

# Ethnobotanical Studies of Plant Resources of Cholistan Desert, Pakistan

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**Abstract:** *The study was conducted to accumulate information about the plant resources used by various communities of Cholistan desert. It was observed that the area is rich in natural flora and the inhabitants are dependent on these plant resources especially for their food, shelter, fuel, timber, fodder and health care. Ethnobotanical uses of plants collected through questionnaire and interview by local people during different seasons of the year. The different races were present in the study area as Kutwal, Sheikh, Makhy, Maby, Mahar, Bhain, Parhiyar, Bohar, Jam and Tanwari. A total number of 90 plant species belonging to 34 families have been reported to be used ethnobotanically.*

**Keywords:** Ethnobotany, Cholistan desert, medicinal uses, food uses, domestic uses.

## 1. Introduction

Ethnobotany plays an important role in understanding the dynamic relationships between biological diversity and social and cultural systems [1] [2]. Ethnobotanical approaches are significant in emphasizing locally important plant species, particularly for new crude drugs. Many important vital modern drugs achieved by the documentation of indigenous knowledge, in particular the medicinal values of plant species [3]. Plant resources provide materials for survival, medicinal, forage values, but also possess and preserve cultural heritages, biological information and indigenous knowledge [4] [5]. Unfortunately, very little attention has been paid to the ethnobotanical aspects of plants as only hakims are associated with medicinal plants [6] [7] [8] [9]. It is a common practice that was started from the earliest times of mankind's history to use plants for cure diseases and ailments (Hill, 1989)[10]. Plants as a source of medicine is very much important for human beings use [11]. Several studies have been carried out from the world on ethnobotanical uses [12] [13] [14] [15] [16] [17] [18] [19]. The ethnobotany in Pakistan is going to be matured with the passage of time and various studies have been reported from various parts of the country [20] [21] [22] [23] [24] [25] [26]. Main objectives of this ethno botanical study was to record the indigenous knowledge about plants of the entire area. The ethno botanical information gathered aims for the solution of several constraints and conservation of medicinal herbs of the cholistan desert and provide scientific basis for further research.

## 2. Material and Methods

### 2.1 Study area

The Cholistan desert spreading over an area of 26,000 km<sup>2</sup> situated in southern of Punjab province of Pakistan. It is located between 27°42' and 29°45' N latitude and 69°52' and 75°24' E longitude [27] [28] [29] [30] [31]. It is a hot and sandy desert with mean annual rainfall of 100-250 mm,

usually falling during the monsoon period and in winter and spring. The mean minimum winter temperature is 6.5 °C and the mean maximum in summer is 46.5 °C with an absolute maximum around 51 °C [32] [33] [34].

Inconsistent rainfall supports only a leafless and spiny, scrub desert with stunted and grazed shrubs, and a few trees. The soils of Cholistan are generally saline, alkaline, gypsiferous and often duned. The dunes reach an average height of about 100-150 m [35] [28]. There are no permanent natural surface water reservoirs. The rainwater is harvested in the low-lying areas or trench ponds ('tobas'), Underground water can be found at the depth of 30-50 m and mostly is brackish (9000–24,000 mg/L of salts) [27] [36].

### 2.2 Data collection

The present exploration was carried out through various field surveys in study area during different seasons of the year. Questionnaire was adopted for interviews and gathered data about ethnobotanical uses from the local inhabitants. The collected information was cross checked with the available literature about medicinal and ethnobotanical uses. During the survey plant specimens were collected from the study area. These were identified with the help of different floras [37] [38] [39] [40] [41].

## 3. Results and Discussion

A total number of 90 plants species belonging to 74 genera and 34 families were identified which are being used by the nomadic people of Cholistan desert by many ways. The data collected are arranged in alphabetical order of the species name, family name, common name, habit, mode of uses and their medicinal uses given for each species (Table 1). The medicinal uses include parts used, methods of preparation, administration wherever available. Along with these 16 plant species were used as nutritional value and 15 plant species were used as domestic were also explored and documented (Table 2 & 3).

