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Importance of Flora in the Economy of Local Inhabitants of Karnah in Jammu and Kashmir India

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Abstract

Present study, conducted in Karnah, Jammu and Kashmir, from February 2022 to August 2023, rigorously collected data through interviews, discussions, and observations. The Study investigated the economic significance of local flora, documenting 28 plant species across 20 families. Pinaceae (14%) stood out. Trees (n=18), herbs (n=10), and one shrub (n=1) were noted. Wild species (16) surpassed cultivated (12). Plant parts had varied economic uses; a significant difference ($\chi 2=90.587$, df=7, $p<0.001$) was observed. *Notably, Juglans regia, Prunus cornuta, Celtis tetrandra, Ficus carica, Morus alba,* and *Cynodia oblang* were highlighted for economic applications. "Whole plant" (51%), leaves (20%), fruits (17%), bulb and seeds (6% each) were the most used components. Six uses (Medicine, food, timber, fuel, aesthetic, and industrial) contributed to the local economy. This pioneering study sheds light on the economic role of plant taxa in the Karnah region of Jammu and Kashmir.

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Cultivated;
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Flora; Livelihood;
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Introduction

The Jammu and Kashmir is having a rich biodiversity of plants playing an important role not only in the regional ecosystem and but also in economy.[1] The local people are affiliated with agriculture and allied services.[2] Plants are utilized for a variety of purposes like medicine, food, fodder, timber, many do possess religious value and many more. All these uses are the source of economy for few or large number of people. Many species have led to thriving industries contributing potential amount of money to the local economy.[3] Many plant taxa are considered as the basic constituents of the local cuisine (Wazwan) which is an important livelihood source of many people in the valley of Kashmir.[4] Variety of species like deodar are important in the local construction form time immemorial paving a path to generate money for related people.[5] According

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to Bhat *et al*.,[6] plant taxa are the backbone to the local economy in Jammu and Kashmir. Ahad *et al*.,[3] reported the economic importance of traditional wild food plants gathered by the local inhabitants of Gurez, Jammu and Kashmir, India. Similar other studies include Ahad Aziz *et al*.,[12] Nafeesa *et al*.,[2] Hassan *et al*.,[1]

Economic plants are those utilized for the direct or indirect benefit of humanity. Indirect utilization encompasses meeting the needs of human livestock and contributing to the upkeep and enhancement of the environment. The advantages derived from economic plants may manifest in domestic, commercial, or aesthetic realms.[7] Economic ethnobotanists have endeavored to describe the dependence of humans on plants for economic benefits from a very long time.[8] We see a huge literature in the said realm across the globe, however in the Union territory of Jammu and Kashmir the no such study has been carried out in the region "Karnah". Finding the research gap the present study was carried out to evaluate the importance of plant taxa in the economy of local inhabitants of Karnah (administrative region).

