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Eating from raw wild plants in Himalaya: Traditional knowledge documentary on *Sheena* tribe in Kashmir

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Present investigation describes the ethnobotanical information of 42 raw edible plants used by the *Sheena* tribe residing in Kashmir. Most of these species are consumed as wild fruits (22 spp.), some are eaten as greens salads or used in the preparation of local chutney (15 spp.), and tubers are eaten raw or occasionally boiled (5 spp.). These raw foods are considered as rich source of minerals and vitamins and are sold by locals to supplement their income. Besides food value, more than half of the investigated species (60 %) have multiple uses in the form of medicine, drugs or as NTFPs. Ethnobotanical information on four species *Oxalis acetosella*, *Crataegus rhipidophylla*, *Rubus caesius*, and *Rubus saxatilis* are recorded for the first time from India. In addition, existing ethnobotanical information on these documented plants have been reviewed along with their availability and population status on global level have been provided.

Keyword- Traditional documentary, *Sheena tribe*, Kashmir, India.

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Introduction

Jammu and Kashmir state in the Western Himalaya spreading over an area of 2,22,236 sq km is geographically divided into three main divisions, *viz*. Jammu, Ladakh, and Kashmir and is home to several valleys such as Kashmir valley, Tawi valley, Chenab valley, Poonch valley, Sind valley, and Lidder valley, whose altitude ranges from 327-8,611 m mean sea level (MSL)[1]. Commonly referred as *Terrestrial Paradise on Earth*[2], valleys of Kashmir Himalaya are sub-divided into ten districts with a total area of 15,948 km^2, formed by girding chain of Pir Panjal mountain ranges of Lesser Himalaya in south, Zanskar range of Greater Himalaya in southeast and west[3]. The total forest area is 8,128 sq km (forest cover 50.97 %), and population of Kashmir in 2011 was 69,07,623, with a density of 433 person per sq km[4]. The area under study in Kashmir lies between latitudes of 34˚31' 34.04"-34˚ 41' 12.03" N and longitudes 74˚15'42.50"-78˚38'18.50" E. The altitude of the study regions ranged between 2000-3512 m MSL and the valley remains cut off for five to six months in a year due to heavy snowfall in several places such as Razdan Pass and Purana Tulel[5]. The vegetations and forest types can be categorized into four groups: alpine, sub-alpine scrub, temperate coniferous, and temperate broad-leaved[6]. The region is known for rare animals such as Snow Leopard (*Panthera uncia*-IUCN categorized as an endangered C1 species[7]. Hangul Deer (*Cervus canadensis hanglu*-critically endangered Kashmir Stag as per IUCN[8]), Alpine Ibex (*Capra ibex*-a species of wild goat), and Himalayan Monal Pheasant (*Lophophorus impejanus*).

Available data indicated extensive ethnobotanical work has been carried out on various tribes such as *Gujjar, Kashmiri*, *Pahari, Bakarwal*, and Boto[9-12] in J&K and elsewhere in Himalaya in India[13-18]. Information on raw edible plants (REPs) used by the *Sheena* tribe have not been previously documented and to fill this gap, the present ethnobotanical work was undertaken throughout the prefecture. The present study provides the information on REPs used by the *Sheena* tribe including the botanical name, vernacular name, family, voucher number, life-form, parts used, modes of usage, and population status.

Materials and Methods

Field studies were undertaken in different seasons in between 2012 to 2016. Ethnobotanical data was

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collected using different interview methods including participatory rural appraisal (PRA), direct observation of use, semi-structured interviews, individual discussions, and questionnaires. Village head, medicine man, head of the family, and shepherds in field were contacted for discussion on ethnobotany. Information on REPs, their local names, plant parts used, and mode of usage were discussed and recorded. Locations using Garmin Oregon 650 GPS Navigation Device were recorded. The plant specimens were processed for making herbarium sheets following standard methods as per Jain & Rao herbarium techniques[19] and voucher specimen were deposited at Janaki Ammal Herbarium (acronym: RRLH) in CSIR-IIIM Jammu. The plants were carefully identified and authenticated with the help of various floras[20-21], monographs[22-23], matching plants with herbarium samples housed in Regional Research Laboratory Herbarium (RRLH) and Botanical Surve of India Dehradun (BSD). The authors of scientific valid names and abbreviations used were from renowned literature[24].

