Medicinal Plants Biodiversity of some Selected Villages of Zanskar Valley (Ladakh region)

Tsering Lamo, Tashi Stobgais, Padma Gurmet, Tsewang Dolma, Sonam Dawa*, Tsering Angdus and Thinles Chosdup

National Research Institute for Sowa-Rigpa Leh Ladakh, Ministry of AYUSH, India

*Corresponding author

Introduction

Ladakh, the land of high passes is located in the northern part India (J&K state), covers 70,000 sq km² geographical area of the state which lies between 31°44' 57’’- 32° 59’ 57’’N. latitude and 76° 46’ 29’’-8° 41’ 34’’ E longitude (Hamid and Raina, 2014). Zanskar lies to the north of main Himalaya lies between 11000ft to 14000ft of altitude with huge diversity of plants. The Indian trans-Himalaya covers 186,000 km² above natural tree line zone with sparsely distributed vegetation (Chaurasia and Gurmet, 2003). The
flora of Himalaya comes under alpine and subalpine zone and due to its unique climate condition plants are sparsely distributed, dominated by herbs, shrubs, grasses and bushes. The mountain slopes and barren land display a magnificent view of flowers of the region.

The entire Ladakh is categorised into five valleys namely, Indus, Nubra, Changthang, Suru and Zanskar (Kaul, 1997). And this paper deals with ethno-botanical study of Zanskar valley, Zanskar is one of the beautiful valley of Ladakh located in west. Ethnobotany is the study of interaction between people and plant with emphasis on traditional tribal culture (Mefsin et al., 2013). The valley is separated from rest part of the Ladakh with high mountain bounding the valley from all direction and Zanskar river. As we enter the Zanskar valley, there comes a mountain pass called Penzi La with 14450 ft, after crossing this pass the different villages of Zanskar valley visible one by one. The important villages with rich medicinal plants are Rangdum, Padum, Bardan and Raru. People of Zanskar valley depend on Amchi system of medicine (a traditional healer), during earlier period it was the only healthcare system but later allopathic medical system came into picture after the independence of India (Chaurasia et al., 2007) (Fig. 1).

**The people of Zanskar**

The valley is inhabited by two tribe in Zanskar Bot tribe and Muslim tribe; mostly there is Bot tribe which are Buddhist community. Most of the people are illiterate and their main sources of income are animal rearing and agriculture. Food habit is generally both vegetarian and non vegetarian. There is a small patch of agricultural farm where they grow wheat, barley and pea. They grow vegetables in the garden for their own purpose.

**Climate condition of Zanskar valley**

The valley comes under one of the extreme cold and hot climate condition where summer season is very short with high radiation, low precipitation, low humidity and winter season is long with the temperature below –27° result in heavy snowfall. Therefore, due to the harsh climate condition the valley is cut off from rest of the world by the huge mountain passes and that’s why people of this valley have to rely upon their own traditional method of living where people store the vegetables grown during summer season (Gurmet et al., 2000). Due to the side effect and high cost of modern medicine people are mainly depend on traditional system of medicine. The rich diversity of medicinal plants is due to peculiar temperature and type of soil of Zanskar valley.

**Sowa-Ripa (The Himalayan art of healing)**

Sowa-rigpa derived from Mongolian word “Am-rjay” means superior of all, commonly known as Amchi or Tibetan system of medicine and the practitioner of it is called Amchi. Since long years ago people have so much faith, trust and respect on traditional or Amchi system of medicine and this system of medicine is also very well known in Tibet, Mongolia, Bhutan, China, Nepal, Bhuriat Republic of Russia and Himalaya region of Himachal Pradesh and Sikkim in India (Wabe et al., 2011). It was the only healing method during the earlier time, later with much progress and development allopathic medicine was came. Every village have an Amchi, it takes several years to become a skillful Amchi. Earlier, it was knowledge passes from father to son now it can be practise by all. Amchis never ask for cost and services, it all depends on the people to present something beside’s money like earlier time people offer wheat, barley or help the Amchi family during the time of harvesting the crops, etc (Gurmet, 2004). Rgyud-bzi, a fundamental text book of
sowa rigpa believed to taught by Buddha outlines a vast knowledge of medicine, basic principle of health and disease, method of diagnose disease and therapeutic approaches. The basic theory of sowa rigpa is based on the principles of Jung-wa-Ina (English- five elements, Sanskrit — Panch-mahabhuta) and Nespa gsum (English — three humours, Sanskrit — Tri-dosh) (Yuthog 2008). All the medicine either in powder form or capsules are made up of 3 to 40 ingredients. Stan Gyur, a Buddhism text book contain various aspects of medicine and treatment of many incurable disease (Phunstog, 2006).

