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People's Biodiversity Registers of Selected Gram Panchayat of Block Dasuya, District Hoshiarpur, Punjab (India)

Kuljinder Kaur^{1*} and Sangeeta Sarangal²

¹Department of Botany, Akal University, Talwandi Sabo, Bathinda, Punjab, India

²Punjab Biodiversity Board, Chandigarh, Punjab, India

ABSTRACT

Present study aimed to prepare People's Biodiversity Registers of three villages falling in Dasuya block of district Hoshiarpur, Punjab, India. In biodiversity registers, both wild as well as domesticated biodiversity and their associated traditional knowledge were documented using people participatory approach along with questionnaire methods. In this present study, crops (42), fruit plants (13), ornamental species (22), timber plants (15), medicinal plants (56), aquatic plants (9), weed (23) and wild (98) plant species were recorded. Crop plants included cereal crops (3), oil crops (3), sugar yielding crop (1), pulses (6), vegetables (14), spices (6) and fodder plants (9). During biodiversity assessment, it was observed that large numbers of medicinal plants were grown in these villages. Village residents have sound information about the plants based traditional healthcare practices and they always preferred local medicinal plants for minor human as well as animal ailments. Mostly the tree species (21) were used in traditional remedies followed by herbs (15), shrubs (15) and only 5 species of climbers. In present study, it was also observed that there is an increasing trend of biodiversity in this area due to the joint action of local people, forest department and Punjab Biodiversity Board.

KEYWORDS

Biodiversity, Dasuya, Hoshiarpur, People's Biodiversity Registers, Traditional knowledge



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INTRODUCTION

India is one of the 17 mega-biodiverse countries of the world representing 4 out of 36 globally identified biological hotspots. It is also a vast repository of traditional knowledge associated with biological resources¹. India is the signatory of the Convention on Biological Diversity (CBD) in 1992 and Nagoya Protocol on Access and Benefit-sharing in 2014. Following the obligations of CBD, Biological Diversity Act, 2002 and Biological Diversity Rules, 2004 were constituted in India. The Biodiversity Act proposes the establishment of a National Biodiversity Authority (NBA) at central level, State Biodiversity Boards (SBB) at state level and Biodiversity Management Committees (BMCs) at municipalities and village level². The main responsibility of BMCs is to prepare and maintain the People's Biodiversity Registers (PBRs) of the area in their jurisdiction.

PBR is a document to record the local biodiversity, associated traditional knowledge and practices of sustainable harvests and conservation, as also economic uses of biological resources for the communities. Hence, PBR is an important document prepared by the people at the grass root level. The benefits of PBRs include among others, documentation and

sustainable management of local biodiversity; an information on local endemic and endangered species; protection of traditional knowledge from bio-piracy and unethical bio-prospecting; as a base for pharmaceutical research; equitable share of benefits to the individual or local communities arising from the use of such knowledge and resources³. Biodiversity Management Committees also have the authority to levy charges on the biological material collected for commercial purpose from the area under their jurisdiction in consultation with State Biodiversity Boards and National Biodiversity Authority⁴. Therefore, PBRs serve as income generating tools for the people. Documentation of biodiversity in the form of People's Biodiversity Registers is not only used for the fulfillment of commitments at national and international level but also as a tool for natural resource management and sustainable development. Akal University, Punjab, with the technical and financial assistance of Punjab Biodiversity Board, Chandigarh has prepared PBRs of three villages falling in Dasuya block of District Hoshiarpur, Punjab, India during the financial year 2018-19. In these PBRs, many unique floral and faunal diversity and traditional practices have been documented and preserved.



MATERIALS AND METHODS

Study Area

Dasuya block is situated in the northern part of district Hoshiarpur of Punjab, India. It has three main regions namely Kandi, Bet and Plain areas. Its eastern face consists of sub-mountainous region popularly known as Kandi area⁵. Most part of this region is under natural forests, hence has rich biodiversity. On the west side of this block, river Beas is passing which separates the districts of Hoshiarpur and Gurdaspur. A famous Kali Bein (Black Bain rivulet) is also passing through Dasuya block parallel to the river Beas. The portion of land in between Beas river and Kali Bein is called bet area. This area is good for cultivation. The region situated between kandi and bet area is called plain area and it is densely populated area of this block. Due to the presence of different geographical region, this block is flourished by vast floristic diversity. Dasuya block consists of total 379 villages and its total geographical area is 842 km² including 803.97 km² rural area and 38.40 km² urban area⁶. The villages (Bhatoli, Bisso Chak & Sansarpur) selected for present study are situated in Kandi area of this block, which is rich with many species of plants and animals along with magnificent landscapes and seasonal rivulets.

Bhatoli village is located with the GPS coordinates of 31°49'02.90" N and 075°45'27.44" E. The total geographical area of the village is 124 hectares, of which 116 hectares are under agriculture, especially under mono cropping land use systems. The geocoordinates of village Bisso Chak is 31° 51' 55.4292" N and 75° 44' 39.9012" E. The village is spread over an area of 168 hectares. Out of this, 108 hectares is under cultivation and 32 hectares is under forests. Most of the families are dependent on agriculture as source of income. Village Sansarpur is situated at latitude of 31°49'34.97" N and longitude of 075°48'14.44" E. Out of total geographical area of village (446 hectares), 298 hectares are under forest and 145 hectares under agriculture. Major portion of sown area is under traditional wheat crop cultivation (106 hectares)⁷.