Results and Discussion

The study area was rich in flora and abode to a large number of useful economic and other plant species. While studying ethnobotany, a total of 42 species under 32 genera and 17 families were documented to be consumed by the *Sheena* tribe as raw food. Out of these, roots and tubers of 5 spp., stems and petioles of 2 spp., leaves and young twigs of 9 spp., flowers/flower-buds of 1 sp., fruits/pods of 21 spp., seeds and kernels of 2 spp., whole parts of 2 spp., were observed to be consumed by the *Sheena* tribe (Plate 1). All documented REPs with information on botanical name, family, voucher number, life form, vernacular name(s), parts eaten, and mode of usage by locals are given in Table 1. The average number of species mentioned for ethnobotanical use per informant investigated was about 4 species. Plants mentioned by only one informant was treated as data deficient and not included in this study.

The plants documented were categorized in different life-forms like herbs (50.00 %), shrubs (21.43 %), liana (4.76 %), and trees (23.81 %). The majority of food taxa belonged to the family Rosaceae (12 spp.), Polygonaceae (4 spp.), Lamiaceae (3 spp.), Berberidaceae (3 spp.) and Asteraceae (3 spp.); while families such as Apiaceae, Campanulaceae, Fabaceae, Grossulariaceae and Moraceae, represented by 2 species each, and rest of the families like Cyperaceae, Elaegnaceae, Juglandaceae, Liliaceae, Oxalidaceae, and Solanaceae were represented by only 1 species each.

Plate 1 — Ethnobotanical investigation from *Sheena* tribe in Kashmir Himalaya: a) A woman of *Sheena* tribe, b) Plant sample collection, c) *Asparagus racemosus*, d) *Berberis pachyacantha* ssp. *zabeliana*, e) *Berberis lyceum*, f) *Centella asiatica*, g) *Hippophae rhamnoides*, h) *Juglans regia, i*) *Mentha longifolia*, j) *Oxyria digyna*, k) *Ribes orientale*, l) *Rosa webbiana*, m) *Rubus saxatilis*, n) *Solanum americanum*, o) *Rumex patientia* ssp. *orientalis*, p) *Sinopodophyllum hexandrum,* q) *Trifolium repens* , r) *Oxalis acetosella*, s) *Fragaria vesca*

Table 1 — Raw wild edible plants used by the *Sheena* tribe in Kashmir, Western Himalaya