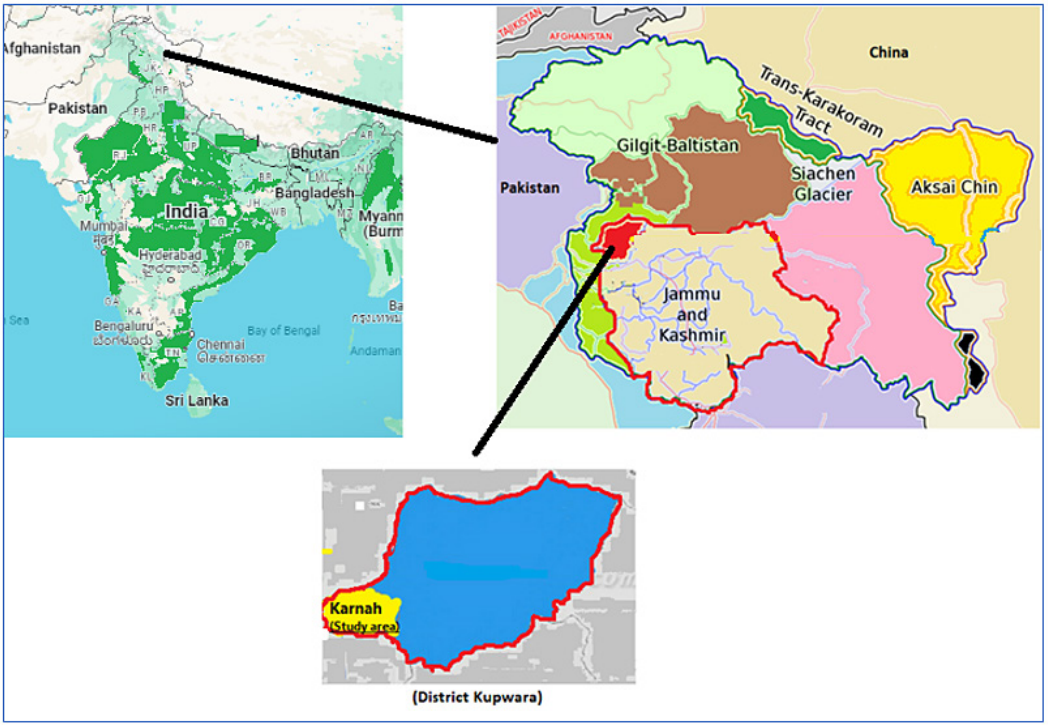

Fig. 1: Map of study area (Karnah, J&K-India)

Materials and Methods

Study Area

Jammu and Kashmir, historically one of India's largest princely states, has recently undergone a profound transformation with its reorganization into two distinct union territories: Jammu & Kashmir and Ladakh, orchestrated by the Central Government of India. This region's geographical intricacy is underscored by its adjacency to the Uygur Autonomous Region of Xinjiang in China to the northeast, the Tibet Autonomous Region to the east, and the Chinese-administered portions of Kashmir.[1] To the south, it shares borders with the Indian states of Himachal Pradesh and Punjab, while its southwestern boundaries adjoin Pakistan, and to the northwest, it converges with the Pakistani-administered segment of Kashmir. The Kashmir region is further divided into 20 administrative districts with Kupwara as on the extreme north sharing its borders with the Pakistan. Located within the Kupwara, Karnah is a tehsil situated 180 km north of Srinagar and approximately 80 km from the district headquarters, Kupwara, positioned at 34.39' N latitude and 73.86' E longitude (refer to Figure-1).

The topography of the region spans altitudes ranging from 1380 to 3300 meters above sea level. According to the 2011 census, Karnah sustains a population of 60,129 individuals, with predominant languages being Pahari, Gojjari, and Kashmiri. The overall literacy rate stands at 63.65% based on the 2011 census data

Agriculture stands as the cornerstone of the Kashmir Valley,[9] entwined with a symphony of allied services. Beyond the agrarian fields, the community unfolds in myriad livelihoods, with some engaged in trade, others as daily laborers, semi-skilled artisans, and shepherds, each contributing uniquely to the vibrant mosaic of this land. According to the anthropological survey of India, under people of India project, 111 ethnic groups inhabit the erstwhile Jammu and Kashmir.[11]

Data Collection

The present study was executed through field interviews conducted from February 2022 to August 2023 in the administrative region "Karnah" of Kashmir Valley. A total of 97 informants, comprising 52% male and 48% female participants aged between 20 and 75 (as summarized in Table 1), were selected using a snowball technique. Prior to the informant selection, a reconnaissance survey was carried out in the region to gain familiarity, and the area head (sarpanches) was approached from where we started the selection of informants. The data collection process involved the application of semi-structured interviews, focus group discussions, and field observations, in accordance with established methodologies adopted by Aziz *et al*.,[12] Information of significant interest encompassed plant species with economic value, their local nomenclature, growth habit, parts utilized, Questionnaires were administered in Urdu, facilitated by the inclusion of images and plant specimens collected during the interactions, which were instrumental in a specimen identification test. Individual interviews were conducted as required to supplement questionnaire responses. The study rigorously adhered to the ethical guidelines outlined by the International Society of Ethnobiology.