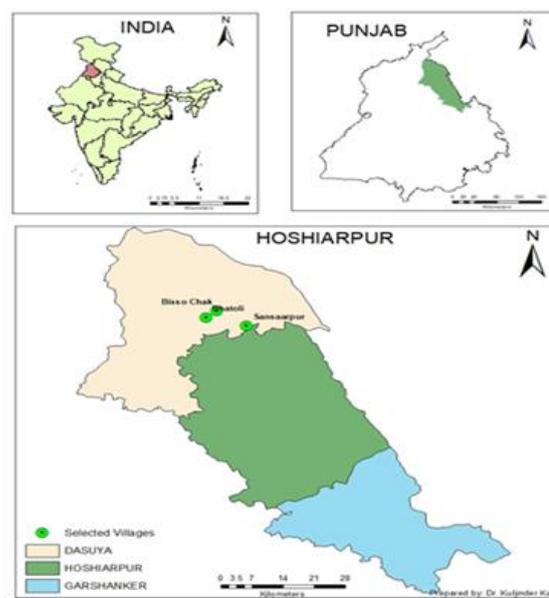


Figure 1 Location map of study area



METHODOLOGY

Standard methodology given by National Biodiversity Authority (NBA) in Revised PBR Guidelines-2013 was adopted⁸. Firstly, the preliminary meeting was organized with BMC members and local people for sensitization of the public about the present study and survey. In the second meeting, village level Participatory Rural Appraisal (PRAs) exercise was arranged in which all village residents were requested to gather at a common place in the village. In this activity, all the formats of PBR (Formats 1-31) provided by NBA were consulted with the village natives one by one. Data collection also included house hold interviews, individual interviews with village leaders, knowledgeable individuals, hakims (traditional healers) etc., focus group interview with BMC members and farmers.

Field surveys were done in different seasons of the year in selected villages to document landscape elements, water bodies, soil type, biodiversity components and other management aspects. The secondary data was collected from the

reports of forest department, agriculture department, irrigation department, soil department, animal husbandry department, census data and reports published by various agencies. The plants specimens were identified by using various local floras, monographs, manuals, e. floras, online herbaria and various internet sites. Photographs of plants were also taken in their natural habitat for proper identification.

RESULTS AND DISCUSSION

Present study was conducted in three villages situated in Kandi area of Block Dasuya. The people biodiversity registers of these villages were prepared with the help of village BMCs, local inhabitants and concerned Government Departments. In the present investigation, the detailed information related to floristic diversity of these villages was documented.

Crop Plants

A total of 42 crop plant species including cereal crops (3), oil crops (3), sugar yielding crop (1), pulses (6), vegetables (14), spices (6) and fodder plants (9) were documented from the study area (Table 1).

Table 1 Details of agricultural crops

Scientific Name	Local Name	Variety	Cropping Season	Traditional Uses
Cereal crops				
<i>Triticum aestivum</i>	Kanak	HD-2967, HD- 3086, PBW-550, PBW-621, WH 1105,	October to April	Rural snacks like Dalia, Sewia, churma, ghoomnia etc. prepared from wheat seeds. Boiled seeds of wheat called 'Ghoomnia' are enclosed in a piece of cloth and tied on wrist of new born baby.



		Desi		
<i>Oryza sativa</i>	Chawal	Basmati-1121, 1509 Sathi Basmati, Sharbati, PR-47, PR-126, 121, Sava 127	May to November	Rural snacks 'Pinnea' is prepared from rice flour especially in winter season. The north Indian dish "Khichdi" prepared with rice & moong daal is given to patients during diarrhea & dysentery.
<i>Zea mays</i>	Makki	Desi, Kanchan, Partap Kohenoor	May/ June to August/ November	Seeds are used in poultry and animal feed. Seed flour is used to make chapati (Makki di roti) in combination with Sarson ka-sag. Boiled seeds locally called 'Baklia' are especially eaten during Lohri festival.
Sugar yielding crop				
<i>Saccharum officinarum</i>	Gana	COJ 85, 64, 88, CO 0238	February to November	Juice is coolant hence good for jaundice & indigestion.
Oil yielding crops				
<i>Brassica rapa</i>	Saroh or Sheti sarhon	Gobi Saroh, Kali Saroh, Raya	October-March	Cattle feed locally called 'Khal' is prepared from mustard seeds. Mustard seed oil is used to cure many skin and skelto-muscular problems. Kheti sarhon seeds are tied on wrist of new born babies to protect them from negative energies.
<i>Eruca sativa</i>	Taramira	Desi	October-March	Seed oil or green plant vegetable is said to be good to open the blocked blood vessels.
<i>Sesamum indicum</i>	Til	Desi	June to October	Chapati prepared from mixture of Gur and till is given to cattle to cure loose motion. Mixture of ghur and til seeds is also used in Kular fast and in lohri festival.
Pulses				
<i>Cajanus cajan</i>	Arhar	Desi	May to October	Young green plants are used as fodder for cattle
<i>Vigna mungo</i>	Mah	Desi	March to June	Split seeds cooked as 'Daal'
<i>Lens esculentus</i>	Masur	Desi	October to March	Boiled seeds are given to cattle as body tonic & for many reproductive problems.
<i>Cicer arietinum</i>	Channe	Desi	October to March	Black chane dipped in water overnight and eaten in early morning is good for eye sight. Roasted seeds are beneficial for diabetes & Jaundice. Gram flour called 'Basin' is used topically for skin problems.
<i>Pisum sativum</i>	Matar	Hybrid	October to March	Fresh peas used in various dishes, soups, fried rice and also eaten raw.
<i>Vigna radiata</i>	Sathi moongi	Desi	March to May	Split seeds cooked as 'Daal'
Vegetables				
<i>Abelmoschus esculentus</i>	Bhindi	Hybrid	April to September	Decoction of dried roots is given to control diabetes. Smoke of dry seed is applied on caries in teeth. In vegetable form, good for body-ache and joint pain.
<i>Allium cepa</i>	Piyaz	Local	December to April	Bulb extract is used as eye drop to improve eye sight. Mixture of piyaz & pudina extract is taken orally to control vomiting, diarrhea, cholera. Dropped into ear for earache. Poultice made from bulb is applied on abscess and to remove splinter in the skin.