S. No	Plant name/Family/ Voucher no.	Kashmiri Name	Life- form	Parts used	Mode of Use	Population status
1	*Anaphalis triplinervis* (Sims) Sims ex C.B.Clarke/ Asteraceae/RRLH16190	*Yoktso/ Chikiga*	Herb	Flower buds	Yellowish flower buds are consumed as salads by shepherds	Endemic to Asia; common in Kashmir Himalaya
2	*Asparagus racemosus* Willd./ Liliaceae/ RRLH51548	*Prangoos*	Liana	Tubers	Fresh tubers are eaten raw by shepherds	Endemic to Asia; sparsely distributed in Himalaya belts
3	*Berberis lycium* Royle/ Berberidaceae/ RRLH51024	*Daruhaldi*	Shrub	Fruits	Ripe bluish fruits are eaten raw	Endemic to Asia; common in Himalayan belts
4	*Berberis pachyacantha* Koehne ssp. *zabeliana* (C.K.Schneid.) Jafri/ Berberidaceae/ RRLH51559	*Phulchopa*	Tree	Fruits	Ripe fruits are eaten raw	Rare and endemic to Kashmir Himalaya
5	*Centella asiatica* (L.) Urban/ Apiaceae/ RRLH51017	*Gotu Kola*	Herb	Leaves	Fresh green leaves are eaten as salads	Common throughout Asia, abundant in Himalaya belts
6	*Codonopsis ovata* Benth./ Campanulaceae/ RRLH20920	*Chameli*	Herb	Roots	Fresh roots are consumed raw by shepherds	Rare and endemic to Kashmir Himalaya
7	*Codonopsis rotundifolia* Benth./ Campanulaceae/ RRLH51025	*Kabra/ Bibdi*	Herb	Roots	Raw roots are eaten	Rare and endemic to Kashmir Himalaya
8	*Crataegus rhipidophylla* Gand./ Rosaceae/ RRLH51531	*Shoonat*	Tree	Fruits	Ripe red coloured fruits are eaten raw	Naturalized growth in Himalaya belts
9	*Cyperus rotundus* L./ Cyperaceae/ RRLH51520	*Chirpeet*	Herb	Tubers	Fresh tubers are eaten raw	Common naturalized growth in Himalaya belts
10	*Elsholtzia densa* Benth./ Lamiaceae/ RRLH21115	*Philongtso*	Herb	Leaves	Young leaves used in preparation of local chutney	Common in Himalaya belts
11	*Elsholtzia eriostachya* (Benth.) Benth./ Lamiaceae/ RRLH50956	*Tsatsa*	Herb	Leaves	Young leaves are used in preparation of local chutney	Common in Himalaya belts
12	*Ficus auriculata* Lour. Moraceae/ RRLH18981	-	Tree	Fruits	Pinkish ripe fruits are eaten raw	Common in Himalaya belts
13	*Fragaria nubicola* Lindl. ex Lacaita / Rosaceae/ RRLH50905	*Budmewa*	Herb	Fruits	Eaten raw	Common in Himalaya belts
14	*Fragaria vesca* L./ Rosaceae/ RRLH51563	*Budmewa/Jungli strawberry*	Herb	Fruits	Reddish ripe fruits eaten raw	Rare in Kashmir Himalaya belts
15	*Gentiana tianschanica* Rupr. ex Kusn./ Gentianaceae/ RRLH19757	*Wanglo*	Herb	Whole plants	Fresh plant parts are eaten as salad	Common in Kashmir and Ladakh Himalaya belts
16	*Heracleum candicans* Wall./ Apiaceae/ RRLH51027	*Folla/ Mirkul*	Shrub	Young twigs	Fresh twigs are eaten by shepherds as salad	Common in Kashmir Himalaya belts
17	*Hippophae rhamnoides* L./ Elaeagnaceae/ RRLH51527	*Kond/ Chacoo*	Shrub	Fruits	Local juice prepared, stored and consumed in winter	Very common in Kashmir and Ladakh Himalaya belts
18	*Juglans regia* L./ Juglandaceae/ RRLH51510	*Akhrot/Achoo*	Tree	Fruits	Kernel of fruits are eaten	Very common in Kashmir and Ladakh Himalaya belts
19	*Lactuca sativa* L./ Asteraceae/ RRLH51026	*Salad*	Herb	Young twigs	Fresh leaves and young twigs are eaten raw as salad	Cultivated in Himalaya belts of Asia
20	*Lathyrus humilis* (Ser.) Fisher ex Spreng./ Fabaceae/ RRLH51536	*Kaown*	Herb	Seeds	Raw seeds are eaten	Common in Kashmir and Ladakh Himalaya belts
21	*Malus domestica* Borkh./ Rosaceae/ RRLH51515	*Pulay*	Tree	Fruits	Ripe fruits are eaten raw, it is cultivated as source of cash income	Cultivated in Kashmir Himalaya belts

(*Contd*.)

Table 1 — Raw wild edible plants used by the *Sheena* tribe in Kashmir, Western Himalaya(*Contd*.)