**Table 1:** List of plants with their family name, common name, habit, mode of use and medicinal uses

Plant name	Family	Common name	Habit	Mode of use	Medicinal uses
<i>Alhagi maurorum</i>	Papilionaceae	Jawansa	Shrub	Roots/whole Plant in the form of infusion and decoction	Blood purifier, cough and asthma
<i>Abutilon muticum</i>	Malvaceae	Kanghi-buti	Shrub	Leaves and Roots in the form of decoction	Kidney infection, kidney stones and gastritis.
<i>Acacia jacquemontii</i>	Mimosaceae	Banwli	Tree	Thorns used as infusion and decoction	Fever, cough, chicken pox and small pox
<i>Acacia nilotica</i>	Mimosaceae	Babul or Kikar	Tree	Leaves, fruit, flowers, and gum all ingredients mixed in sugar (misri) and making powder. One tea spoon taking three times daily. Tooth sticks used cleaning the teeth	Impotency, night fall, sexual debility and leucorrhoea
<i>Aerva javanica</i>	Amaranthaceae	Bui	Shrub	Root, root bark and leaves used as decoction and infusion	Vesicle stones and gall stones
<i>Anticharis linearis</i>	Scrophulariaceae	Assmani butti	Herb	Leaves past on forehead and on eyes in headache and eyes pain. Decoction used in hypotension.	Fatigue, headache, eyes sore, and hypotensive.
<i>Arnebia hispidissima</i>	Boraginaceae	Sorkhi butti	Herb	Whole plant used in the form of infusion and decoction	Hysteria, dysmenorrhoea, epilepsy and insanity
<i>Asphodelus tenuifolius</i>	Asphodelaceae	Piazi	Herb	Whole plant used as powder	Blood purifier, eczema, asthma, cold and allergy
<i>Blepharis indica</i>	Acanthaceae	Gandi-Buti	Herb	Whole plant used as decoction	Low blood pressure, anemia and weakness
<i>Boerhavia diffusa</i>	Nyctaginaceae	Biskhipra	Herb	Roots used in the form of decoction	Kidney failure, hematuria and burning urination
<i>Boerhavia procumbens</i>	Nyctaginaceae	Biskhipra	Herb	Whole plant used as a decoction and infusion	Kidney failure, hematuria, blood purifier and septic condition
<i>Calligonum polygonoides</i>	Polygonaceae	Phog	Shrub	Flowers used as vegetable, floral buds and green twigs chewing and past on eyes	Conjunctivitis, heart burn, sore throat and fever
<i>Calotropis procera</i>	Asclepiadaceae	Ak	Shrub	Latex (Milk collected on cotton) and leaves past on joints and rupturing the wounds. Flowering and shot buds eating in snake poisons and used as a decoction in others diseases	Wound healing, ulcer, arthritis, fever, jaundice, hepatitis, and epilepsy.
<i>Capparis decidua</i>	Capparidaceae	Karir	Tree	Fruit making pickles, leaves and stem used as a decoction and infusion. Roots used as tooth stick for cleaning the teeth	Hemorrhoids, fungus infection, fevers, obesity, constipation, gastric ulcer, and bone fractures
<i>Capparis spinosa</i>	Capparidaceae	Kubber	Shrub	Fruits used as vegetable, leaves and flowers used as a decoction and infusion	Arthritis, asthma, hepatitis, splenomegaly and fever
<i>Caralluma edulis</i>	Asclepiadaceae	Seetoo	Herb	Whole plant used as vegetable and salad.	Diuretic and aphrodisiac.
<i>Cassia italica</i>	Caesalpinaceae	Ghoray wall or sana	Shrub	Whole plant used as decoction	Arthritis, dyspepsia, fever and constipation
<i>Cenchrus ciliaris</i>	Poaceae	Dhaman	Grass	Whole plant used in the form of infusion	Anti-anthelmintic, kidney pain, tumors and wound healing.
<i>Cenchrus setigerus</i>	Poaceae	Dhaman	Grass	Whole plant used in the form of infusion	Allergy, fever and intestinal worms.
<i>Chenopodium album</i>	Chenopodiaceae	Bathu	Herb	Whole plant used as vegetable and in the form of decoction	anthelmintic, diuretic, aphrodisiac, tonic, useful in biliousness, abdominal pain, eye diseases, throat troubles,
<i>Chrozophora plicata</i>	Euphorbiaceae	Nilkari	Herb	Whole plant used as decoction	Wounds, ulcer, cough, asthma and tuberculosis.
<i>Cistanche tubulosa</i>	Orobanchaceae	Phaphorr	Herb/parasite	Whole plant used as a decoction and infusion	Impotency, cough, gastric ulcer, vomiting and diarrhea
<i>Citrullus colocynthis</i>	Cucurbitaceae	Tumma or Kor tumma	Herb	Roots used as tooth stick for cleaning the teeth and gums swelling and fruits as decoction	Menstrual disorder, diabetes, sciatica and digestive disorders