<i>Allium sativum</i>	Lasun	Local	December to April	Raw bulblets, taken empty stomach in early morning are good for cardiovascular diseases, rheumatic pain and to control cholesterol or uric acid. Bulblet is fried into mustard oil and oil is poured into the ear to get relief from earache.
<i>Daucus carota</i>	Gajar	Hybrid	December to April	Carrot juice improves eye sight, good for cardiovascular problems, gynaecological problems, body tonic and as anti-anaemic. Carrot muraba is good for epilepsy.
<i>Raphanus sativus</i>	Mooli	Hybrid	December to April	Radish is a good appetizer. It is coolant, carminative and good for indigestion.
<i>Brassica oleracea var. botrytis</i>	Gobhi	Hybrid	December to April	Only as vegetable
<i>Brassica rapa subsp. rapa</i>	Shalgum	Hybrid	December to April	Only as vegetable
<i>Solanum tuberosum</i>	Aaloo	Kufri-Arun, Kufri-Pukhraj	December to April	Thin piece of potato is put on eyes to remove dark circle around eyes.
<i>Solanum melongena</i>	Bengan	Hybrid	April to December	Cooked as vegetable
<i>Lycopersicon esculentum</i>	Tamatar	Hybrid	May to September	Eating fruit empty stomach is good for constipation and also acts as anthelmintic. It has anti-anemic property.
<i>Luffa acutangula</i>	Tori	Local	June to December	Commercially grown for its unripe fruits as a vegetable. Mature fruits are used as natural cleaning sponges.
<i>Momordica charantia</i>	Karela	Hybrid	June to December	Fruit juice and vegetable are used to control diabetes, blood pressure and as blood purifier.
<i>Lagenaria siceraria</i>	Loki/ gheea	Local	May to December	Fruit vegetable or fruit juice is good for diabetic patients.
<i>Spinacia oleracea</i>	Palak	Hybrid	December to April	Leafy vegetable of spinach is rich source of iron and vitamins.
Spices				
<i>Zingiber officinale</i>	Adhvak	Local desi	May to December	Rhizome extract with honey is taken orally to cure cough/cold.
<i>Curcuma longa</i>	Haldi	Local desi	July to February	Powder of rhizome with hot milk is taken orally for curing internal injury. Powder mixed with mustard oil is applied for many skin problems. Paste of ginger and turmeric powder is good to treat cough.
<i>Capsicum annum</i>	Mirchi	Hybrid	July to December	Powder of fruit is applied topically on dog bite.
<i>Trigonella-foenum graecum</i>	Methi	Local	December to April	Seeds powder is good for diabetic patients & to control uric acid.
<i>Coriandrum sativum</i>	Dhania	Local	October to April	Green leaf paste or raw leaves kept in mouth to cure mouth ulcers.
<i>Foeniculum vulgare</i>	Mithi Saunf Pahari Saunf	Local	December to April	Decoction of fruit is used to treat fever, digestive disorders both in human & cattle. Also cure stomach pain. Crushed pahari saunf is good for babies to cure loose motion and stomach pain. Mithi saunf is good for constipation.

Wheat, rice, maize, sugarcane and potato were prioritized crops of these villages

grown for commercial purposes. Other crops were grown on small scale for their



domestic uses only. It was also observed that high yielding hybrid varieties were preferred by local farmers. About 6 wheat varieties, 9 paddy varieties, 4 maize varieties, 4 sugarcane and 2 potato varieties were enlisted during discussion with farmers in PRA activity. Similar study was conducted in Baigachak area of Dindori District of Madhya Pradesh, in which 14 varieties of paddy, 6 varieties of maize and 4 varieties of wheat were recorded⁹. Only few farmers were growing traditional (desi) varieties for their own use due to their better flavor and taste than the modern hybrid varieties. *Avena sativa*, *Cyamopsis tetragonoloba*, *Cynodon dactylon*, *Panicum spp.*, *Pennisetum glaucum*, *Sorghum vulgare*, *Trifolium alexandrinum* and

Zea mays are the major fodder crops of this area. Besides these fodder crops, leaves of some tree species like Shree (*Albizia lebbek*), Toot (*Morus alba*), Arjun (*Terminalia arjuna*) & Ber (*Ziziphus jujube*) were also used as fodder for cattle especially in winter season during scarcity of fodder crops.

