antidiarrheal (c) | *Aconitum heterophyllum, Angelica glauca, Orobanche alba, Polygonum viviparum, Rumex acetosa, Trillium govanianna, Rosa webbiana* |
| 5 | Anti-flatulent (c) | *Carumcarv* |
| 6 | Antihelminthic (c) | *Artemisia absinthium, Artemisia amygdalina, Artemisia Praviflora, Peganum harmala, Picrorhiza kurroa* |
| 7 | Anti-inflammatory (e) | *Aconitum heterophyllum, Atropa acuminata, Inula racemosa, Rheum moorcroftianum, Euonymus hamiltonianus, Rosa webbiana* |
| 8 | Antiproliferative (b) | *Morchella esculenta, Podophyllum hexandrum, Taxus wallichiana* |
| 9 | Anti-rheumatic (g) | *Aconitum chasmanthum, Atropa acuminata, Bunium persicum , Carum carvi, Sassurea costus, Urtica dioica, Taxus wallichiana* |
| 10 | Antispasmodic (c) | *Artemisia absinthium, Atropa acuminate, Fritillaria cirrhosa, Hyoscyamus niger, Polygonatum verticillatum, Prunella vulgaris, Rosa webbiana* |
| 11 | Antitussive (h) | *Colchium luteum, Dactylorrhiza hatagirea, Fritillaria cirrhosa, Malva sylvestris, Nepeta floccose, Verbascum Thapsus, Rhododendron anthopogon, Rosa webbiana, Trifolium pratense* |
| 12 | Aphrodisiac (i) | *Dactylorhiza hatagirea, Rumex nepalensis, Trillium govanianna* |
| 13 | Appetite disorders (c) | *Rubia cordifolia, Angelica glauca, Bunium persicum, Picrorhiza kurroa, Rhododendron anthopogon* |
| 14 | Body pain (g) | *Colchium luteum* |
| 15 | Boils (d) | *Trillium govanianna* |
| 16 | Cardio-stimulant (a) | *Arnebia benthamii, Onosma hispidum,* |
| 17 | Cold (h) | *Achillea millefolium, Angelica glauca, Nepeta floccose* |
| 18 | Demulcent (c) | *Malva neglecta* |
| 19 | Depurative (a) | *Plantago lanceolata* |
| 20 | Diaphoretic (b) | *Arctium lappa* |

| | | |
|---|---|---|
| 21 | Diuretic (i) | *Arctium lappa, Atropa acuminate, Malva neglecta, Prangos pabularia, Taraxacum officinale* |
| 22 | Frostbite (e) | *Aesculus indica* |
| 23 | Haptoprotective (b) | *Achillea millefolium, Prangos pabularia, Taraxacum officinale* |
| 24 | Headache (g) | *Verbascum Thapsus* |
| 25 | Heel fissures (e) | *Pinus wallichiana* |
| 26 | Lactogogue (b) | *Fritillaria roylei* |
| 27 | Menstruation disorder (b) | *Carum carvi, Polygonatum verticillatum, Prangos pabularia, Trillium govanianna, Valeriana jatamansii* |
| 28 | Neurological disorders (f) | *Aconitum chasmanthum* |
| 29 | oral contraceptive (b) | *Dioscorea deltoidea* |
| 30 | Sedative (f) | *Hyoscyamus niger, Polemonium caeruleum, Trifolium pretense* |
| 31 | Sore throat (h) | *Arnebia benthamii* |

**Note:** Letters in superscript denote ailments cured under different human body systems; cardiovascular system[a]. endocrine system[b]. gastrointestinal system[c]. hematopoiesis[d]. integumentary system[e]. neurologic system[f]. pain[g]. respiratory system[h]. urogenital system[i].