<i>Cleome brachycarpa</i>	Capparidaceae	Noli or kastoori	Herb	Whole plant	Intestinal worms, inflammations of internal organs and hepatic disorders
<i>Cleome scaposa</i>	Capparidaceae	Kastoori Buti	Herb	Whole plant used as a decoction	Malarial fever, ulcer, diabetes and burning sensation in body.
<i>Convolvulus prostratus</i>	Convolvulaceae	Hiran Buti	Herb	Leaves and soft twigs used as decoction and infusion	Excessive thirst, hotness, diabetes, constipation and fever
<i>Corchorus depressus</i>	Tiliaceae	Bhao-phali	Herb	Whole plant used as a infusion, powder and decoction	Aphrodisiac, premature ejaculation, night fall and polyuria
<i>Cressa cretica</i>	Convolvulaceae	Oin	Herb	Whole plant used as a paste and decoction	Fungus infection, asthma, blood purifier and eczema
<i>Crotalaria burhia</i>	Papilionaceae	Chag	Shrub	Whole plant boiling in water used externally and decoction	Leukoderma, fever, arthritis and skin diseases
<i>Cucumis melo var. agrestis</i>	Cucurbitaceae	Chibbar	Herb	Fruit used as vegetable and powder and also decoction	Hyperacidity, increase appetite and constipation.
<i>Cymbopogon iwarancusa</i>	Poaceae	Kitrin or Khawi	Grass	Roots and whole plant used as infusion and decoction	cardio-myopathy Cholera, thirst, fever, and hysteria
<i>Cyperus conglomeratus</i>	Cyperaceae	Deela	Sedges	Whole used as a decoction and infusion.	Dyspepsia, hyperacidity and constipation
<i>Cyperus rotundus</i>	Cyperaceae	Deela or Murki	Sedges	Roots and Tubers use decoction and infusion	Diabetes, burning smaturation and inflammation
<i>Dipterygium glaucum</i>	Capparidaceae	Phel	Shrub	Whole plant used as a decoction and infusion	Jaundice, blood purifier, psoriasis and ring-worms
<i>Echinops echinatus</i>	Asteraceae	Unt Katara	Herb	Whole plant and roots used powder and decoction	Hepatitis, jaundice, fever, anorexia and sexual debility
<i>Ephedra ciliata</i>	Ephedraceae	Choti Phog	Shrub	Floral buds and green twigs used as decoction	Asthma, bronchitis, headache and cough
<i>Euphorbia granulata</i>	Euphorbiaceae	Hazar Dani	Herb	Whole plant used as paste and decoction	Blood purifier, leprosy, and psoriasis
<i>Euphorbia prostrata</i>	Euphorbiaceae	Hazar Dani	Herb	Whole plant used as paste and decoction	Piles, eczema, gangrene Scabies and psoriasis
<i>Fagonia cretica</i>	Zygophyllaceae	Dhamasa	Herb	Whole plant used as a infusion and decoction	Blood purifier, wounds, hepatitis, cancer, chronic fever, jaundice and cysts.
<i>Farsetia hamiltonii</i>	Brassicaceae	Fareed buti or Lathia	Herb	Whole plant used as powder and decoction	Diabetes, numbness of lower limbs, polyuria and Inflammations.
<i>Gisekia pharnaceoids</i>	Aizoaceae	Buloka Sag	Herb	Whole plant used as decoction	Hepatitis, Jaundice, ulcer, anorexia and constipation
<i>Glinus lotoides</i>	Molluginaceae	Phatokar	Herb	Whole used as decoction	Ulcer, Wound healer and antiseptic.
<i>Corchorus trilacularis</i>	Tiliaceae	Bari Buo-phali	Herb	Leaves used as infusion	Burning urination and kidney infection
<i>Haloxylon stocksii</i>	Chenopodiaceae	Khar or sSaji	Shrub	Whole plant making ash and mixed with sugar	Gastric ulcers and renal stones
<i>Haloxylon salicornicum</i>	Chenopodiaceae	Lana	Shrub	Whole plant making ash and mixed with sugar	Dyspepsia, ulcer and antidote of insects
<i>Heliotropium crispum</i>	Boraginaceae	Hathi Sundi	Herb	Whole plant used as a decoction and powder	Kidney stone, impotency and weakness
<i>Heliotropium europaeum</i>	Boraginaceae	Hathi Sundi	Herb	Whole plant used as a decoction and powder	Aphrodisiac and hypertension.
<i>Heliotropium strigosum</i>	Boraginaceae	Gorakh Pan	Herb	Whole plant used as a decoction and powder	Jaundice, hepatitis, blood purifier and arthritis
<i>Indigofera siseliflora</i>	Papilionaceae	Jantri	Herb	Whole plant used decoction and infusion	Jaundice, hepatitis, blood purifier and urticaria disorders
<i>Indigofera argentea</i>	Papilionaceae	Neel	Herb	Whole plant used as decoction and infusion	Malaria, jaundice, headache, and gastric disorder
<i>Launaea nudicaulis</i>	Asteraceae	Bhattal	Herb	Whole plant used as decoction	Chronic constipation
<i>Launaea resedifolia</i>	Asteraceae	Dhudhkal	Herb	Whole plant used as decoction	Hepatitis, anorexia and fever.