Weeds

Weeds are the important component of agrobiodiversity. These are the unwanted plants which are growing along with crops and competing with them for space, nutrition, light, water, etc. Some invasive

weeds like *Parthenium hysterophorus* secrete allelochemicals that inhibits the germination of seeds of surrounding crops¹⁰. Besides this, some plants have becoming a problem for the locals like *Lantana camara*, an exotic dense, spiny shrub, invaded in maximum part of Kandi region. *Parthenium hysterophorus*, also causes skin allergy to human beings, hairy fruits of *Mucuna purpurea* causes various kind of allergy. Some wood rotten fungal species were also destroying the horticultural and timber plants. On the other hand, some weeds like *Avena fatua*, *Cynodon dactylon*, *Echinochloa colonum*, *Echinochloa crusgalli*, *Medicago polymorpha*, *Phalaris minor* and *Sorghum halepense* were used as fodder for cattle. Other common weeds of the agriculture area are *Amaranthus viridis*, *Anagallis arvensis*, *Artemisia scoparia*, *Asphodelus tenuifolius*, *Caesulia axillaris*, *Chenopodium album*, *Commelina benghalensis*, *Cucumis melo var. agrestis*, *Cyperus rotundus*, *Digera muricata*, *Phragmites spp.*, *Senna occidentalis*, *Trianthema portulacastrum*, *Tribulus terrestris* and *Vicia sativa*.

Fruit Plants

As these villages are situated in Kandi area which is less fertile and has scarcity of water. Hence not good for annual cultivation of crops for economic benefits.



So, in recent years, people started to grow fruit plants like Mango (*Mangifera indica*), Kinnow (*Citrus reticulata*), Amrood (*Psidium guajava*), Amla (*Phyllanthus emblica*), Ber (*Zizyphus jujube*), etc. on large scale. Other fruit plants grown in home garden/ farmland for domestic use only are *Carica papaya*, *Citrus limetta*, *Musa paradisiaca*, *Prunus persica*, *Punica granatum*, *Syzygium cumini* and *Vitis vinifera*.

Ornamental Plants

Ornamental plants are grown in houses, schools, community halls, religious places etc. only for their aesthetic features. While some ornamental plants also have medicinal importance like *Aloe vera*, *Catharanthus roseus*, *Rosa indica* and *Tagetes erecta*. Powder of *Cassia fistula* pod (fruit) is used as laxative to treat constipation. *Epipremnum aureum* locally known as 'Money Plant' is grown in homes due to socio-religious believe associated with it. People believed that growing this plant in home bring good luck, happiness & prosperity. A total of 22 ornamental plants were recorded from these villages which are *Aloe vera*, *Bauhinia variegata*, *Bignonia spp.*, *Bougainvillea spp.*, *Callistemon lanceolatus*, *Cassia fistula*, *Catharanthus roseus*, *Chrysanthimum spp.*, *Dahlia variabilis*, *Duranta repens*, *Epipremnum aureum*, *Euphorbia milii*,

Ficus elastica, *Hibiscus rosa-sinensis*, *Nerium oleander*

Petunia spp., *Portulaca grandiflora*, *Rosa spp.*, *Roystonea regia*, *Senna sulfurea*, *Tagetes erectus* and *Thevetia neriifolia*.

Timber Plants

Altogether 15 plants species were reported that produce wood for commercial purpose as well as for building structures. These timber yielding trees are *Acacia catechu*, *Acacia nilotica*, *Albizia lebeck*, *Azadirachta indica*, *Leucaena leucocephala*, *Mangifera indica*, *Melia azedarach*, *Populus deltoides*, *Syzygium cumini*, *Eucalyptus tereticornis*, *Dalbergia sissoo*, *Terminalia arjuna*, *Morus indica*, *Toona ciliata* and *Holoptelea integrifolia*. These plants were also used for fuel wood, as fodder, in traditional medicines and for agricultural implements.

Medicinal Plants

Village residents have sound knowledge about the uses of plants in medicinal preparations and they preferred to use medicinal plants in minor ailments in human as well as animals. Whenever we talked to the local people about the traditional knowledge of plants, they always gave information about the medicinal importance of the plants. This shows that traditional knowledge for the villagers only means the medicinal uses of plants. This may be the reason to record



maximum number of medicinal plants (56) in the present study. Mostly the trees (21) were used in remedial formulations followed by herbs (15), shrubs (15) and only 5 species of climbers. Similar observations were made in Jalandhar district of Punjab, while documented the ethnomedicinal knowledge of that area¹¹. Some medicinal plants were cultivated like *Aloe vera*, *Ocimum*, *Mentha*, *Curcuma longa*, *Trigonella foenum-graecum*, *Zingiber officinale*, etc. whereas others were (*Achyranthes aspera*, *Momordica dioica*, *Murraya koenigii*, *Ficus palmata*, *Cuscuta reflexa*, *Justicia adhatoda* etc.) collected from wild. Most commonly used

plant parts in traditional formulations were leaves, fruits, flowers, bark, stem, etc. (Figure 2).

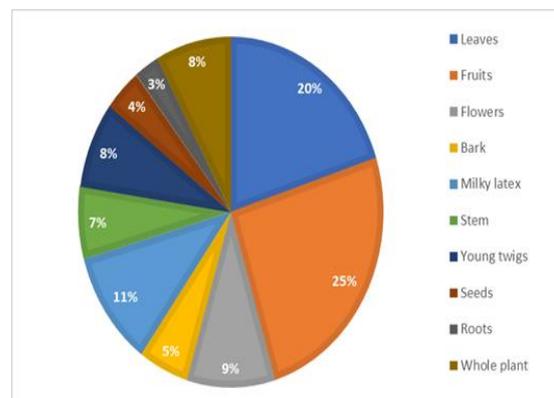


Figure 2 Plant parts used in traditional medicinal formulations

A list of these plants along with their local name, part used and traditional preparation methods is given in Table 2.