Table 1: Demographic status of the informants from the study area (Karnah, J&K)

Region	Respondents	Percentage
Karnah	97	100
Language	Pahari, Urdu	
Gender		
Women	45	63.39
Men	52	53.61
Age groups		
20-30years	25	25.77
31-50 years	30	30.93
51-75 65 years	42	43.30
Education		
Illiterate	52	53.61
Primary	27	27.84
Secondary	18	18.55
Religion		
Islam	97	100
Socio-economic status	Agriculture	

Plant Identification

To ensure meticulous verification and the creation of herbarium specimens, we collaborated with knowledgeable informants from each survey site. For accurate plant identification, we relied upon regional literature sources.[9,10,13] In cases where

disagreements arose over local nomenclature, a group consensus was reached through rigorous debates. To achieve precise taxonomic identifications, the collected specimens underwent comprehensive scrutiny, with the invaluable guidance of taxonomists affiliated with the Glocal University in Saharanpur-India. Additionally, the correctness of nomenclature was confirmed through reference to The Plant List (TPL) (http://www.theplantlist.org) in an effort to uphold the highest standards of accuracy and scientific rigor.

Data Analysis

A cord diagram was employed as a graphical representation to illustrate the prevalent utilization patterns of different plant parts within the compiled species dataset.[3] For a quantitative analysis of the relationships between each species and economic use, analysis was conducted using PAST software (version 3.14).

Results and Discussion

Diversity of Plants Species with Economic uses

Plant species serve as vital sources of sustenance for rural populations worldwide. In the current study, a comprehensive inventory of n=28 plant species, encompassing 20 taxonomic families, was documented through informant reports (Table 2). The preeminent family among these was Pinaceae (14%) (Figure 2a). The association of family species relationship (y = 0.0263x + 1.1737 R^2 = 0.0423) is shown in Figure 2b. R represents the linear association between the selected variables. This prominence of Pinaceae can be attributed to the region's amenable environmental conditions and habitat suitability for their proliferation. Moreover, the local populace possesses extensive ecological and traditional knowledge concerning these families (9,14). Upon analyzing the results, the most prevalent life form among the documented species was trees (n=18), herbs (n=10), trailed by shrubs (n=1) (Table 2). Further, the documented were categorized into wild and cultivated; the wild species (n=16) displayed an ascendency over the cultivated (n=12). These findings align with earlier research conducted in the Western Himalayas (1, 9). A comprehensive inventory of the cataloged species is available in Table 2. The utilization of these documented species within the area can be attributed to factors such as plant diversity, accessibility, deep-seated knowledge of plant species, the healthy state of forest flora, and economic benefits.

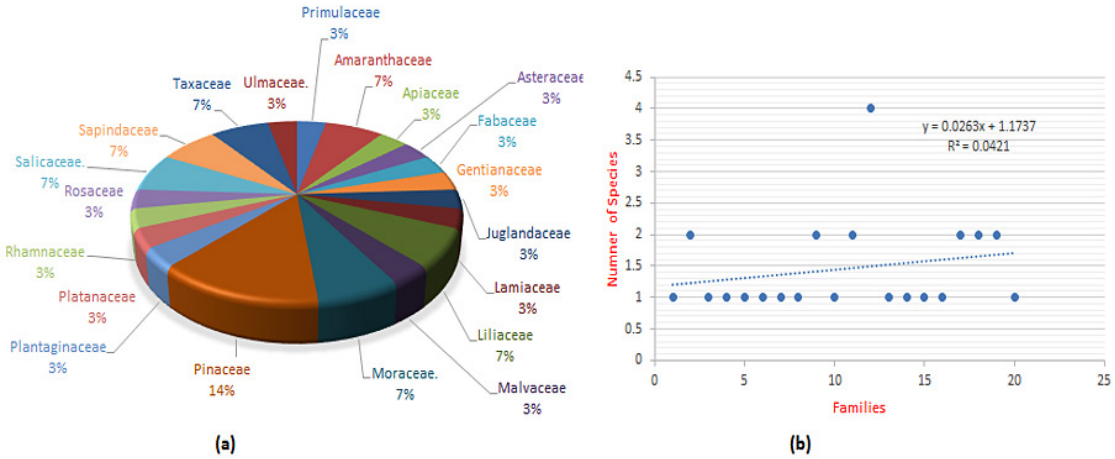

Fig. 2: (a) Percentage of the families; (b) Family species relationship of the documented species

