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Review article

Harvesting and management of medicinal and aromatic plants in the Himalaya

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ABSTRACT

The medicinal and aromatic plants (MAPs) of the Himalayan region have been harvested from ancient times for their multiple uses. The traditional harvesting practices of these valuable MAPs have been altered over the period of time due to several reasons, including advent of market forces, resulting in decline of many MAPs populations. In this context, the system of MAPs harvesting is analysed and reviewed in view of their management and sustainability. Along the altitudinal gradient in the Himalaya, seasonality determines specific trend in collection of MAPs. In alpine areas (> 3500 m), the collection begins in May till the next heavy snowfall in late September, and mainly underground plant parts are harvested. The temperate region (1500–3500 m) being occupied by permanent settlers, collection of some MAPs continues here throughout the year likewise subtropical areas (1000–1500 m). The collectors are either dedicated or opportunistic. The dedicated collectors are totally focused on the particular plant collection which is on high demand and fetch them attractive cash. The collection practices of both dedicated and opportunistic gatherers are not organised. Competition among collectors for MAPs has brought in changes in the harvesting cycles and harvesting periods that subsequently affect the regeneration and reproductive potential of these species. Besides, the overharvesting of MAPs has wedged the development of MAPs sector. Formulation of sustainable harvesting practices and suitable regulations are required for the long-term conservation and management of MAPs in the Himalaya.

1. Introduction

The Himalayan mountain system, likewise other biomes of the world, has been known for centuries for harbouring a rich wealth of extremely valuable medicinal and aromatic plants (MAPs) (Kala, 2005a; Kala, 2010). At present, the trade of MAPs from the Himalaya to the other parts of the world is speeding up due to increase in their demand which subsequently affect the traditional collection practices of MAPs (Olsen, 1998). Earlier, the harvesting of MAPs was mainly practiced by traditional healers but with the high demand of MAPs at regional to international markets, many of the untrained collectors begin to participate in collection (Sharma and Kala, 2016). To draw maximum profit out of trade, the local people tend to harvest MAPs without taking care of traditional norms (Uniyal et al., 2011a,b). Such exploitation of MAPs from the natural habitats is subjected to serious concerns, globally, especially with respect to their sustainability. There are reports on population decline of such commercially extracted MAPs in the wild (Kala, 2005a; Ghimire et al., 2005), which impose negative impacts on the entire MAPs sector, ecologically, economically and socially (Shrestha and Bawa, 2013; Kala, 2015a). Other than harvesting of MAPs for health care, perfumery and trade, MAPs are also collected for various other household activities including requirement for fuel wood, fodder, and fibres that have also hastened the endangerment of these valuable species (Hamilton, 1997).

MAPs being a valuable resource, it is essential to understand the present course of dynamics in their harvesting trends so that sustainability of this important resource can be maintained for posterity. The lack of information on the extraction of MAPs may harm the species that requires immediate conservation interventions. Hitherto, the information on ecological sustainability of MAPs extraction from the Himalaya and their post harvesting handling are obscure. In this context, analysis of MAPs harvesting is presented in this paper, which is based on the field experiences and availability of existing literature on the harvesting processes and post harvest handling practices of MAPs.

2. Methods

2.1. Study area: the Himalaya

At stretch, Himalayan arc of 2500 km in length and 240–320 km in

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width covers almost 8 countries (i.e., Afghanistan, Pakistan, India, Nepal, Bhutan, Bangladesh, China and Burma). The Himalaya spans an area of about 750,000 km^2. Nepal and India occupy maximum percentage of Himalayan region. Longitudinally, the Himalaya is classified into three strips i.e. outer Himalaya (Siwalik range), middle Himalaya and higher Himalaya (Great Himalaya) (Wadia, 1964). From east to west the Himalaya is divided into three regions i.e., western, central and eastern Himalaya. The range comprises of different forest types starting from the sub-tropical and temperate forest type to the sub-alpine and alpine zone (Kala, 2005a). Eastern part of the Himalaya is recognised as the biodiversity hotspot, which comprises of variety of flora and fauna. Nineteen major rivers drain through the Himalaya of which the Indus (flowing through Tibet, India and Pakistan), Brahmaputra (flowing through Tibet, India and Bangladesh), and the Ganges (flowing through India and Bangladesh) are well-known rivers.

About 40 million people inhabit the Himalayan region, of which 55% lives in Indian Himalaya. Of the Indian Himalayan population 54% lives in central Himalaya, 25% in western Himalaya and 21% in eastern Himalaya (Badola and Aitken, 2003). Nepal supports 27.07 million inhabitants whereas the population of Bhutan is only 792,581. Historically, the inhabitants of the Himalaya are self-reliant and depend on natural resources, which form a complex cultural diversity. The tribal groups live here include Dards and Mons of western Himalayas; Khasa and Kanet of west and central Himalayas; Thakuris, Chhetris, Gurungs, Tamangs and Sherpas from Nepal Himalayas; the Sherpas, Lepchas and Bhutiyas of eastern Himalaya. The occupations of these communities vary from subsistence agriculture, commercial cropping, agro processing and pastoralism. Many communities also involve in activities such as mountaineering, collection of non timber forest produce (mostly MAPs) and animal husbandry as a part of source for sustaining the livelihood.