Table 2 Details of medicinal plants used in traditional medicines

Plant type	Local Name	Scientific Name	Part Used	Associated TK
Climber	Jangli angoor	<i>Cayratia trifolia</i>	Leaves	Medicine is prepared from leaves of this plant is used to cure piles and constipation problems in cattle.
Climber	None	<i>Coccinia grandis</i>	Fruits	Edible ripen fruit and unripe fruits are used to control diabetes.
Climber	None	<i>Cryptolepis buchanani</i>	Whole plant	Plant boiled in water and its steam is given body to get relief from body ache or joint pains
Climber	Kash vel or Hariol	<i>Cuscuta reflexa</i>	Whole plant	Raw plant is used to cure poison in cattle. Decoction of plant is used to treat skelto-muscular problems.
Climber	Giloye	<i>Tinospora cordifolia</i>	Stem	Decoction of young or dry stem is used popularly to treat typhoid fever
Herb	Puth-kanda	<i>Achyranthes aspera</i>	Plant & Seeds	Plant is given to cattle to treat reproductive problems. Powder of roasted seeds with honey is good for cough.
Herb	Piaz	<i>Allium cepa</i>	Bulb	Piaz extract is used to treat vomiting, indigestion, snake bite, ear ache. Bulb extract is also poured in eyes to improve eye sight.
Herb	Lahsun	<i>Allium sativum</i>	Bulb	Bulblets are used as an expectorant, control diabetes, cholesterol, uric acid, arthritis & ear ache
Herb	Kuwar gandal	<i>Aloe vera</i>	Leaf	Leaf gel or its juice is used to cure many skin problems, diabetes, joint pain and hair problems
Herb	Haladi	<i>Curcuma longa</i>	Rhizome	Powder of rhizome with hot milk is taken orally for curing internal injury. Powder mixed with mustard oil is applied for many skin problems. Paste of turmeric and ginger in water is good for cough.
Herb	Bharingraj	<i>Eclipta alba</i>	Whole plant	Used for hair problems
Herb	Saunf	<i>Foeniculum vulgare</i>	Fruits	Fever, digestive disorders both in human & cattle



Herb	Pudina	<i>Mentha arvensis</i>	Leaves	Due to its coolant property, it is used to make chutney especially in summer season. Cure many digestive disorders
Herb	Karela	<i>Momordica charantia</i>	Fruit	Fruit vegetable and juice is used to control diabetes.
Herb	Jangli karela	<i>Momordica dioica</i>	Fruits	Unripe fruit vegetable is good for diabetic patients.
Herb	Tulsi	<i>Ocimum sanctum</i>	Leaves	Leaf extract or leaves in tea are good for respiration disorders & for fever. Tulsi plant is also worshiped by local people.
Herb	Pambola	<i>Solanum nigrum</i>	Above ground parts	Green plant vegetable is good for body pain especially for ladies.
Herb	Karkara	<i>Spilanthes oleracea</i>	Flowers	Flowers kept in aching teeth.
Herb	Genda	<i>Tagetes erecta</i>	Flowers	Flower extract is poured into ear or eyes to cure many problems.
Herb	Adrak	<i>Zingiber officinale</i>	Rhizome	Decoction of rhizome or its extract is good for respiratory disorders.
Shrub	Satyanashi	<i>Argemone mexicana</i>	Flowers	Used in veterinary profession, for curing reproductive problems.
Shrub	Chuank-hana or Jhau	<i>Artemisia scoparia</i>	Whole above ground plant & young twigs	Young twigs or young leaves are eaten in morning in empty stomach is good for stomach-ache. Used to cure digestion problems both in human as well as cattle.
Shrub	Sarho	<i>Brassica napus</i>	Seed, oil	Seed oil is used to cure skin problems and skelto-muscular problems.
Shrub	Akk	<i>Calotropis procera</i>	Young leaves, flower, latex	Latex applied on wasp cut, dog bite and to remove spine. Warm leaves are tied on abscess (type of skin disease).
Shrub	Bhang	<i>Cannabis sativa</i>	Young leaves	In case of wasp cut, rub leaves of cannabis. People also use it as narcotic plant, veterinary medicine for diarrhea.
Shrub	Sada bahar	<i>Catharanthus roseus</i>	Leaves	Young leaves are used to control diabetes.
Shrub	Datura	<i>Datura alba</i>	Fruits, seeds	Used to medicines and also taken due to its sedative property. People also worship it.
Shrub	Thohar	<i>Euphorbia royleana</i>	Milky latex	Milky latex is applied on painful blisters, close wounds. Plant is also used to make boundary of farm land.
Shrub	Akdha	<i>Ipomea carnea</i>	Milky exudate	Milky exudate of akdha is applied on painful blisters or other skin problems. Leaves are effective for joint pain, flowers given to cattle to cure poison.
Shrub	Kali Basuti	<i>Justicia adhatoda</i>	Leaves	Decoction of leaves in tea is good for cough.
Shrub	Kaan	<i>Martynia annua</i>	Fruits	Fruit powder is said to be effective to treat cancer
Shrub	Kadhi Patta	<i>Murraya koenigii</i>	Leaves	Leaves are taken raw or added in vegetables are good for arthritis pain or used as pain killer
Shrub	Gumian	<i>Opuntia stricta</i>	Fruits, milky exudate	Fruits are eaten raw due to their anti-anaemic property. Milky exudate is also applied topically on skin problems.
Shrub	Gulab	<i>Rosa indica</i>	Flowers	Flower extract is good for constipation & as appetizer.
Shrub	Aksin	<i>Withania somnifera</i>	Flowers & young twigs	Flowers, young twigs or leaves are given to cattle for reproductive problems & for the treatment of zeharbad in cattle.
Small tree	Arind	<i>Ricinus communis</i>	Leaves & fruits	Seed oil was used to prepare soap & as hair oil. Warm leaf is tied on wound & painful joints
Small tree	Nirgundi or Bna	<i>Vitex negundo</i>	Twigs	Young twigs are used to cure Janeu (shingles) disease
Tree	Khair	<i>Acacia catechu</i>	Bark	Bark decoction is given to diabetic patients
Tree	Kikar	<i>Acacia nilotica</i>	Young twigs	Young twig is used as toothbrush
Tree	Beal	<i>Aegle marmelos</i>	Fruits	Fruit juice is coolant. Beal leaves are used in pooja ceremony during 'Shivratri'
Tree	Shreen	<i>Albizia lebbeck</i>	Leaves	Leaf extract is dropped in cattle's eyes to treat chitta or other eye problems.



