Traditional Foodgrain Crops of Himachal Pradesh









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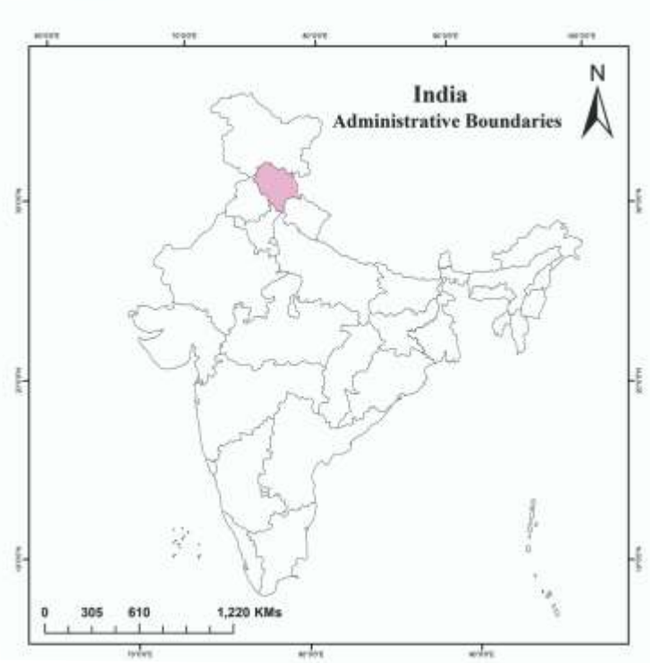
UNEP-GEF- MoEFCC Project

Himachal Pradesh State Biodiversity Board

Himachal Pradesh Council for Science, Technology & Environment (HIMCOSTE)

Vigyan Bhawan, Bemloe, Shimla-1 Himachal Pradesh

Website: http://www.hpbiodiversity.gov.in; http://www.hpccc.gov.in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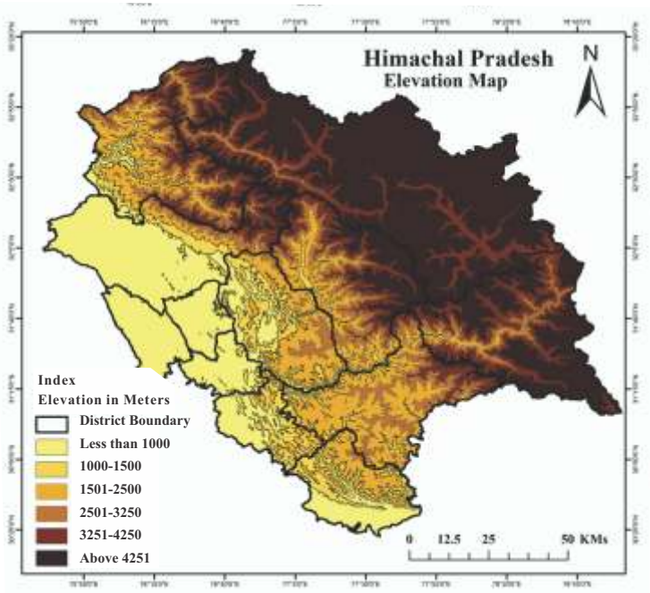
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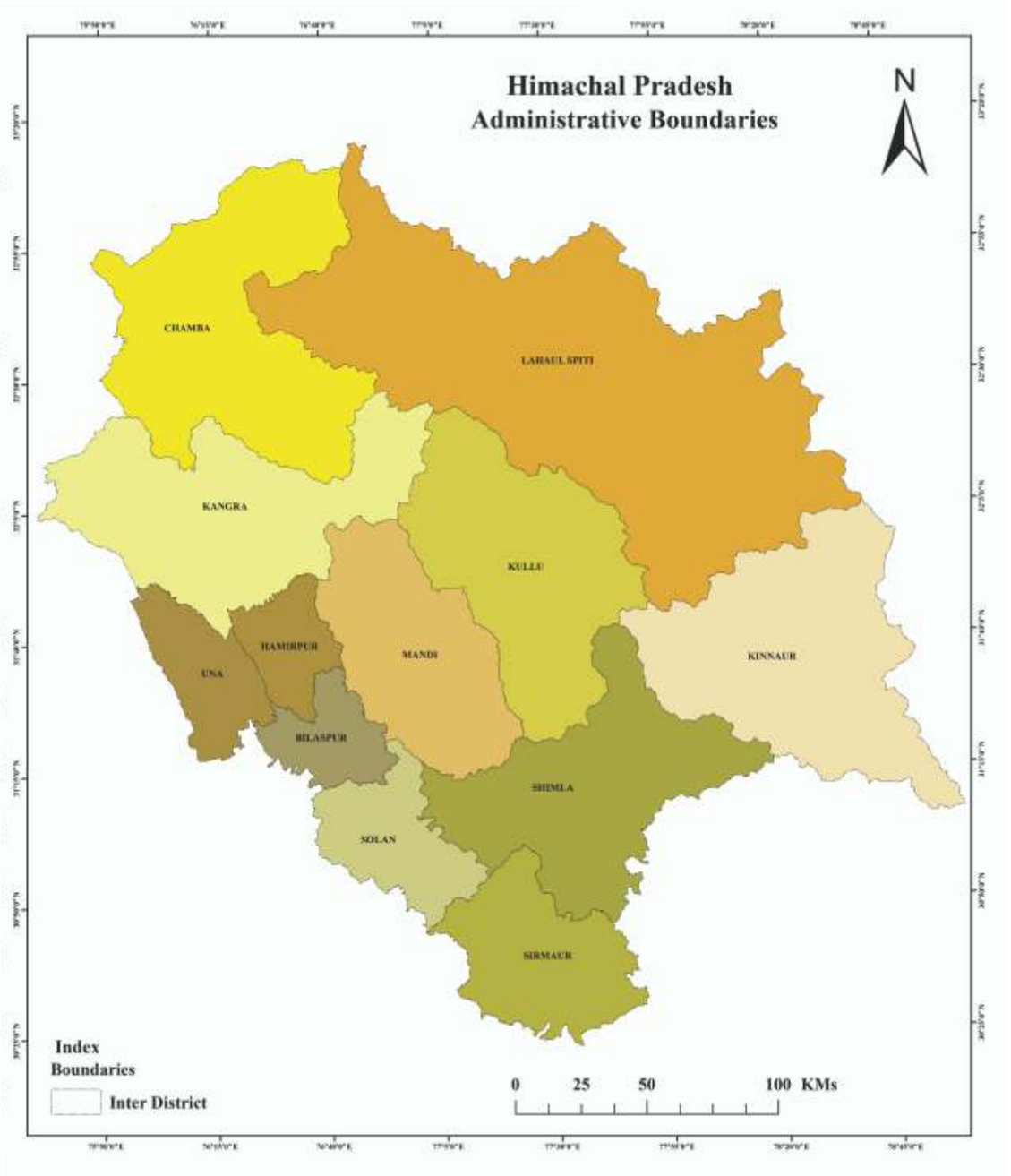
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Chief Minister