<i>Leptadenia pyrotechnica</i>	Asclepiadaceae	Khip	Shrub	Leaves and shoots used as a decoction and powder	Obesity, constipation, dysmenorrhea, jaundice and fever
<i>Limeum indicum</i>	Aizoaceae	Lonri	Herb	Whole plant used as infusion	Haemorrhoids, diabetes and dyspepsia
<i>Melilotus officinalis</i>	Papilionaceae	Sinji	Herb	Whole plant use vegetable and decoction	Headache, vomiting and appetizer.
<i>Mollugo cerviana</i>	Molluginaceae	Padi or Sarr	Herb	Whole plant used as decoction	Fever, burning micturition and gonorrhoea
<i>Mukia madaraspatana</i>	Cucurbitaceae	Gawala-kakri	Climber	Shoots, roots and seeds used as a decoction and infusion	Jaundice, fever, muscular weakness and lumbago
<i>Neurada procumbens</i>	Neuradaceae	Chhapri	Herb	Whole Plant used as "Panjeeri" (Cooking in butter with flour of chickpea) and decoction	Sexual tonic, sunstroke, low blood pressure.
<i>Oligochaeta ramosa</i>	Asteraceae	Birham Dandi	Herb	Whole plant used as decoction and infusion.	Allergy, jaundice, arthritis and excessive hotness
<i>Oligomeris linifolia</i>	Resedaceae	-	Herb	Whole plant used as infusion	Jaundice, chronic fever and constipation
<i>Oxystelma esculantum</i>	Asclepiadaceae	Dudhani	Climber	Whole plant used as a decoction and infusion	Hepatoprotective, chronic fever, Dysuria, gonorrhoea and blood purifier
<i>Panicum antidotale</i>	Poaceae	Murrot or Bansi Ghaa	Grass	Whole plant used as a decoction	Cough, throat infection, fever and general debility
<i>Panicum turgidum</i>	Poaceae	Murrot	Grass	Whole plant used as a decoction	Antipyretic, cough, dysuria and renal stones
<i>Pentatropis spiralis</i>	Asclpiadaceae	Hiran Buti	Herb	Leaves, stem and latex used as a paste and decoction	Bleeding tendency, ulcer and wound
<i>Polygala erioptera</i>	Polygalaceae	Asmani Buti	Herb	Whole plant used as decoction and infusion	Blood purifier, hepatitis, jaundice and eczema
<i>Polygonum plebejum</i>	Polygonaceae	Charri Hatha	Herb	Whole plant used as a powder and decoction	Cough, bronchitis, asthma and pneumonia
<i>Praecitrullus fistulosus</i>	Cucurbitaceae	Jangli Tindy	Herb	Fruit use as vegetable and powder	Appetizer, dyspepsia and weakness.
<i>Prosopis cineraria</i>	Mimosaceae	Jandi or Kanda	Tree	Leaves, bark, flowers used as a powder and decoction and dry pods ("Sangrian") used as a dry fruit	Anemia, wound, menstrual disorders and contraceptive
<i>Prosopis juliflora</i>	Mimosaceae	Maskit	Tree	Leaves and bark used as a decoction	Skin disorders, dermatitis, broken bones and cure gall stones.
<i>Psoralea plicata</i>	Fabaceae	Makka Buti	Herb	Roots used as a tooth stick for the cleaning of teeth and seeds use as decoction and powder	Skin diseases, Blood purifier and Psoriasis.
<i>Portulaca oleracea</i>	Portulacaceae	Lonak	Herb	Whole plant used vegetable and decoction.	Cough, piles, constipation and weakness
<i>Pulicaria crispa</i>	Asteraceae	Bui	Shrub	Whole plant used as a decoction	Hepatitis, jaundice and chronic fever
<i>Rhynchosia capitata</i>	Papilionaceae	Choti Ghore Walh	Herb	Whole plant used as a decoction	Dyspepsia, constipation and vomiting
<i>Saccharum bengalense</i>	Poaceae	Sarkanda	Grass	Roots used as decoction and infusion	Renal stone and dysuria.
<i>Salvadora oleoides</i>	Salvadoraceae	Pilu, Wan	Tree	Fruit use as vegetable, stem used as tooth cleaning and leaves used as decoction	Nutritive, anorexia, ulcer, blood purifier and boils
<i>Salsola imbricata</i>	Chenopodiaceae	Lani	Shrub	Used areal part making ash and mix with sugar	Dyspepsia, constipation and Abdominal distension.
<i>Suaeda fruticosa</i>	Chenopodiaceae	Kali Lani	Shrub	Used areal part making ash and mix with sugar	Kidney stone and gout
<i>Seetzenia lanata</i>	Zygophyllaceae	Jeuli Buti	Herb	Whole plant used as decoction	Tonic, cough, flue and hypertension.
<i>Solanum surratense</i>	Solanaceae	Kandiari	Herb	Fruit and whole plant used as powder and decoction	Jaundice, hepatitis, fever arthralgia and asthma
<i>Sesuvium sesuioides</i>	Aizoaceae	Barri Ulwaiti	Herb	Whole plant used as a decoction	Arthritis, gout and epistaxis.
<i>Tamarix aphylla</i>	Tamaracaceae	Ukhan, Frash	Tree	Leaves and bark used in form of decoction and ash powder	Jaundice, ulcer, hepatitis, dyspepsia, leucorrhoea, and