S. No	Plant name/ Family/Voucher no.	Kashmiri Name	Life- form	Parts used	Mode of Use	Population status
22	*Mentha longifolia* L./ Lamiaceae/ RRLH51516	*Breeena/Jungli Phudina*	Herb	Leaves	Fresh leaves are eaten as chutney	Commonly occurs in Kashmir and Ladakh Himalaya belts
23	*Morus alba* L./ Moraceae/ RRLH51514	*Marooth*	Tree	Fruits	Ripe fruits are eaten raw and chutney is prepared from unripe fruits	Common in Asian countries
24	*Oxyria digyna* (L.) Hill/ Polygonaceae/ RRLH50985	*Lamanchu/ Tajkiral*	Herb	Leaves	Eaten as salad and chutney	Sparsely occurs in high altitude areas of Kashmir and Ladakh regions
25	*Oxalis acetosella* L./ Oxalidaceae/ RRLH51028	*Gammenuma*	Herb	Tubers	Eaten raw to alleviate thirst by Shepherds	Common in Himalaya belts
26	*Persicaria alpina* (All.) H.Gross/ Polygonaceae/ RRLH850985	*Chikro / Maruch phonar*	Herb	Stems	Stem is chewed as well as used in chutney	Common in Kashmir and Arunachal Himalaya belts
27	*Prunus armeniaca* L./ Rosaceae/ RRLH19613	*Chuli*	Tree	Fruits	Kernel of fruits is eaten raw	Common in Himalaya belts
28	*Prunus cornuta* (Wall. ex Royle) Steud./ Rosaceae/ RRLH21785	*Padus*	Tree	Fruits	Ripe fruits are eaten raw	Common in Himalaya belts
29	*Rheum webbianum* Royle/ Polygonaceae/ RRLH21343	*Lachhu*	Herb	Petioles	Eaten as salad and chutney	Common in Kashmir and Ladakh Himalaya belts
30	*Ribes alpestre* Wall. ex Decne./ Grossulariaceae/ RRLH50984	*Shatoo*	Tree	Fruits	Ripe fruits are eaten raw	Common in Kashmir Himalaya belts
31	*Ribes orientale* Desf./ Grossulariaceae/ RRLH50988	*Askut*	Tree	Fruits	Ripe fruits are eaten raw	Common in Kashmir and Ladakh Himalaya belts
32	*Rosa webbiana* Wall ex Royle/ Rosaceae/ RRLH50989	*Siah*	Shrub	Fruits	Ripe fruits are eaten raw	Common throughout Himalaya belts
33	*Rubus alceifolius* Poir./ Rosaceae/ RRLH50985	-	Liana	Fruits	Ripe fruits are eaten raw	Common throughout Himalaya belts
34	*Rubus caesius* L./ Rosaceae/ RRLH51584	*Akhray*	Shrub	Fruits	Ripe fruits are eaten raw	Common throughout Himalaya belts
35	*Rubus idaeus* L./ Rosaceae/ RRLH51552	*Lalresh*	Shrub	Fruits	Ripe pinkish fruits are eaten raw	Sparsely occurs in Himalaya belts
36	*Rubus niveus* Thunb./ Rosaceae/51550	*Jomy*	Shrub	Fruits	Ripe black fruits are eaten raw	Common throughout Himalaya belts
37	*Rubus saxatilis* L./ Rosaceae/ RRLH59982	*Chhota Akhray*	Shrub	Fruits	Ripe red fruits are eaten raw	Rare in Himalaya belts
38	*Rumex patientia* L. ssp. *orientalis* (Bernh. ex Schult. & Schult.f.) Danser/ Polygonaceae/ RRLH50958	*Shommena*	Herb	Leaves	Eaten as chutney	Common throughout Kashmir and Ladakh Himalaya belts
39	*Sinopodophyllum hexandrum* (Royle) T.S.Ying / Berberidaceae/ RRLH50983	*Chamandi*	Herb	Fruits	Ripe red fruits are eaten raw	Common throughout Northern Himalaya belts
40	*Solanum americanum* Mill./ Solanaceae/ RRLH51590	*Tsigma*	Shrub	Fruits	Black ripe fruits are eaten raw	Common throughout Himalaya belts
41	*Sonchus oleraceus* (L.) L./ Asteraceae/ RRLH51598	*Khala*	Herb	Leaves	Shepherds eat the fresh leaves as salad	Common throughout Kashmir and Ladakh Himalaya belts
42	*Trifolium repens* L./ Fabaceae/ RRLH50958	*Ishpit*	Herb	Whole plants	Fresh plant parts are eaten as salad	Common throughout Himalaya belts

The genera with by the highest number of REPs species was *Rubus* (5 spp.), followed by *Berberis*, *Codonopsis*, *Elsholtzia*, *Fragaria*, *Prunus*, and *Ribes*, which were represented by 2 species each. The most frequently used parts were fruits, young leaves, and tubers. The results are similar to earlier studies from

Ladakh in North Himalaya (India)[25] and from Tibet in Yunnan (China)[26]. Collection season of the wild edible plants varied from May to August (for young leaves, tubers and roots) and late August to October (for fruits and seeds). In winter, plants usually die out due to heavy snowfall in higher altitude regions; therefore, people dry the edible parts and store them for use in winter months. Kernel of *Juglans regia* is consumed fresh as well as stored for use in winter. Commonly available fruits of *Berberis lycium*, *Berberis pachyacantha* ssp. *zabeliana*, *Ficus auriculata*, *Fragaria nubicola, Morus alba*, *Rubus alceifolius, Rubus caesius*, and *Rubus idaeus* were found to be eaten fresh. Young twigs and leaves of *Gentiana tianschanica*, *Lactuca sativa*, and *Sonchus oleraceus* were consumed as salad or added to preparation of local home-made soup.