Himachal Pradesh

Message

Himachal Pradesh is a hilly State in the northwestern Himalayan region and the physiography ranges from the foothills of the Shiwaliks to the High Hills of the Great Himalayan Range. These distinguishing niches support cultivation of wide variety of cereals, vegetables, medicinal and aromatic plants, and fruit crops depending upon their ecological adaptation. Traditional agriculture in the past was for subsistence with cereal based farming system where millets and pseudocereals were important components in the State.

After independence, Green Revolution was one of the most significant movements in India that promoted the development of high yielding varieties with introduction of chemical fertilizers and pesticides. But these intensive cultivation practices led to the environmental degradation through denudation of the soil and pollution of the environment due to pesticides and fertilizers runoff. There is now a great need to revive our old traditional hill agriculture system adopting organic farming in place of the chemical based farming in this mountain State, so that the environmental as well as the nutritional security is ensured. The initiative for documenting the information on traditional foodgrain crops grown in the State for its wider promotion is a good effort made by the State Centre on Climate Change and H.P. State Biodiversity Board (HPSBB) of the H.P. Council for Science Technology & Environment (HIMCOSTE) and wish that this document would be helpful in getting knowledge about these traditional crops and their values for reviving our traditional farming system.

(Jai Ram Thakur)

सत्यमेव जयते
हिमाचल प्रदेश

Minister of Health & Family Welfare, Medical Education, Ayurveda and Science & Technology, Himachal Pradesh

Message

Himachal Pradesh is an agrarian State with 76% population securing their livelihood from agriculture base and contributes about 9.4% to the total GDP of the State. With the passage of time, cash crops were included in the cropping system which paid very high dividends and vegetable/fruit/floriculture based farming system became more popular, as a result of which the cultivation of the traditional crops declined drastically and the lesser availability of these crops deprived the population from nutritional and livelihood security.

Worldwide, only three cereal grains i.e. wheat, rice and maize dominate the food supply accounting for about 75% of all grains produced, which may have risk for humankind in case of total crop failure due to some disease. Besides this, our reliance on these few grains may have serious long term health concerns because of the deficiencies in some of the micronutrients in our diet. To promote the traditional crops in the mountain regions and to reduce the detrimental effects of the green revolution, the hill people are to be made aware of our traditional crops so that the food and the nutritional security is ensured. The present compilation in the form of a Coffee Table Book on theTraditional Foodgrain Crops of Himachal Pradesh is an appreciable effort made by State Centre on Climate Change of the H.P. Council for Science Technology & Environment (HIMCOSTE), which may be a good source of information for the masses to know about the traditional crops of Himachal Pradesh.

(Vipin Singh Parmar)

सत्यमेव जयते
हिमाचल प्रदेश

Chairman HIMCOSTE-cum- Additional Chief Secretary
(Env. S&T), Government of Himachal Pradesh

Message

The intensive cultivation practices needed to produce the required high yields of cereals under the green revolution led to the environmental degradation. However, the green revolution did enable the Nationto achieve self-sufficiency in food production, but the continuous use of chemical fertilizers in inappropriate ratio of the nutrients, has not only polluted soil, water and environment but also, made soils more nutrient hungry, moisture thirsty and microbiologically inactive. Disproportionate addition of major nutrients with least quantity of organic manures has resulted in expression of deficiencies of macro and micro nutrients which has resulted in reduced yields with increased production costs.