Table 2: Inventory of documented species with economical uses

Name	Family	Habit	Part used	Economic uses						Habit	Source
				Medicine	Food	Timber	Fuel	Aesthetic	Industrial use		
Abies pindrow Royle	Pinaceae	Tree	whole plant	0	0	1	1	0	1	Tree	wild
Acer caesium Wall. ex Brandis	Sapindaceae	Tree	whole plant	1	0	1	1	0	0	Tree	wild
Cedrus deodara	Pinaceae	Tree	whole plant	1	0	1	1	1	1	Tree	wild
Juglans regia L	Juglandaceae	Tree	Fruits/Whole plant	1	1	1	1	0	1	Tree	Cultivated
Picea smithiana Boiss	Pinaceae	Tree	whole plant	0	0	1	1	0	1	Tree	wild
Pinus wallichiana A.B.Jacks	Pinaceae	Tree	whole plant	1	1	1	1	1	1	Tree	wild
Prunus cornuta (Wall.ex Royle).	Primulaceae	Tree	Fruits	1	1	0	0	0	0	Tree	Cultivated
Salix denticulata Andersson	Salicaceae	Tree	whole plant	0	0	0	1	1	0	Tree	Cultivated
Taxus wallichiana Zucc.	Taxaceae	Tree	whole plant	1	0	1	1	1	1	Tree	wild
Aesculus indica Hook	Sapindaceae	Tree	whole plant	1	1	0	1	1	0	Tree	wild
Allium sativum	Liliaceae	Herb	bulb	1	1	0	0	0	0	Herb	Cultivated
Allium cepa	Liliaceae	Herb	bulb	1	1	0	0	0	0	Herb	Cultivated
Taraxacum officinale F.H.Wigg	Asteraceae	Herb	leaves	1	1	0	0	0	0	Herb	wild
Ziziphus jujaba.	Rhamnaceae	Shrub	whole plant	1	0	0	1	0	0	Shrub	wild
Celtis tetrandra	Ulmaceae.	Tree	fruit	1	0	1	1	0	1	Tree	wild
Populous deltoids	Salicaceae.	Tree	whole plant	0	0	1	0	1	1	Tree	Cultivated
Ficus carica	Moraceae.	Tree	Fruits	1	1	0	0	0	0	Tree	Cultivated
Morus alba Linn.	Moraceae.	Tree	Fruits	1	1	1	1	0	1	Tree	Cultivated
Taxus baccata	Taxaceae	Tree	whole plant	1	0	0	0	0	0	Tree	wild
Chenopodium album lin.	Amaranthaceae	Herb	whole plant	1	1	0	0	0	0	Herb	Cultivated

Coriandrum sativum L	Apiaceae	Herb	whole plant	1	1	0	0	0	0	Herb	Cultivated
Malva neglecta L.	Malvaceae	Herb	leaves	1	1	0	0	0	0	Herb	wild
Mentha longifolia Linn.	Lamiaceae	Herb	leaves	1	1	0	0	0	0	Herb	Cultivated
Plantago ovata Forssk	Plantaginaceae	Herb	leaves	1	1	0	0	0	0	Herb	wild
Geranium wallichianum	Gentianaceae	Herb	whole plant	1	0	0	0	0	0	Herb	wild
Celosia argentea var.cristata	Amaranthaceae	Herb	seeds	1	1	0	0	1	0	Herb	Cultivated
Cynodia oblanga	Rosaceae	Tree	Fruits	1	1	0	0	0	0	Tree	Cultivated
Robinia pseudoacacia	Fabaceae	Tree	whole plant	1	0	0	0	1	0	Tree	wild
Platanus orientalis L	Platanaceae	Tree	whole plant	1	0	1	0	0	1	Tree	wild/cultivated

(1: denotes the species has the usage; 0: denotes species don't possess the usage)