					menstrual disorders.
<i>Tephrosia purpurea</i>	Papilionaceae	Jhilli	Shrub	Whole plant used as powder and decoction	Worms, fever, blood purifier, jaundice, hepatitis, ulcers, leprosy, asthma, piles, cancer and urticaria.
<i>Tribulus longipetalus</i>	Zygophyllaceae	Tirkindi or Bakhara	Herb	Whole plant and seeds used as a powder and decoction	Renal stones, impotency, premature ejaculation, night fall and sexual weakness
<i>Tribulus terrestris</i>	Zygophyllaceae	Tirkindi or Bhakra	Herb	Whole plant and seeds used as a powder and decoction	Impotency, sexual weakness, premature ejaculation and piles.
<i>Trianthema triquetra</i>	Aizoaceae	Choti Ulwaiti	Herb	Whole plant used as decoction, powder and infusion	Skin disease, diabetes and inflammation
<i>Withania coagulens</i>	Solanaceae	Paneer		Fruit used as powder and decoction	hepatitis, jaundice, loss of appetite, skin problems, and chronic fever
<i>Withania somnifera</i>	Solanaceae	Asghanh		Leaves and root used as a powder, infusion and decoction	Impotency, premature ejaculation, diabetes, fever and arthritis
<i>Zizyphus spina-christi</i>	Rhamnaceae	Beri	Tree	Fruit, bark, leaves and seeds used as powder decoction	Hemorrhage, leucorrhoea, anemia and spermatorrhoea
<i>Zygophyllum simplex</i>	Zygophyllaceae	Lunak	Herb	Whole plant used powder and decoction	Blood purifier, worms and leukoderma
<i>Zaleya pentandra</i>	Aizoaceae	Itsit, Wisah	Herb	Roots used as powder and decoction	Dysuria, kidney stone, hematuria.