In Himachal Pradesh farmers rely on rain fed agriculture for their livelihood as 81% of the cultivated area is rained making the farmers more vulnerable. Traditional crops viz. millets, pseudocereals and other lesser known crops have been known as staple food grain crops to humans for thousands of years. These crops have remained important component of cropping systems in rain fed areas supporting millions of people living in difficult terrains of hill mountain ecosystems as they have wider adaptability due to endurance to drought and poor soil fertility, high nutritional and medicinal value, and resilient to biotic and abiotic stresses.However, the area under traditional crops has been on the decline despite their rich nutritional value. But now the cultivation of these crops is again gaining momentum owing to their nutraceutical superiority in comparison to fine cereals and considering their importance they should be popularised among the farmers of the State. The present compilation of all information related to traditional crops in the form of a Coffee Table Book on the Traditional Foodgrain Crops of Himachal Pradesh is anexcellent effort of the State Centre on Climate Change and H.P. State Biodiversity Board of the H.P. Council for Science Technology & Environment (HIMCOSTE) and wish that this information would be useful for acquiring knowledge for their further propagation.

(Tarun Kapoor)











Member Secretary (HIMCOSTE)

Preface

Himachal Pradesh possess a vast agro-ecological variability, from subtropical Shiwalik hillzone starting from 360m to high hill wet and dry temperate zones encompassing the alpine pastures up to 6800m. The State also encompasses large variability in topography from fertile valley lands to high hills with limited fertility. Due to varied agro-ecologies, the State is endowed with immense variability in plant wealth.

In the recent past, cultivation of traditional crops has been replaced by cash crops and as a result many old varieties of foodgrains are disappearing. As a result, the age old wisdom of mixed farming that ensured ecological and food security has vanished. Climate variability is also posing serious challenge in the hill State because of the dependence of the regional economy on climate sensitive natural resources. The occurrence of numerous climatic stresses is increasing with each passing year and is posing threat to sustenance of agriculture as a profession. In Himachal Pradesh, farmers mostly rely on rainfed agriculture for their livelihood making them more vulnerable to biotic and abiotic stresses. The State is looking at the hidden potential of rainfed areas to support future food and nutritional security to the growing population. Traditional crops possess more endurance to moisture stress and nutrient deficient conditions prevalent in the mountain ecosystem. These are rich source of energy, protein, micronutrients, and essential amino acids and have hypoglycaemic effects because of high level of dietary fibre.

In order to propagate and promote the traditional foodgrain crops in Himachal Pradesh, the State Centre on Climate Change and the H.P. State Biodiversity Board (HPSBB) of the H.P. Council for Science Technology & Environment (HIMCOSTE) made an attempt to compile the information on millets, pseudocereals, pulses and oil crops which are grown traditionally in State. This information has been compiled in the form of a Coffee Table Book from different sources depicting their ethnobotanical, medicinal, nutritional features and their distribution so that the masses are made aware about the value of these crops.

(Kunal Satyarthi, IFS)

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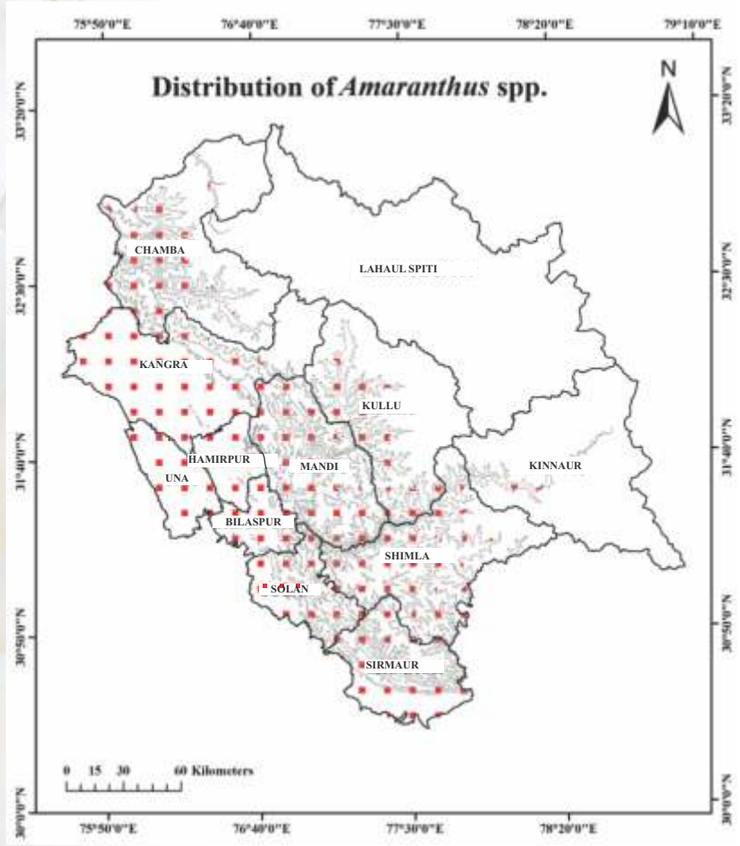
Amaranthus hypochondriacus L.