Tree	Neem	<i>Azadirachta indica</i>	Leaves, fruits, twigs	Leaf & fruits decoction is used to treat skin disorders. Young leaves extract is also used to treat skin problems. Twigs used as tooth brush (Datan) for tooth problems. It is a good blood purifier. Leaves and twigs are also kept in seed storage drums due to its insect repellent property.
Tree	Kachnar	<i>Bauhinia variegata</i>	Flowers, fruits	Flowers & fruits are used as vegetable and as raita.
Tree	Kesu/ Palah	<i>Butea monosperma</i>	Milky exudate	Kamar kas' a medicinal product is prepared from milky exudate which is good for backache especially for ladies.
Tree	Ree fali	<i>Cassia fistula</i>	Fruit pulp	Decoction or powder (churan) of fruit is given to cure indigestion & constipation in human as well as cattle. Paste of fruit powder is also applied on painful joints & swelling in human.
Tree	Tali	<i>Dalbergia sissoo</i>	Young shoot	Young shoot of plant is eaten in early morning to treat fever
Tree	Bohr	<i>Ficus benghalensis</i>	Bark, aerial roots & milky latex	Useful in treatment of ulcers, vomiting, vaginal complains, fever, inflammation, leprosy & skin problems.
Tree	Faguda	<i>Ficus palmata</i>	Milky exudate	Milky exudate is applied on skin to remove spine and also to cure blisters
Tree	Rumbal	<i>Ficus racemosa</i>	Fruit	Fruit is said to be good to improve eye sight
Tree	Peepal	<i>Ficus religiosa</i>	Bark, Leaves, Latex, Fruits	Leaves are useful to treat constipation. Bark is cooling and astringent and is useful in inflammations and swellings of neck.
Tree	Sawajna	<i>Moringa oleifera</i>	Roots, pods	Roots of young plant are used to make pickle. Young pods are used as vegetable
Tree	Amla	<i>Phyllanthus emblica</i>	Fruit	Good source of vitamin C. Beneficial for skin, hair, digestive & liver problems.
Tree	Jamun	<i>Syzygium cumini</i>	Fruit, leaves	Fruits and seeds have anti-diabetic properties.
Tree	Arjun	<i>Terminalia arjuna</i>	Bark, fruit	Bark decoction is used to control blood pressure and for digestive problems.
Tree	Baheda	<i>Terminalia bellirica</i>	Fruits	Fruit pulp is applied in hairs to get rid from hair fall
Tree	Beri	<i>Ziziphus jujube</i>	Leaves	Leaves are boiled in water and then water is used to wash hairs which is good for hair problems.

Aquatic Plants

Aquatic biodiversity was very rare because there is a scarcity of water in these villages. However, plants species growing in and around domestic wastewater ponds were enlisted. Aquatic plant species consist of 6 species of angiosperms (*Bacopa monnieri* (Brahmi), *Eichhornia crassipes* (Jalkumbhi), *Lemna minor* (Chotopana), *Typha angustifolia* (Dibb), *Saccharum*

spontaneum (Kaana) & *Najas minor*), one species of pteridophyte (*Marsilea minuta*) and two algae (*Oedogonium* & *Oscillatoria*).

Wild Plants

A list of 98 wild plant species was compiled during biodiversity assessment. The local names of plants, their uses and plant parts collected were also documented with the consultation of local people. Out of 98



species, 43 were herbs, 28 shrubs, 13 trees, 12 climbers and one species of bryophyte and fungi each (Table 3). Local people utilized many wild plant species for food, fruit, fodder, medicine, timber, etc. Others were also used for decoration, as narcotic drugs, insect repellent, making utensils and brooms. Figure 3 shows the number of