Table 2: Plants used as food

Plant name	Family	Common name	Parts used	Uses
<i>Acacia jacquemontii</i>	Mimosaceae	Banwli	Pods	Making pickle and vegetable with unripe pod
<i>Acacia nilotica</i>	Mimosaceae	Kikar	Pods	Making pickle and vegetable with unripe pod
<i>Calligonum polygonoides</i>	Polygonaceae	Phog	Flowers	Making vegetable
<i>Capparis decidua</i>	Capparidaceae	Karir	Fruit	Making Pickle and vegetable
<i>Capparis spinosa</i>	Capparidaceae	Kubber	Fruit and Flowers	Cooking and eat with bread
<i>Caralluma edulis</i>	Asclepiadaceae	Seetoo	Whole	Making vegetable
<i>Cencherus ciliaris</i>	Poaceae	Dhaman	Seeds	Making flour and bread
<i>Cenchrus biflorus</i>	Poaceae	Muhabbat Butti	Seeds	Making flour and bread
<i>Chenopodium album</i>	Chenopodiaceae	Bathu	Whole plant	Cooking as Vegetable
<i>Cucumis melo var. agrestis</i>	Cucurbitaceae	Chibbar	Fruit	Fruit eating and cooking
<i>Panicum antidotale</i>	Poaceae	Murrat	Seeds	Making flour and bread
<i>Panicum turgidum</i>	Poaceae	Bansi Gha	Seeds	Making flour and bread
<i>Pennisetum divisum</i>	Poaceae	Murrat	Seeds	Making flour and bread
<i>Portulaca oleracea</i>	Portulacaceae	Lonak	Whole plant	Cooking and eat with bread
<i>Prosopis cineraria</i>	Mimosaceae	Jandi	Fruit and pods	Dry fruits eating
<i>Salvadora oleoides</i>	Salvadoraceae	Pilu, Wan	Fruit, bark and leaves	Fruits eating

Table 3: Plants used as domestic

Plant Name	Family	Common name	Parts used	Uses
<i>Abutilon muticum</i>	Malvaceae	Kanghi buti	Whole	Fire wood
<i>Acacia nilotica</i>	Mimosaceae	Kikar	Wood	Making "Gopas" or room roof and fire wood
<i>Aerva javanica</i>	Amaranthaceae	Bui	Whole plant	Making "Gopas" or room roof and fire wood
<i>Calligonum polygonoides</i>	Polygonaceae	Phog	Whole plant	Making "Gopas" or room roof and fire wood
<i>Calotropis procera</i>	Asclepiadaceae	Ak	Wood	Fire wood
<i>Capparis decidua</i>	Capparidaceae	Karir	Wood	Fire wood and fencing
<i>Crotalaria burhia</i>	Papilionaceae	Chag	Whole plant	Bushes use for fire
<i>Haloxylon stocksii</i>	Chenopodiaceae	Khar or Saji	Whole plant	Making "Soda" or soap powder.
<i>Haloxylon salicornicum</i>	Chenopodiaceae	Lana	Whole plant	Fire wood
<i>Leptadenia pyrotechnica</i>	Asclepiadaceae	Khip	Wood	Making "Gopas" or room roof and fire

				wood
<i>Prosopis cineraria</i>	Mimosaceae	Jandi	Wood	Making "Gopas" or room roof and fire wood
<i>Prosopis juliflora</i>	Mimosaceae	Maskit	Wood	Fire wood
<i>Salvadora oleoides</i>	Salvadoraceae	Pilu, Wan	Wood	Making "Gopas" or room roof and fire wood
<i>Tamarix aphylla</i>	Tamaracaceae	Ukhan, Frash	Wood	Making "Gopas" or room roof and fire wood
<i>Zizyphus spina-christi</i>	Rhamnaceae	Beri	wood	Fire wood and fencing

The study indicated that the study area has plenty of medicinal plants to treat a wide range of human ailments. Studies on traditional medicinal plants revealed that the local people prefer folk medicine due to low cost and sometimes it is a part of their social life and culture so it is necessary to acquire and preserve this traditional system of plant utilization by proper documentation and identification of specimen. Sustainable harvesting of these plants is essential. Thus there is a need to create awareness of importance of these plants among local people and to provide them guidance and training in collection and processing to enhance the economic benefits from local flora.

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