Study area

Fig. 1 Map of Zanskar valley showing the study area

Materials and Methods

The survey is basically done with the aim to identify medicinal plants, to collect medicinal plants for documentation and herbarium preparation. Due to short growing season survey can carried out only during the summer season because it is very cold during winter.

The villages have been surveyed through rocky mountains, pastured land, wetlands, crossing the passes and agriculture land. Around 60 medicinal plants were collected out of which 22 were selected for present study. Plant specimens collected from the area were dried, pressed and kept in a herbarium sheet. Herbarium were made for all the plants and kept in National Research Institute for Sowa-rigpa, Leh. With the help of traditional healers uses of plants was documented. The botanical plant specimens were identified with the help of flora and literary survey. The essential medicinal plants used in Sowa-rigpa were given below in alphabetical order along with botanical name, family, local name, habitat, characteristic feature and Sorig uses.

Results and Discussion

It is represented in table 1.

In conclusion since, Zanskar is one of the hotspot for medicinal plants and there is high risk of extinction of those medicinal plants due to lack of knowledge, over collection by traditional healer and researcher, unscientific exploration, uprooting for fuel, overgrazing and other activities. There are natural enemies also like pathogen, herbivores and predator (Kala et al., 2006).

Cultivation of medicinal plants can provide income for the people living in the remote area. It is therefore becomes important to conserve and cultivate those medicinal plants for future generation.

To cultivate medicinal plants, plant material should be of good quality, rich in active ingredients, pest and disease resistant and environment tolerant. Cultivation can be done either by ex-situ or in-situ method. Appropriate agro-techniques, awareness among interested farmer’s, supportive government policies, protectable cultivation practise, and assured market are the key factors for successful medicinal plants cultivation.
### Table 1. Enumerations