1. *Amaranthus hypochondriacus* L.

Common name	:	Saliara, Seul, Chaulai, Rajgiri, Ramdana, Amaranth
Family	:	Amaranthaceae
Native	:	Tropical America
Elevation	:	Up to 2500 m
Growing period	:	March-June
Distribution	:	It is cultivated as a mixed crop or on field bunds and sole crop sporadically in almost all the districts of the State. *A. cruentus* and *A. caudatus* are the other species of amaranth which are also grown in Himachal Pradesh



Ethnobotanical importance:

- Popped and puffed seeds of amaranth are cooked as rice.
- Popped grains are used to prepare *laddu* after mixing with sugar syrup.
- Popped grains are boiled in milk to prepare kheer or mixed with curd/ buttermilk to prepare *raita*.
- Amaranth preparations are acceptable meals during fasting days in religious ceremonies.
- Boiled leaves after sieving water are fried to prepare *chaulai ka saag*.
- Leaves mixed in Bengal gram flour batter are fried to prepare *pakora*.
- Grains cooked in water as *kheer* are used in curing chicken pox and measles.

Medicinal importance:

- Amaranth decreases plasma cholesterol level, stimulates immune system, possess antitumor activity, helps in reducing blood glucose levels, improves hypertension and anaemia.
- Phytic acid present in amaranth lowers blood cholesterol and is helpful in cardiac problems.
- Amaranth does not contain gluten therefore it is suitable for persons suffering from abdominal diseases.
- Popping of amaranth grains increases the protein quality and availability of amino acids.

Nutritional value (*A. cruentus*):

Constituents	Value (g per 100 g)
Moisture	9.20
Proteins	13.27
Fats	5.56
Total fiber	7.47
Carbohydrates	61.46
Potassium	0.41
Phosphorus	0.41
Magnesium	0.27
Calcium	0.16
Iron	0.008
Energy (KJ)	1489

Unique value:

Minerals (calcium, magnesium, iron, potassium and zinc) and vitamins (thiamine B_1, riboflavin B_2, ascorbic acid and Vitamin E) in amaranth seed are much higher in comparison to cereals.

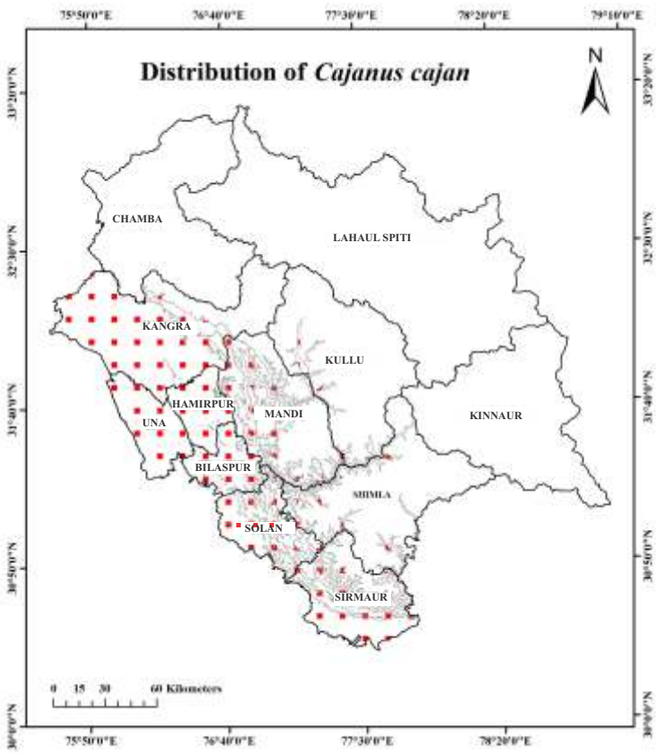
Phytochemicals:

Alkaloids, tannins, flavanoids, phenolic compounds, glycosides and saponins

Cajanus cajan (L.) Millsp.

2. *Cajanus cajan* (L.) Millsp.

Common name	:	Arhar daal, Tur, Pigeon pea, Red gram
Family	:	Fabaceae
Native	:	Peninsular India
Elevation	:	Up to 2000 m
Growing period	:	June - October
Distribution	:	Hamirpur, Nurpur (Kangra), Paonta (Sirmaur), Bilaspur, Una, Shimla, Mandi and Solan districts of the State.



Ethnobotanical importance:

- Mainly eaten in the form of split grain as *daal* which makes a rich source of proteins and important amino acids like methionine, lysine and tryptophan.
- Its young pods, shoots and leaves are edible. The leaves are used for mouthwash, tongue sores, gums problems, loose motions and induce uterine contraction.
- The leaves and pods are valuable and palatable protein-rich feed for poultry and pod husk along with leaves constitute a valuable cattle feed.
- Stem is used as fuel and also for making baskets, thatching and fencing.
- Green pods are used as a vegetable; leaves are used for rearing silkworms; husk, green leaves and tops are used as green manure for soil amelioration.
- Leaf paste is applied in oral ulcers and inflammations.