Part usage

Different plant parts were documented for economic uses, and there was a significant difference ($\chi 2=90.587$, df=7, $p<0.001$) between their uses. Based on the cord diagram, a variety of plant parts find application in diverse economic uses, with whole plant (n=18), leaves (n=7), fruits (n=6), seeds and bulb (n=2 each) representing the most frequently used components (Figure 3a). The maximum usage of the "whole plants" can be attributed to multi-usage, (i.e medicine, fuel, timber, etc) The prominent species of which whole plants were used are *Abies pindro, Acer caesium, Cedrus deodara, Juglans regia, Picea smithiana, Pinus wallichiana, Chenopodium album, Coriandrum sativum*. Likewise, plants from which fruits were employed include, *Juglans regia, Prunus cornuta, Celtis tetrandra, Ficus carica, Morus alba, Cynodia oblanga.* Species from which seeds were used are *Celosia argentea, Pinus wallichiana* and species from which blub are exploited are *Allium sativum, Allium cepa. Ahad et al*.,[3] reported the different parts of plants for economical uses form the northern Himalayas. Among the documented parts, the Whole plant contributed (51%), followed by leaves (20%), fruits (17%), bulb and seeds (6% each) (Figure 3b). The maximum use of the whole plant can be attributed to the cost-effective ness.

Important usage Contributing Economy

All documented species play an important role in the economy of the region by servicing different day today needs. In the present study we recorded a total of six uses (Medicine, food, timber, fuel aesthetic, and industrial use) contributing to the economy and livelihood in the region (Figure. 4). The maximum number of species (n=25) were found to be used in traditional medicine followed by (n=16) for food, fuel (n=12), timber (n=11), industrial use (n=11) and aesthetic (n=8) (Figure. 4). It is important to mention that the maximum number of species are used in traditional medicine, however, in spite of the maximum number the species used in timber contribute maximum in the economy. For instance, species like *Cedrus deodara, Pinus wallichiana,* are most important playing an important role in the local construction (houses, government buildings, huts, hotels, restaurants). Further, *Juglans regia* listed in our food category, has led to an important cottage industry.

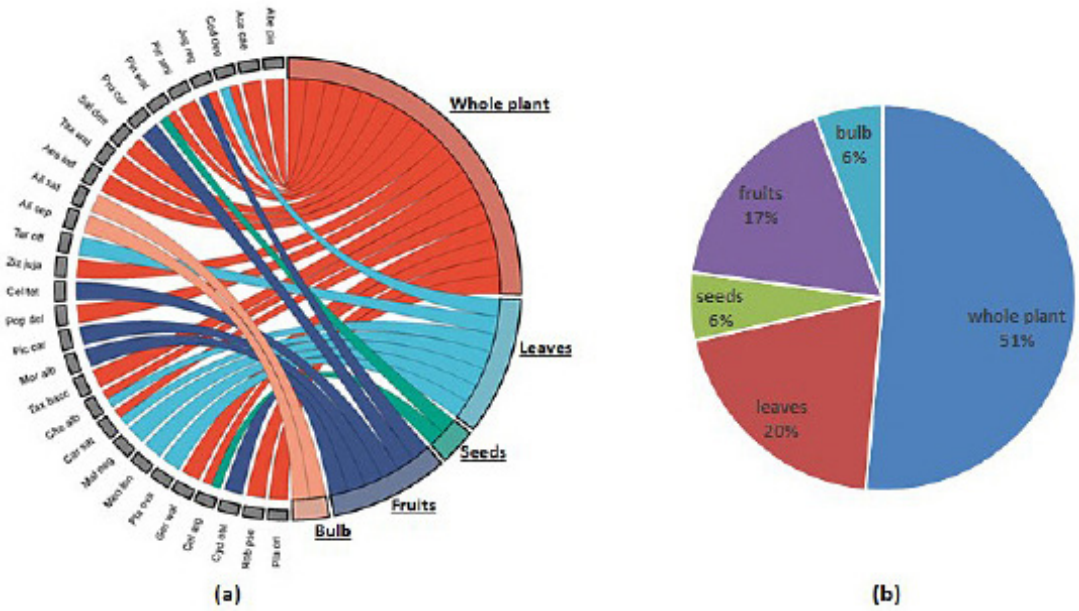

Fig. 3: (a) Chord diagram representing the different part usage of the documented species; (B) Percentage of the different parts used. The abbreviations of the species in the chord diagram are first three letters from generic and species names each