Review of literature reveals that ethnobotanical works on four species, *viz*. *Crataegus rhipidophylla*, *Oxalis acetosella*, *R. caesius*, and *Rubus saxatilis* have not been published from Himalaya and presented first time in this investigation. The plant species like *Elsholtzia eriostachya*, *F. auriculata*, *G. tianschanica*, *L.sativa*, *Lathyrus humilis*, *Malus domestica*, *Prunus cornuta*, *Ribes alpestre*, *Ribes orientale*, *R.alceifolius*, *Rubus niveus*, *Rumex patientia* ssp. *orientalis*, and *S.oleraceus*, were found to be eaten by many people in the study area and elsewhere in Kashmir Himalaya[27-28]. *B. pachyacantha* ssp. *zabeliana*, *Cyperus rotundus*, *Heracleum candicans, Mentha longifolia* and *R.idaeus* are documented for the first time from *Sheena* tribe and added as raw wild edible potential plant of India. This information may be useful for development of new nutraceuticals and value-added products. *Anaphalis triplinervis*, *Asparagus racemosus*, *B. lycium*, *Centella asiatica*, *Codonopsis ovata*, *Codonopsis rotundifolia*, *Elsholtzia densa*, *F. nubicola*, *Fragaria vesca*, *Hippophae rhamnoides*, *Juglans regia*, *M. alba*, *Oxyria digyna*, *Persicaria alpine*, *Prunus armeniaca*, *Rheum webbianum*, *Rosa webbiana*, *Sinopodophyllum hexandrum*, *Solanum americanum*, and *Trifolium repens* were used by *Sheenas* for their day to day medicine as well as edible raw food materials.

Wild edible plant resources play an important role in providing local people with various vital nutritional elements, such as amino-acids, vitamins, and minerals needed to maintain good health and promote immunity against infection in harsh environment conditions. Investigated REPs were also reviewed from the published ethnobotanical studies in India and elsewhere in the world. Analysis suggests that 30.95 % (13 spp.) used as wild edible food, 11.9 % (5 spp.) used as medicine, and 47.62 % (20 spp.) plants have mixed values and were used as raw edible food as well as medicine. Fresh roots and leaves of *A. triplinervis* are used in stomach pain and dried leaves are used in fever[29]. Same plants have been used by different tribes for different medicinal purposes[30-32], as for example, consuming tubers of *A. racemosus* diluted with milk for three months cures epilepsy in *Tripuri* and *Reang* tribes of Assam[33]. Similarly, local herbal medicine *Rasaunt* is prepared from dried roots and young apical shoots of *B. lycium* to cure eye infection[34]**.** Powdered roots of *Codonopsis* are used in the treatment of ulcers and wounds[34]; extract prepared from aerial parts is used for the treatment of asthma and general weakness in livestock[35]**.** Similarly, tuber paste of *C. rotundus* is used as appetizer; decoction made after crushing with root of *Solanum torvum* and stem of *Tinospora cordifolia* is used in the treatment of childbirth infections; and the tuber paste mixed with honey is given in dyspepsia[36]. Juice extract from *E. densa* is used in dysentery and stomach pain. Fresh rhizome of *F. nubicola* mixed with 2-5 mg powdered sugar cures tonsillitis[37]**.** *H. rhamnoides* is useful in digestion, used as anti-oxidants, treatment of tumours, liver ailments, eye ailments, bronchial asthma, skin wrinkles and high cholesterol[38]; fruit jelly is taken to cure hepatic enlargement, and seeds used for treatment of cancer[39].

Conclusion

This study is the first ethnobotanical investigation of raw edible plants used by *Sheena* tribe residing along LoC border of Kashmir. As plant resources in Western Himalaya are rather plentiful and under the influence of other ethnic groups such as *Pahari* and *Bakarwals*, the *Sheenas* not only cultivate various crops, but also collect wild edible plants as food. The present study concludes that different parts of the plants were used as food and medicine by the *Sheena* tribe, which sustains their life. The most frequently used parts include fruits, leaves, and tubers. If properly maintained and harvested, wild plants of this region could be the source of additional income for local people. With increased demand for green nutraceuticals, wild raw foods have attracted global interest as they contain numerous micronutrients and pharmacologically active substances. But, due to

urbanization and fast modernization activities, the traditional knowledge on the use of plants is fast vanishing. Therefore, there is an urgent need to document the traditional knowledge associated with a particular tribe, or otherwise such customs and indigenous knowledge will be lost forever. The conservation efforts of the tribal communities need to be recognized and the *in-situ* and *ex-situ* conservation of important documented wild plant species needs to be revitalized.

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