Medicinal importance:

- Arhar is widely used for treating diabetes, sores, skin irritations, hepatitis, measles, jaundice, dysentery, for expelling bladder stones and stabilizing menstrual period.
- Biological activities and pharmacological actions *viz.* antimicrobial, antibacterial, anti-cancerous and neuroactive properties.
- It is useful in controlling hypoglycemia occasionally caused due to excess of insulin and other hypoglycemic drugs.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	9.30
Proteins	20.47
Fats	1.38
Total fiber	22.84
Carbohydrates	42.48
Potassium	1.30
Phosphorus	0.31
Magnesium	0.16
Calcium	0.14
Iron	0.00 5
Energy (KJ)	1146

Unique value:

Drought tolerant, nitrogen fixing crop and grown as hedge row plantation on slopes to reduce soil erosion.

Phytochemicals :

Flavonoids, stilbenes, saponins, tannins, methyl-cajanone, genistein, isoflavones, cajanin, concajanin and cahanones

Chenopodium album L.

3. *Chenopodium album* L.

Common name : Bathua, Bathu, Vajjar, Karaun, Takka, Chenopod

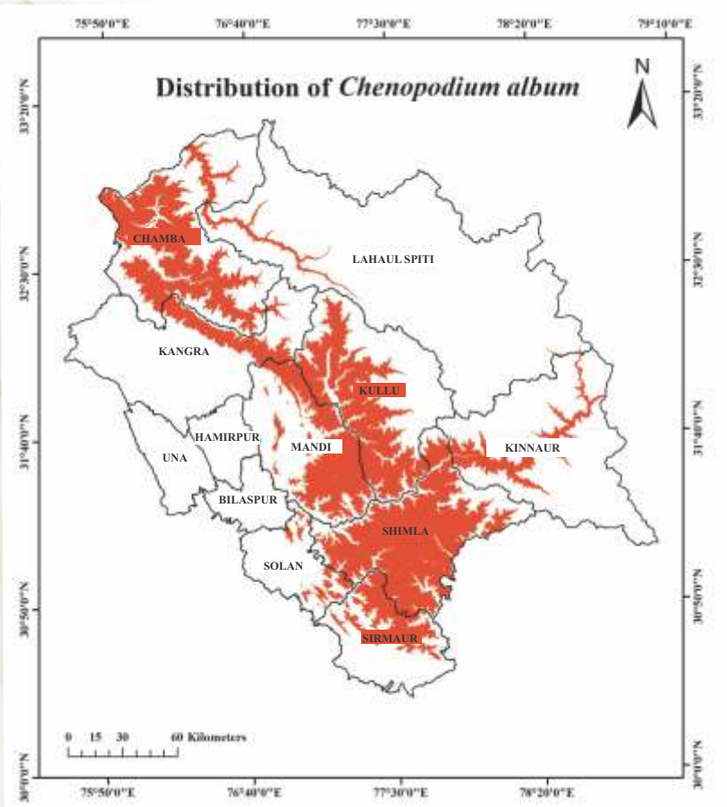
Family : Chenopodiaceae

Native : North Asia

Elevation : 1250-2700 m

Growing period : June-October

Distribution : Kinnaur, Lahaul- Spiti, Chamba, Shimla, Solan, Kangra, Kullu, Mandi and Sirmaur districts of the state.



Ethnobotanical importance:

- Fresh leaves are eaten as vegetable and are acceptable spinach substitute.
- Leaves can be used to make delicious *raita* or used as a stuffing for *rotis* and *pakodas*. Chenopod seeds are ground to flour and baked as pancake locally called as *bithu-ki-roti*.
- Chenopod grains are also cooked along with rice to a gruel called *fimbra* or *laafi* which is very popular traditional cuisine in Himachal Pradesh.
- Bathu leaves are mixed with other greens and lentils to make daal.
- A mixed preparation of chenopods, rice, foxtail millet, beans and spices called *jhinjhna* is cooked by boiling all these seeds together.
- Bathu leaves mixed with bengal gram flour (besan) are used to prepare *pakoras*.
- Chenopods grains are also roasted, ground and made into porridge. Chenopod seeds are popularly used in preparing a local fermented beverage *soora* and an alcoholic drink *ghanti*.
- A fine powder of leaves is dusted to reduce irritation and leaf juice is used for treating burns and sunburn.

Medicinal importance:

- Bathu is rich in vitamin B, C and E and contains significant amount of folic acid.
- The plant has been traditionally used as a blood purifier, diuretic, analgesic, laxative, sedative, used in liver and skin infections, and as an anthelmintic against roundworms and hookworms.
- The leaves are generally very nutritious but very large quantities can disturb the nervous system and cause gastric pain.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	10.43
Proteins	13.27
Fats	5.56
Total fiber	7.47
Carbohydrates	61.46
Potassium	0.05
Phosphorus	0.41
Magnesium	0.27
Calcium	0.16
Iron	0.008
Energy (KJ)	1374

Unique value:

Phytochemicals like flavonoid, isoflavonoid, polyphenol *etc*. have potential to reduce cancer risk.

Phytochemicals:

Quercetin, kaempferol, quercetin, rutin, quercetin, phenolic amide, saponin, cinnamic acid, alkaloid chinoalbicin, apocortinoid, xyloside, phenol and lignins.

Cicer arietinum L.