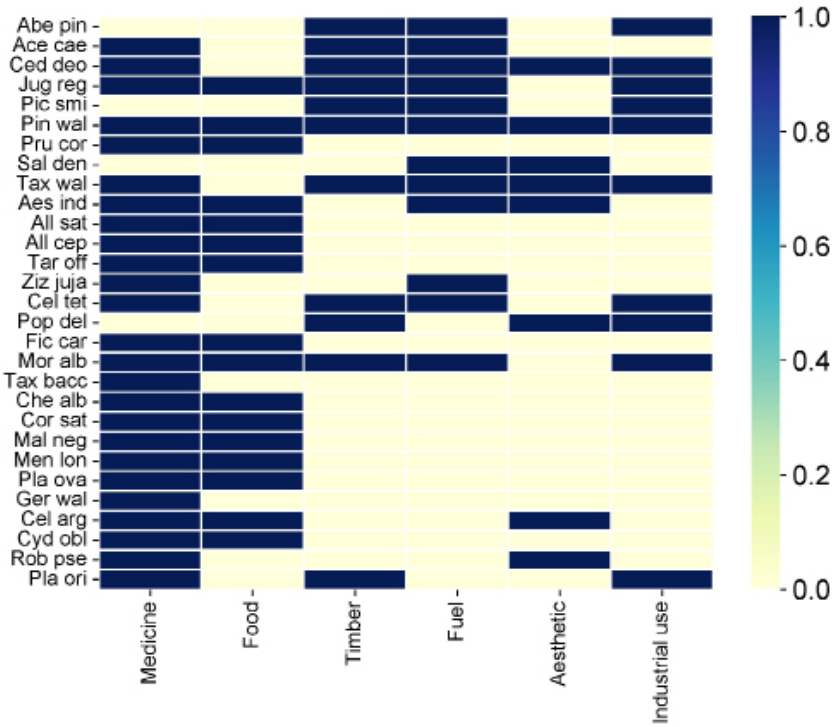

Fig. 4: Quantitative representative of the documented species with different economical attributions

The kernels obtained form are exported to the other parts of the country and out of the country generating a potential revenue. Similarly, Allium *staivum* and *Allium cepa* are very important to the local cuisine (Wazwan), hence are easily available in the market serving the economy of local farmers; *Malva neglecta, Cynodia oblanga* are unique used in the newly lactating mother for nutrition and immune boosting respectively, hence play an important role in the livelihood of traditional healers. In the higher parts of the region with less connectivity of roads the people use variety of the species like *Celtis tetrandra, Abies pindrow, Acer caesium, Cedrus deodara, Pinus wallichiana* for fuelwood. In this regard many people use collect the dried parts of the species and then sold to the inhabiting people at low prices. Some times in return they demand for many items for food making like turmeric, salt etc. Species like *Cedrus deodara, Juglans regia* are also used in making furniture, windows, doors, wood paneling, cupboards hence play avital role in the industrial purposes. With the current pace of urbanization people are also interested in the aesthetic value of species hence many people take the advantage of this and sellout the species with said attribution and generate the handsome money, the prominent species from this category are *Salix denticulate, Aesculus indica, Taxus wallichiana.* Our results are in accordance with Mace *et al*.,[15] Gómez *et al*.l,[16] Rees and Wackernagel.[17]

Conclusion

In Conclusion, the study has illuminated the importance of the local plant taxa in the economy of the people inhabited in the administrative region (Karnah). The plant species are utilized via different mode (i.e., medicine, food, timber, fuel wood, industrial use, aesthetic) ultimately providing an important livelily hood and economic boost to the local populace. It is important to note that people which are disconnected via road use variety of species for fuelwood which in turn has a potential to cause forest fires, respiratory diseases. Further, the unchecked use of the species for variety of purposes to generate money can cause eradication of various species from the region leading the mass extension. In this regard, awareness programs are need to generate awareness among the people using print electronic media, seminars, workshops. Also, the local stakeholders to draft the policies which will assist the use of the local flora via applying scientific approach.

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Conflict of Interests

The authors declare that they have no Conflict of Interests.

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