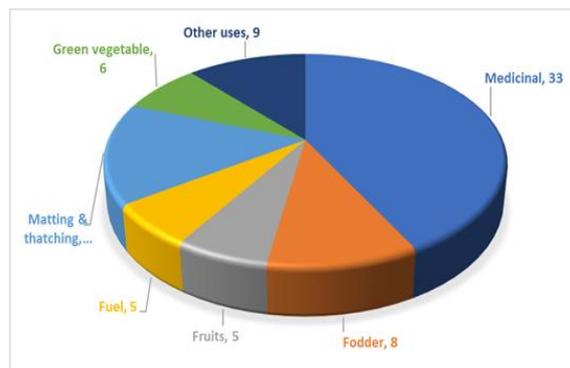


Figure 3 Utilization of various wild plants for different purposes

Table 3. Details of wild floristic diversity

Habit	Local Name	Scientific Name	Part collected	Uses/ other details
Climber	Raktaan	<i>Abrus precatorius</i>	Seeds	Used for decoration during 'Navratre'
Climber	Kiokpurifig	<i>Basella alba</i>	Whole plant	Green vegetable (Saag)
Climber	Gadha vel	<i>Boerhavia diffusa</i>	None	None
Climber	Jangli angoor	<i>Cayratia trifolia</i>	Leaves	Medicinal
Climber	Katori	<i>Cissampelos pareira</i>	Leaves	Medicinal
Climber	None	<i>Coccinia grandis</i>	Fruits	Medicinal
Climber	None	<i>Convolvulus arvensis</i>	Whole plant	None
Climber	None	<i>Cryptolepis buchanani</i>	Whole plant	Medicinal
Climber	Amar bel	<i>Cuscuta reflexa</i>	Whole plant	Medicinal
Climber	Jangli karela	<i>Momordica dioica</i>	Fruits	Medicinal
Climber	Gajooli	<i>Mucuna pruriens</i>	Fruits	Fruits covered with small hair which cause allergy or itching
Climber	Giloe	<i>Tinospora cordifolia</i>	Stem, leaves	Medicinal
Fungi	Fungi	<i>Polyporus umbellatus</i>	None	Fungus growing on dead wood
Herb	Chitti bui	<i>Aerva javanica</i>	None	None
Herb	Jangli pootni	<i>Ageratum conyzoides</i>	Whole plant	Used as insect repellent
Herb	Chulai	<i>Amaranthus viridis</i>	Whole plant	As vegetable, Medicinal
Herb	None	<i>Anagallis arvensis</i>	Whole plant	Animal fodder
Herb	Jhau/ chuankhra	<i>Artemisia scoparia</i>	Young plant	Dried plant is used to make brooms and in cattle's medicine
Herb	Bathu	<i>Chenopodium album</i>	Whole plant	Green vegetable
Herb	Kodha bathu	<i>Chenopodium murale</i>	None	Due to bitter taste, animals avoid to eat it.
Herb	Leh	<i>Cirsium arvense</i>	None	None
Herb	Khabbal	<i>Cynodon dactylon</i>	Whole plant	Medicinal, soil binder, as fodder
Herb	Nut grass	<i>Cyperus rotundus</i>	Leaves	Used to make mats, ropes
Herb	Baans	<i>Dendrocalamus strictus</i>	Stem	Hollow stem is used for making many handicrafts, building materials, weapons & instruments
Herb	Dib	<i>Desmostachya bipinnata</i>	Inflorescence	It is used as brooms.
Herb	None	<i>Dicliptera paniculata</i>	None	None
Herb	Tandla	<i>Digera muricata</i>	Young plant	Green vegetable (saag)
Herb	Bharingraj	<i>Eclipta alba</i>	Whole plant	Medicinal
Herb	None	<i>Erigeron bonariensis</i>	None	None



Herb	None	<i>Euphorbia hirta</i>	None	None
Herb	None	<i>Euphorbia prostrata</i>	None	None
Herb	None	<i>Lepidium didymum</i>	None	None
Herb	None	<i>Majus rugosus</i>	None	None
Herb	None	<i>Malva pusilla</i>	None	None
Herb	None	<i>Marchantia spp.</i>	None	It is a bryophyte species
Herb	Maina	<i>Medicago polymorpha</i>	Whole plant	Green vegetable
Herb	Jangli tulsi	<i>Ocimum spp.</i>	Leaves	Medicinal
Herb	Khatti buti	<i>Oxalis corniculata</i>	Leaves	Raw leaves are eaten due to their sour taste.
Herb	None	<i>Oxalis debilis</i> var. <i>corymbosa</i>	None	None
Herb	None	<i>Panicum virgatum</i>	None	None
Herb	Gajar buti	<i>Parthenium hysterophorus</i>	None	Troublesome weed cause allergy to human
Herb	None	<i>Peristrophe bicalyculata</i>	None	None
Herb	Nari	<i>Phragmites maxima</i>	Leaves	For matting & thatching
Herb	Rasbhari	<i>Physalis minima</i>	None	None
Herb	None	<i>Portulaca pilosa</i>	None	None
Herb	None	<i>Pteris vittata</i>	None	Pteridophyte fern
Herb	Munj	<i>Saccharum benghalensis</i>	Stem, leaves	Used for matting & thatching, hollow stem is also used for making pens (Kalam). Effective sand binder, as fuel material
Herb	Kahi	<i>Saccharum spontaneum</i>	Leaves, inflorescence	Used for roof thatching, stem is used to woven winnowing trays (Chaj) that is used to separate chaff from grains, effective sand binder, as fuel material
Herb	None	<i>Sisymbrium irio</i>	None	None
Herb	Bhawole	<i>Solanum nigrum</i>	Whole plant	Medicinal, it's ripened berries are eaten as fruit
Herb	Kandiari	<i>Solanum virginianum</i>	Fruits	Medicinal
Herb	None	<i>Sonchus oleraceus</i>	None	None
Herb	Karkara	<i>Spilanthes oleracea</i>	Flowers	Medicinal
Herb	Itsit	<i>Trianthema portulacastrum</i>	Whole plant	Medicinal
Herb	Bhakra	<i>Tribulus terrestris</i>	Fruits	Medicinal
Herb	None	<i>Tridax procumbens</i>	None	None
Herb	Bater	<i>Typha elephantina</i>	Leaves	Used for thatching
Shrub	Kangi	<i>Abutilon indicum</i>	None	None
Shrub	Puthkanda	<i>Achyranthes aspera</i>	Seeds	Medicinal
Shrub	None	<i>Anisomeles indica</i>	None	None
Shrub	Satyanashi	<i>Argemone mexicana</i>	Flowers	Veterinary medicines
Shrub	Akk	<i>Calotropis procera</i>	Young leaves, flower, latex	Medicinal
Shrub	Bhang	<i>Cannabis sativa</i>	Young leaves	Used as drug, veterinary medicine
Shrub	Garna/ Garooona	<i>Carissa spinarum</i>	Fruits	Ripen fruits can be eaten as fresh or used for jam.
Shrub	Badhi ealma	<i>Cassia occidentalis</i>	None	None
Shrub	None	<i>Corchorus aestuans</i>	None	None
Shrub	None	<i>Croton bonplandianum</i>	None	None
Shrub	Datura	<i>Datura strumarium</i>	Leaves & Flowers	Used as sacred plant for Shivji pooja, also used as narcotic plant
Shrub	None	<i>Dysphania ambrosioides</i>	None	None
Shrub	Thohar	<i>Euphorbia royleana</i>	Milky exudate	Medicinal