4. *Cicer arietinum* L.

Common name : Chana, Chholle, Chickpea, Bengal gram

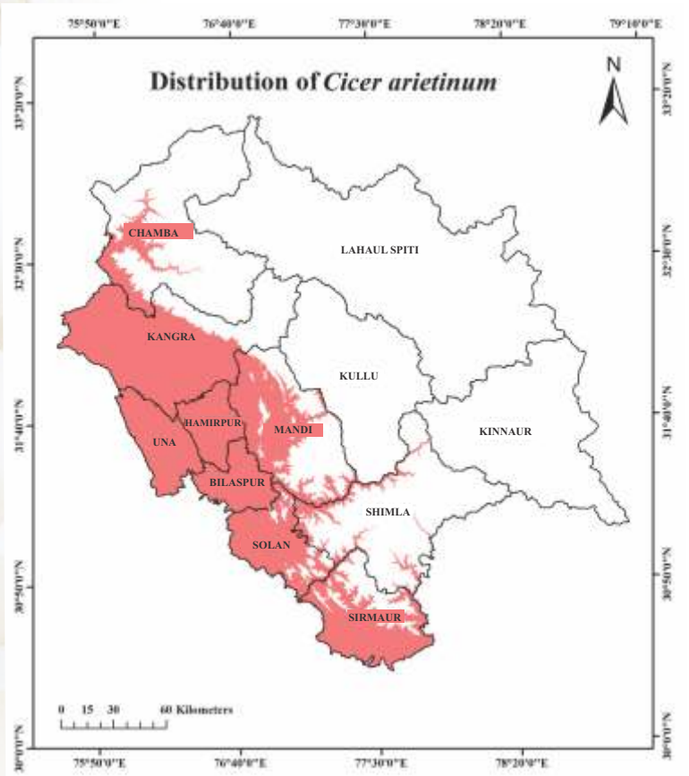
Family : Fabaceae

Native : South West Asia

Elevation : Up to 1200 m

Growing period : October-April

Distribution : Bilaspur, Una, Hamirpur, Mandi, Kangra, Chamba, Solan and Sirmaur districts of the State.



Ethnobotanical importance:

- Seeds are consumed as whole grain (*chhole*) or split cotyledons (*daal*).
- A traditional dish *madrah* (a thick, yogurt based gravy) is a popular cuisine of whole grain which is served in community meals.
- Roasted/fried seeds are eaten as snacks.
- Chana flour (*besan*) is one of the major ingredients for various confectionary (sweet/salty/ spiced) preparations like *boondi*, *laddoo*, *halwa*, *vermicelli, pakoda* etc.
- Tender leaves are used as leafy vegetables.
- An indigo-like dye is obtained from chickpea leaves.
- Roasted ground seeds (*sattu*) are used as a stuffing material for various preparations like *prantha*, *kachauri*, *missi roti* etc.
- The dry stems/leaves and crop residue is used as cattle feed.
- An acid exudation from the seed pods is astringent. It is used in the treatment of indigestion, constipation and snake bite.

Medicinal importance:

- Chickpea possesses high antioxidant, antimicrobial and anticancer properties.
- It decreases urinary stones in the kidney with good diuretic property.
- It is reported that the seeds reduced postprandial plasma glucose and are useful in the treatment of diabetes.
- It helps in the regulation of cardiovascular diseases and digestive disorders.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	8.56
Proteins	18.77
Fats	5.11
Total fiber	25.22
Carbohydrates	39.56
Potassium	0.94
Phosphorus	0.27
Magnesium	0.16
Calcium	0.15
Iron	0.006
Energy (KJ)	1201

Unique value:

Chickpea contains higher content of oligosaccharides which is responsible for abdominal discomfort. Anti-nutritional factors (ANFs) interfere with digestion and also make the seed unpalatable when consumed in raw form. ANFs can be reduced or eliminated by soaking, cooking and boiling.

Phytochemicals :

Alkaloids, flavonoids, isoflavones, saponins, phenols, terpenoids, flavanol, glycoside, tannin and thiols.