| Botanical name                  | Sowa-rigpa name | Family      | Habitat                        | Botanical feature                                                                                       | Part use     | Sowa-rigpa uses                                                                                       |
|---------------------------------|-----------------|-------------|--------------------------------|---------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------|
| *Arnebia euchroma* (Royle.) John. I. M Johnston. | Demok, (‘bri-mog’) | Boraginaceae | dry rocky slopes of Zanskar | A tufted, perennial herb. Stout rootstock. Stem erect, smooth, many arising from rootstock. Leaves sessile, alternate, pinnatisect, extistipulate, leaf outline lanceolate, leaf margin ciliate, leaf apex truncate and leaf base cuneate. Inflorescence racemose. Flower blackish purple. | Root         | It treats lungs and pulmonary diseases, blood disorder, nose bleeding, impure blood, hair losses, etc. |
| *Astragalus rhizanthus* Royle ex Benth. | (srad-ser)       | Fabaceae    | On open stony slopes of Zanskar valley | Stemless, perennial herb, densely covered with silky hairs. Leaves pinnate, pressed to the ground and radiating from the centre, imparipinnately compound, oblong, pilose beneath. Flowers bright yellow in dense stalkless at the centre, aggregate at the base. | leaves, stem, flower and fruit | It treats fever of nerve, fever of wounds, bleeding, high altitude sickness and weakness, etc. |
| *Artemisia dracunculus* Linn. A.glauca ex Wild | (Tshar-bong)     | Asteraceae  | on wastelands of Zanskar      | An erect, strong perennial herb. Stem grooved, smooth. Leaves entire, linear-oblong, acute. Flower heads globular, short-stalk, forming long axillary raceme. Involutural bracts glaucous with papery margin | all parts above ground | It treats pharyngitis, pulmonary diseases and swelling due to hot disorders etc. |
| *Calvatia cyathiformis* (Bosc.) Morg | (Pha-wa-sGo-go) | Lycoperdaceae | grassy area                    | a smooth, spherical, white at young and brown at maturity. As it reach the reproductive stage the exterior part shrunk and the spores will disperse. After the spores becomes disperse there left only a leathery cup shaped structure rooted at the ground. | Spores       | The powder enclosed in this mushroom can be applied directly on the affected part to assist blood clotting and to heal ruptured capillaries and wounds. It is also mixed with water for external application against |
| Species                         | Family       | Habitat                                                                 | Description                                                                 | Uses                                                                 |
|--------------------------------|--------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------|
| Corydalis govaniana            | Papaveraceae | Forest area and moist places and humid condition                        | Stout branched, annual herb. Rootstock woody often branched covered with leaf bases of old leaves. Leaves many, oblong, and 2-pinnatisect. Flowers many, dense, yellow in dense cluster. | It treats excessive impure blood, fever of blood, liver and gall bladder, pain due to hot disorders. |
| Delphinium cashmirianum        | Ranunculaceae | Snow melted alpine slopes                                                 | An erect, glaurous, perennial herb. Stem hispidally hairy, branched, few leaves. Leaves deeply dissected, palmate with cuneate-ovate. Flower bluish-purple with short spur in terminal racemes, long stalk. | It treats dysentery, diarrhea with bleeding, inflammation wounds, lump fluids etc. |
| Dianthus anatolicus            | Caryophyllaceae | Dry places                                                               | A small, slender, densely tufted, perennial herb. Stem 6-10 inches. Leaves small, narrow, midrib and margin thick. Flowers rosy. Corolla toothed, blade small, broad, crenate toothed. | Leaves use against stomach problem                                   |
| Epilobium lantifolium          | Onagraceae   | Damp places                                                              | An erect, leafy, perennial herb. Stem branched, glaurous, often spreading. Leaves narrowed above and below, oblong, elliptic, pubescent. Flower purplish pink in a spike like terminal cluster. Calyx lobes broad lanceolate, long pointed, free at base. Petals 4, rounded, short stalk. Capsule long and pubescent. | Every part of this plant is edible.                                   |
| Ephedra gerardiana             | Ephedraceae  | Stony dry area of                                                        | A low growing tufted shrub. Stem erect, tufted, branched. Branches           | It treats various kinds of bleeding, spleenic diseases.              |
|                                |              |                                                                         | Fruit and stem                                                             |                                                                      |
| **Genus** | **Species** | **Family** | **Habitat** | **Description** | **Parts Used** | **Uses** |
|-----------|-------------|------------|-------------|----------------|---------------|---------|