2.2. Survey methods

2.2.1. Secondary sources

Extensive literature survey was carried out for collection of data on the harvesting patterns of MAPs along the Himalayan mountain range. The literature searched from different sources includes scientific journals, books, reports from national, regional and international organisations, thesis, conference materials and online databases. The academic literature databases were consulted, which include EBSCO, JSTOR, and Science Direct. The relevant materials were screened out of the voluminous results searched in the internet search engines mainly Google, Google Scholar and Scribd. Specific search terms such as medicinal plants, Himalayan biodiversity, harvesting of medicinal and aromatic plants and its impacts were explored. A large set of information was collected through secondary sources.

The inhabitants of the Himalayan region practicing herbal medicinal system were grouped as amchi (practitioners of Tibetan medical system), vaidya (practitioners of Ayurveda), hakim (practitioners of Unani system of medicine), and local people having knowledge on medicinal plants (Dey, 1980; Kala, 2003). The data from different countries (i.e., India, China, Nepal, Bhutan, Pakistan and Bangladesh) were compiled based on the defined groups and the harvesting pattern, which were further classified under different parameters such as objective for collection, basis for collection, type of collector and methods of collection. This helped in determining the relation between the different harvesting groups and harvesting methods. Different parameters i.e. time, maturity, availability, phenology and requirement of plant parts were enumerated. The types of collectors were divided into three categories i.e., selective, dedicated and opportunistic based on the collected information.

2.2.2. Fieldwork

Field surveys have been undertaken along the Himalayan region for past 16 years, especially in the states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Arunachal Pradesh and western region of Nepal. Field surveys helped in gathering data on harvesting patterns along the altitudinal ranges and forest types. The first hand information on MAPs collection practices was obtained from the different Himalayan communities during the fieldwork.

2.2.2.1. Stratification and classification. In order to study the distribution of MAPs, the Himalayan range was stratified based on the different forest types along the altitudinal gradient. The classification of different forest types given by Champion and Seth (1968) was considered and based on this classification the Himalayan range was stratified into three major forest types i.e. sub-tropical forest type (1000–1500m), temperate forest type (1500–3500m) and the alpine region (> 3500 m). The data on MAPs from different forest types were compiled under different parameters i.e., habit, phenophase, plant part collected, means of collection and season of collection.

2.2.2.2. Seasonality. Generally, the Himalaya experiences great seasonal variations (Kala, 1998). The seasons include winters (November – February), followed by spring (February – March), summer (April – August) and autumn (September – November). One of the important weather pattern observed in this region is the monsoon starting from June till September. The collection period, method of collection and collection of plant part of each MAP was recorded across the different seasons.

2.2.2.3. Utilisation pattern. Amchi, vaidya, other local healers, and employees of pharmaceutical companies were interviewed for collection of information on various uses of MAPs, useful plant parts, and ailments to be cured.

2.3. Analytical methods

In order to analyse the data IBM SPSS Statistics 20.0 software (IBM Corp. Released 2011) was used. Relations between the type of collectors, demand of MAPs, types of collection and sustainability were determined. Also, to depict the trend of different MAPs under various life form classes were graphically represented.

3. Results and discussion

3.1. Wealth of MAPs in the Himalaya

The Himalayan arc endows with diverse floral and faunal wealth, which is a source of evolution of rich traditional knowledge. The Indian Himalayan region harbours 1748 species of medicinal plants − 1020 herbs, 338 shrubs, 339 trees, apart from 51 pteridophytes (Samant et al., 1998). This rich diversity of medicinal plants is identified here as a basic necessity of rural and the high altitude folks. The north-eastern part of the Indian Himalaya is flourished with the ethno cultural diversity, which is rich in traditional knowledge and practices. All together the northeast comprises of 30% of the major tribal communities of India (Ramakrishnan, 2000) who depend on MAPs for their health care needs. About 707 species of medicinal plants are reported to occur in Sikkim and Darjeeling region. Uttarakhand state of India, which is declared as the 'Herbal State' by the Indian state government in 2003, forms a major part of the Indian Himalaya. The majority of tribal communities of Uttarakhand (e.g., Bokshas, Tharus, Bhotias, Vangujjars, Marchchas, Tolchas, Jaunsaris, Koltas, Gangwal, and Banrauat) depend on forest produce for their livelihood. About 964 plant species have been identified in this state, out of which 175 species are commercially active and marketed (Kala, 2010). In Himachal Pradesh, the adjacent state of Uttarakhand, 548 species are identified as medicinal plants (Badola and Aitken, 2003).

A wide range of MAPs are native to the Pakistan Himalaya, and about 600–1500 MAPs have been identified in this part of the Himalaya