Echinochloa frumentacea Link

5. *Echinochloa frumentacea* Link

Common name : Shownk, Sawa, Sawan, Jhingora, Madira, Barnyard Millet

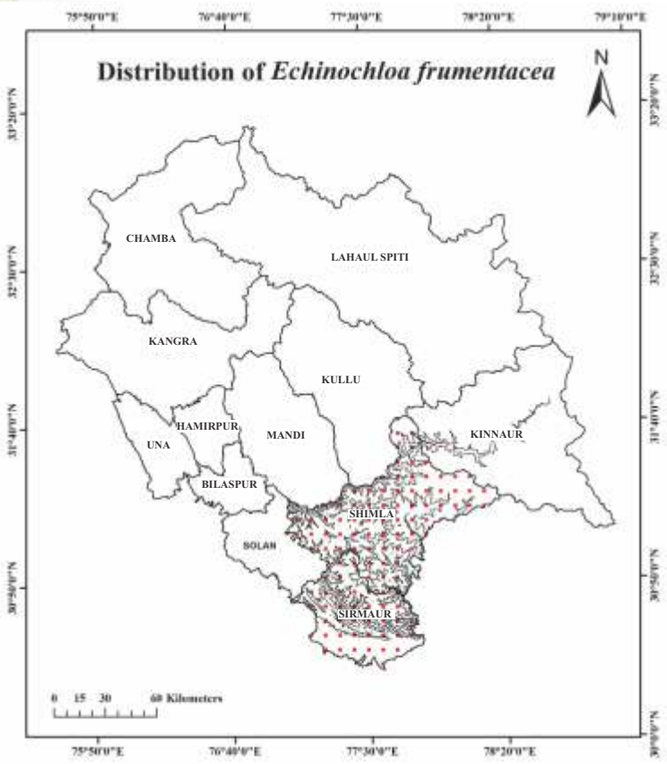
Family : Poaceae

Native : China

Elevation : Up to 2300 m

Growing period : June- September

Distribution : Sirmaur, Shimla and Kinnaur districts of the State.



Ethnobotanical importance:

- Dehusked grains are cooked and consumed like rice.
- Popped grains are used for making *kheer* and *laddoos.*
- Grains are acceptable eatables during religious and ceremonial fasts.
- Grains are used as a functional food for patients with allergic diseases including atopic dermatitis.

Medicinal importance:

- Sawa is most effective in reducing blood glucose/ lipid level and recommended for patients with cardiovascular diseases and diabetes mellitus.
- Grain carbohydrates contain higher proportion of non starchy polysaccharides and dietary fibre, which helps in prevention of constipation.
- It is a rich source of lycine and iso-leucine which improves lipid metabolism, blood formation and skin health.
- It contains high linoleic acid (67%), mineral and amino acids which reduces cholesterol. It also possesses antioxidants and immunological activities.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	8.66
Proteins	6.2
Fats	5.8
Total fiber	9.8
Carbohydrates	65.5
Phosphorus	0.28
Calcium	0.01
Iron	0.005
Energy (KJ)	1665

Unique value:

It is a drought tolerant, short duration crop for dryland agriculture.

Phytochemicals:

Alkaloids, tannins, terpenoids and flavonoids.

Eleusine coracana Gaertn.







6. *Eleusine coracana* Gaertn.

Common name : Koda, Kodra, Ragi, Mandua, Mandal, Finger millet

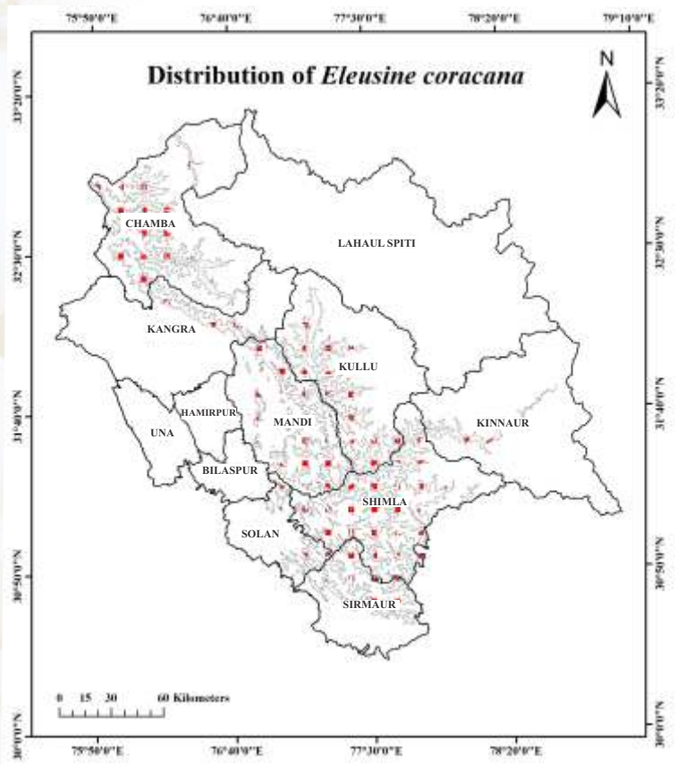
Family : Poaceae

Native : East Africa

Elevation : Up to 2300 m

Growing period : May - September

Distribution : Shimla, Kullu, Sirmaur, Solan, Chamba, Kangra, Mandi, Lahaul-Spiti and Kinnaur districts of the State.



Ethnobotanical importance:

- Koda is cooked like rice, ground to flour for making *roti* and *chilra* which is a pancake prepared from koda flour batter.
- Sprouted grains are recommended for children and elderly people.
- A decoction of fresh plant is used against dysentery and constipation.
- Grains are ground to fine powder which is taken in the morning with milk or tea to strengthen bones.
- Grains are also used to make liquor/beer and its by-product is used as livestock feed.
- Green ragi is used for treating blood pressure, liver disorders, asthama and heart weakness.
- Whole plant is used for making baskets, mats and thatching of roof.