| *Gentianella* | *moorcroftiana* (Wall. ex Griseb) Airy Shaw | Gentianaceae | Open slopes and moist places. | A slender, erect, annual herb. Stem erect, branched from the base. Leaves lanceolate or oblong, elliptic, narrowed below. Flowers blue to white, solitary in terminal or axillary raceme, long pedicillate, tubular to funnel shaped. | all parts above ground. | antitoxin and febrifuge. |
| *Meconopsis* | *aculeate* Royle. | Papaveraceae | Rare on damp slopes | delicate perennial herb. Long stem with bristle hair. Leaves pinnatisect, bristly hair. Flower usually blue, borne on long stock. Petal usually rounded to obovate. Numerous yellow stamen. Capsule oblong, prickly. | all parts above ground. | It treats bone fractured, bones fever, head injured, wounds and strengthen bone marrow etc. |
| *Melilotus* | *officinalis* Linnn. | Fabaceae | wet places. | An erect, biennial herb. Stem slender, branched, glabrous. Leaves 3 pinnate, toothed, trifoliate, leaflet obovate, oblong. Flowers yellow in lax raceme, dense, shortly stalked bracteates. Corolla yellow, odorous, usually 3 times long as calyx. | all parts above ground. | It treats fever associated with poison, severe bacterial diseases, chronic fever, swelling, splenic cramps, diphtheria, microbial diseases, limbs puses etc. |
| *Oxyria* | *digyna* (Linn.) Hill. | Polygonaceae | Moist places | A fleshy acid flavoured, glabrous, succulent, perennial herb. Stem usually unbranched, reddish and hairless. Basal leaves fleshy, numerous, round to reniform, long petiolated with dichotomous venation. Flower minute, pink or green. | flower and stem. | It treats wound infectious and pimples etc. |
| *Pleurosernum* | | Apiaceae | On moist | A stout, perennial plant. Stem hollow, fruit | It treats all kinds of poison like |
| **candollii** (DC.) Benth ex Clarke | slopes | usually very thick. Base of the stem covered with persistent old leaf base. Leaves in basal rosette, pinnate, with sheathing leaf base, leaflet broad wedge shape to broad ovate, usually 3 lobed and toothed. Flower white borne in a solitary terminal compound umbel. Fruits oblong with narrow wings. | green poison, meat poison, fragrance poison, gemstones poison and transmitted poison, heals all type of fever, maintain body, constipation, pain and amenorrhoea, etc. |
| **Rhodiola tibetica** (Hk.f. & T.) Fu | common on moist alpine places | An erect, perennial herb. Stem fleshy, pubescent, green. Leaves fleshy, lanceolate, green. Flower reddish, stalkless, bractless, in a dense domed cluster. | It heals lungs disorder, fever of the lungs, asthma, any type of mouth-disorders, infectious cough and especially for body tonic etc. |
| **Rheum australe** D. Don Syn. (*R. emodi* Wall. ex Meisser) | Open slopes, alpine grassland | Perennial with stout stem. Leaves rounded to broadly ovate blade, basal leaves are very large, reddish brown at maturity. Rootstock stout. | It treats bone fracture, indigestion, bloated stomach, cancers, severe bacterial disease tumours, dermatological disorders, wounds, internal wounds, fever of gall bladder and amenorrhoea etc. Also used for colouring wool and as fixative. Petioles are used as anthelmintic, and in gastritis and swellings. Also used as pickle. |
| **Saussurea obvallata** (DC) Edgew | Grassy area. | An erect, robust, perennial herb with stout stem. Leaves amplexicaul, toothed, lower and upper leaf sessile, arcuate venation. Flower head purple in dense umble like cluster surrounded by large pale yellow boat shaped pappery bracts. | It treats evil spirits diseases, planetary diseases, wound and relief pain etc. |
| **Sedum ewersii** (tsan-rigs) | moist | A small, succulent, glabrous, all part | Leaves are used as a salad and for |
| **Ledeb.** | slopes. | perennial herb. Stem usually branched at the base, reddish. Leaves mostly opposite, ovate to round, younger leaves reddish and older leaves greenish. Flower small purple borne in cluster at the top. | making sauce. |
| --- | --- | --- | --- |
| **Tanacetum tibeticum** Hk.f & T. Ex Clarke (khanchung-srego) | Open slopes and wasteland | Stem many arising from woody rootstock. Leaves much dissected. Flower head yellow, large, rounded, forming terminal corymbs. | all part above ground are used. used as an antiseptic, against swelling gums |
| **Thlaspi alpestre** Linn.ex.Hk.f.& T.Anders (dayga) | Rocky area | A small perennial tufted herb. Stem erect, glabrous, simple or branched. Leaves orbicular, cauline leaves obovate, auricle. Flower large borne in a raceme. Pods triangular, winged. | fruit, leaves, flower used against inflammation of lungs and kidney, seminal and vaginal discharges, kidney problem, pus in lungs, and appendicitis. |
DIHAR (Defence Institute of High Altitude Research) has cultivated the medicinal plants by vegetative propagation and they also conducted workshops and field demonstration on conservation practise of medicinal plants. NGO’s, stakeholder’s, scientist and government organization should work collaboratively to conserve the valuable medicinal plants for the sustainable use.

In spite of advancement in modern medicine people still rely on traditional healing practise of herbal based medicine for health care as old as human civilization. Traditional medicines are effective, safe, inexpensive and culturally acceptable while modern medicines are expensive and show side effect. About 80% of world population are based on herbal products for primary health care but due to lack of interest in younger generation this traditional knowledge has been started declining. Hence it becomes important for all of us to conserve traditional knowledge.

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