Shrub	Akdha	<i>Ipomoea carnea</i>	Leaves, flowers	Medicinal, fuel wood
Shrub	Basuti	<i>Justicia adhatoda</i>	Flower, leaves	Medicinal
Shrub	Panchphuli	<i>Lantana camara</i>	Flowers	In Kandi area, its hedge is made around the farm land to prevent wild animal's entry. Flowers are used for decoration. Sometime cause of forest fire
Shrub	Gandla	<i>Murraya koenigii</i>	Leaves	Medicinal
Shrub	Gumian	<i>Opuntia dillenii</i>	Fruits	Medicinal
Shrub	None	<i>Polygonum plebeium</i>	None	None
Shrub	Chotti ealma	<i>Senna tora</i>	None	None
Shrub	None	<i>Sida acuta</i>	None	None
Shrub	None	<i>Sida cordifolia</i>	None	None
Shrub	None	<i>Sida rhombifolia</i>	None	None
Shrub	Jhanjheer	<i>Triumfetta tomentosa</i>	None	None
Shrub	None	<i>Urena lobata</i>	None	None
Shrub	Aksin	<i>Withania somnifera</i>	Flowers & leaves	Veterinary medicines
Shrub	None	<i>Xanthium strumarium</i>	None	None
Shrub	Mallah	<i>Ziziphus nummularia</i>	Leaves, fruits	Edible fruits, leaves are used as fodder for goats.
Small tree	Arind	<i>Ricinus communis</i>	Fruits, seeds, leaves	Medicinal, seed oil was also used to prepare soap
Tree	None	<i>Broussonetia papyrifera</i>	None	None
Tree	Plah	<i>Butea monosperma</i>	Stem, leaves	Fuel wood, leaves used for animal feed & also to prepare utensils
Tree	Cheela	<i>Casearia elliptica</i>	Leaves	Cattle fodder in winter
Tree	Lasura	<i>Cordia dichotoma</i>	Fruits	Used to make pickle, exudates from ripen fruits is used as gum.
Tree	Barna	<i>Crateva religiosa</i>	Flowers	Medicinal
Tree	Bohr	<i>Ficus benghalensis</i>	Bark, leaves & milky latex	Medicinal, worshiped by people.
Tree	Faguda	<i>Ficus palmata</i>	Milky exudate	Medicinal
Tree	Peepal	<i>Ficus religiosa</i>	Bark, milky latex, fruits	Medicinal, worshiped by local people.
Tree	Dhamman	<i>Grewia tiliifolia</i>	Leaves	During winter, due to the shortage of fodder crops, leaves of dhamman are given to cattle
Tree	Sub-bul	<i>Leucaena leucocephala</i>	Stem, twigs	Young leaves bearing branches used as fodder, dry branches as fuel wood
Tree	Toot or sahtoot	<i>Morus alba</i>	Leaves and twigs	Leaves are used as fodder; twigs are used to make baskets
Tree	Khajoor	<i>Phoenix sylvestris</i>	Leaves	Used to make brooms

species utilized for different purpose which indicates that natives are mainly dependent on wild plants for medicine and thatching material. Similar studies were conducted in Baigachak area of Madhya Pradesh and reported that Baigas utilizes 30 % forest

products for food and fruits, 22 % for medicinal use, 11% species as fodder, 9% for thatching, making agricultural implements and brooms⁹. Out of 98 wild plant species, 5 troublesome plants were also reported which are causing various



kinds of allergies to humans and about 35 species had not been used for any purpose.

CONCLUSION

It is very important to prepare biodiversity registers in the areas where people depend on biodiversity for their livelihood, so that the relationship of local communities with their surrounding biodiversity can be studied. Traditional knowledge is related to various day to day activities like agriculture, health care, food preparation, religious beliefs, rituals, festivals, natural resources management, etc. Hence, documentation and understanding of this knowledge can be deployed for the sustainable development of these areas. From the present investigation, it was observed that no doubt very few people are dependent on natural resources or agriculture for their economic growth, still a rich biodiversity and traditional knowledge does exist in the villages under study. These villages are the home of large number of medicinal plants and their associated traditional knowledge and natives are still relying on local medicinal plants for minor ailments. Therefore, documentation of these medicinal plants and traditional healthcare practices can protect them from unethical bio-prospecting; serve as a base for

pharmaceutical research and can also provide equitable share of benefits to the individual or local communities arising from the use of such knowledge and resources.

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