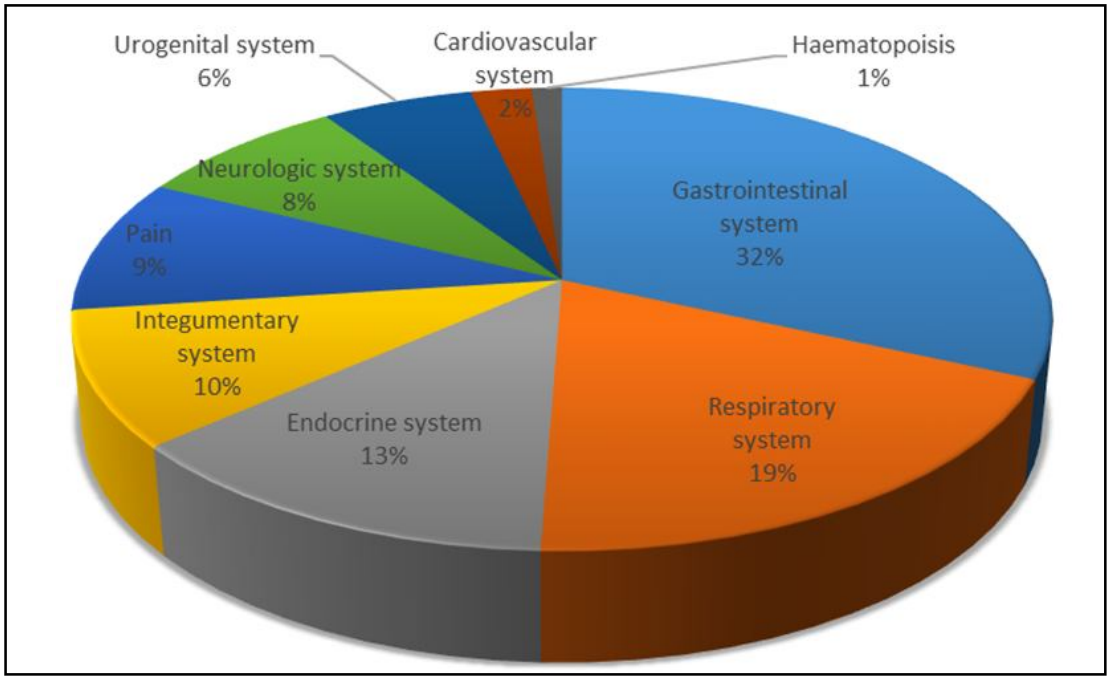


**Figure 5: Pie chart showing medicinal NTFPs used under different therapeutic areas.**

**Table 7: Medicinal NTFPs as a source of income and employment generation**

| Attribute | Collection involvement (Hh) | Total collection (qts annum$^{-1}$) | Consumption (qts annum$^{-1}$) | Marketing involvement (Hh) | Sale (qts annum$^{-1}$) | Rate (Rs/kg) | Income (Rs annum$^{-1}$) | Employment (man-days annum$^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| Medicinal NTFPs | 91(88.34) | 32.76 | 0.0728 | 63 (70.87) | 25.48 | 80-8100 | 756400.00 | 655.20 |
| Average | - | 0.32 | 0.00007 | - | 0.24 | | 7343.69 | 6.36 |

**Note:** Hh = Household, Figures in parentheses show percentages.

### 3.2 NTFPs as livelihood support

The data relating to household medicinal NTFPs extraction consumption, marketing and employment are included in Table 7. The households surveyed were involved in the collection of medicinal NTFPs at 88.34%, while the involvement in the marketing was 70.87%. The medicinal NTFPs generated a total income of Rs. 756400.00 annum$^{-1}$ Rs. 7343.69 household$^{-1}$ annum$^{-1}$ also fetched employment of 655.20 man-days annum$^{-1}$ with an average

employment generation of 6.36 man-days household$^{-1}$ annum$^{-1}$ among the sample populace. During rapid market surveys, it was observed that some NTFPs were sold at lucrative prices because they are in high demand due to their medicinal properties. These properties can range from treating a variety of health problems, from colds and flu to more serious conditions, such as cancer and HIV. As a result, the demand for medicinal NTFPs is increasing, making them a valuable commodity. Furthermore, the scarcity of these products combined with the high demand makes them a profitable item for traders, who can charge high prices for them.

## 4. Discussion

Due to its unique geographical and climatic conditions, the Gurez valley boasts a diverse array of non-timber forest products (NTFPs), which are utilized across various categories of use. The region experiences heavy snowfall during the winter months, leading to the valley's isolation from the surrounding area for approximately 5-6 months each year. This isolation has compelled the local inhabitants to rely on natural resources, particularly NTFPs, for their daily necessities, especially for healthcare purposes since ancient times. Despite the establishment of a few modern medical facilities in recent years, a significant number of villages situated far from the town still adhere to traditional medicinal practices. Consequently, a local herbalist or Hakeem plays a pivotal role in addressing a wide range of health-related ailments. These may include conditions such as colds, flu, fever, vomiting, stomachaches, internal worms, diarrhea, dysentery, skin infections, frostbite, bone fractures, urinary tract infections, and kidney stone expulsion. The herbalist prescribes various herbal formulations, adjusting dosages based on the severity of symptoms exhibited by patients. The majority of medicinal compounds are crafted using solely NTFP components, without the addition of any supplementary ingredients. Occasionally, substances like honey, milk, sugar, or jaggery are administered alongside the prescribed medication, likely aimed at masking the bitter taste of the herbs and enhancing their palatability for patients. Moreover, due to their affordability and minimal adverse effects compared to allopathic medicine, the ethnic communities residing in the Gurez valley hold all of these constituents in high regard for their health and overall well-being. Our findings are consistent with those of previous studies, (Ara and Naqashi 1992b; Kapahi *et al,* 1993; Talukdar and Gupta, 2018; Masoodi and Sundriyal, 2020; Husain, 2021; Peerzada *et al.*, 2022; Rani *et al.,* 2023) which have found that tribal communities have utilized almost all the parts of medicinal NTFPs to create remedies for myriad diseases. This suggests that traditional knowledge can be a valuable source of medical knowledge, especially in the discovery and development of new drugs, (Malik *et al.*, 2020; Parveen *et al.,* 2020).

The medicinal NTFPs are being used since times immemorial by the tribal people living in forest fringe areas all over the globe (Panayotou and Ashton, 1993; Sonowal 2007) by supporting them with safety nets in terms of subsistence and income generation (Nkem *et al.,* 2007; Paavola, 2008; Rasul *et al.*, 2008; Negi *et al.,* 2011; Heubes *et al.,* 2012; Sumukwo *et al.,* 2013; David *et al.,* 2019; Derbe and Alemu, 2023b; Derebe *et al.,* 2023). The ethnic community residing within the Shina tribe of the Gurez valley relies profoundly upon non-timber forest Products (NTFPs) to fulfill their fundamental needs such as sustenance, medicinal resources, and housing (Atta *et al.,* 2018). Consequently, for rural economies like that of the Gurez valley, the role played by NTFPs is of paramount significance. Despite the substantial potential for enhancing the income of rural households through the commercialization of NTFPs (Khan *et al.,* 2018; Islam *et al.,* 2022), the absence of effective governmental strategies and the presence of porous forest policies have resulted in a squandering of the extensive wealth of NTFPs. Moreover, during the exploration phase, it became evident that NTFPs are widely dispersed, with no sustainable harvesting strategy having been implemented. Remarkably, although the possibilities are considerable, the state or forest department of Jammu and Kashmir has not undertaken any measures to facilitate the commercialization, value augmentation, or sustainable harvesting of non-timber forest products. As a result, the substantial potential of NTFPs largely remains untapped.

## 5. Conclusion

In this study, we concluded that NTFPs play a crucial role in treating myriad diseases and providing income and employment opportunities to the indigenous communities of the Shina tribe. Also, the documentation of the traditional use of medicinal NTFPs will be helpful in the identification and isolation of phytochemicals which ultimately will lead to the discovery of novel drugs. But over time the productivity and diversity of NTFPs have declined due to unstainable harvesting and destructive methods of collection from the wild. It is therefore imperative to call upon the state forest department, research institutes, NGOs and local village councils to develop a mechanism for sustainable harvesting, domestication and commercialization of NTFPs.

## Conflict of interest

The authors declare no conflict of interest relevant to this article.

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