Medicinal importance:

- High dietary fiber helps in delayed nutrient absorption, increased faecal bulk, lowers blood lipids and prevents colon cancer.
- Koda contains amino acid tryptophan which lowers appetite and helps in keeping weight in control, lecithine and methionine which helps in bringing down cholesterol level. It also contains threonine which hinders fat formation in liver and regulates cholesterol.
- It is a good source of natural iron and helps in curing anaemia.
- Koda is rich in minerals particularly calcium and potassium which helps in strengthening bones and teeth. It is a good food for growing children, lactating mothers and ageing people.
- Koda does not contain gluten which makes it a wonderful grain alternative for gluten sensitive people.
- It is beneficial in the conditions of anxiety, depression and insomnia. It is also useful for migraine.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	10.89
Proteins	7.16
Fats	1.92
Total fiber	11.18
Carbohydrates	66.82
Potassium	0.44
Phosphorus	0.21
Magnesium	0.15
Calcium	0.36
Iron	0.004
Energy (KJ)	1342

Unique value:
Koda is a famine food as it ensures optimum yield under unfavourable climate conditions and its seeds can be stored for years without insect damage.

Phytochemicals :
Phytates, polyphenols, tannins and trypsin inhibitory substances.

Fagopyrum esculentum Moench.

7. *Fagopyrum esculentum* Moench.

Common name : Fafra, Ogla, Kuttu, Gangadi, Kathu and Buckwheat

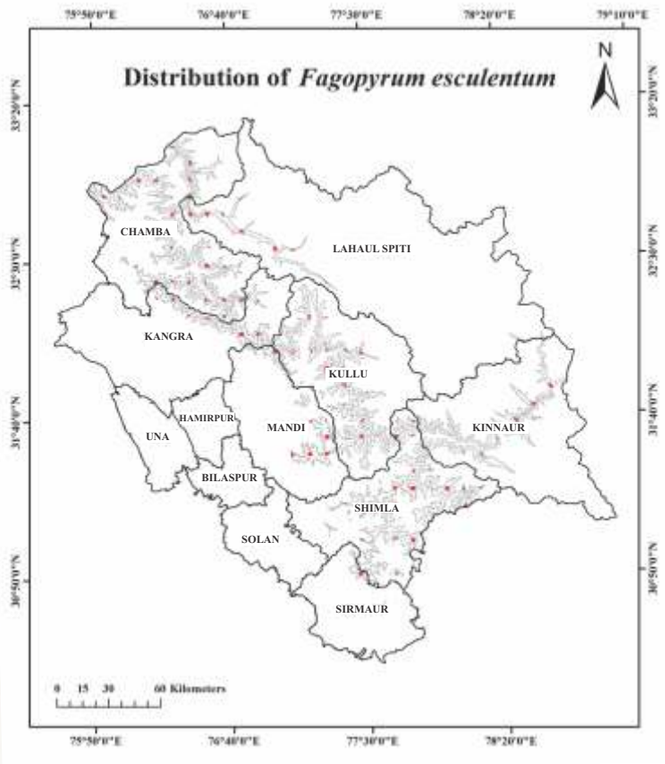
Family : Polygonaceae

Native : Southeast Asia

Elevation : 2000-3500 m

Growing period : April-July (higher hills) and July-October (lower hills)

Distribution : Shimla, Kinnaur, Kullu, Mandi, Kangra (Bhanghal area), Lahaul Spiti and Chamba districts of the State. *F. tataricum* is the other species which is grown in the State.



Ethnobotanical importance:

- Buckwheat is an acceptable eatable during fasting days. Its cutlets are prepared with grain flour mixed with boiled colocacia and potato tubers.
- It is used for preparation of food products, alcoholic drinks and medicines.
- Its leaves are relished as vegetable as sole or in combination with pea/onion/potato and are also fried to prepare *pakora* with Bengal gram flour.
- Buckwheat hay, straw or whole crop is used as animal feed, mainly mixed with other fodders. Bloom of buckweat is excellent nector source for bee foraging.

Medicinal importance:

- It lowers the blood sugar, cholesterol and also prevents/cures arteriosclerosis and diabetes.
- It helps in weight loss, increase immunity and is important for better growth and development in children.
- Buckwheat flour is a physiologically functional food for curing hypertension.
- It contains 70% globulin protein which has a high digestible coefficient.
- Buckwheat proteins are rich in amino acids like lysine (5.5-6.1%), arginine, aspartic acid and contain less glutamic acid, proline than cereal proteins.
- It contains D-chiroinositol, a compound of the secondary messenger pathway for insulin signal transduction found deficient in Type II diabetes and polycystic ovary syndrome.
- Fagopyritols helps in treatment of patients with non insulin dependent diabetes mellitus.
- Choline present in buckwheat increases the efficiency of liver.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	9.75
Proteins	13.27
Fats	3.40
Total fiber	10.10
Carbohydrates	71.5
Potassium	0.46
Phosphorus	0.35
Magnesium	0.23
Calcium	0.18
Iron	0.002
Energy (KJ)	1435

Unique value:

Rutin, a phytochemical present in buckwheat increases the strength and elasticity of arteries/veins and also regulates blood cholesterol level. Thus, an ideal food for blood pressure and diabetic patients.

Phytochemicals:

Flavonoids, rutin, choline, fagopyritols, quercetin, orientin, homoorientin, vitexin, isovitexin, tannins and phenolic compounds.

Glycine max (L.) Merr.

8. *Glycine max* (L.) Merr.

Common name : Soybean, Soya, Bhatt, Bharth

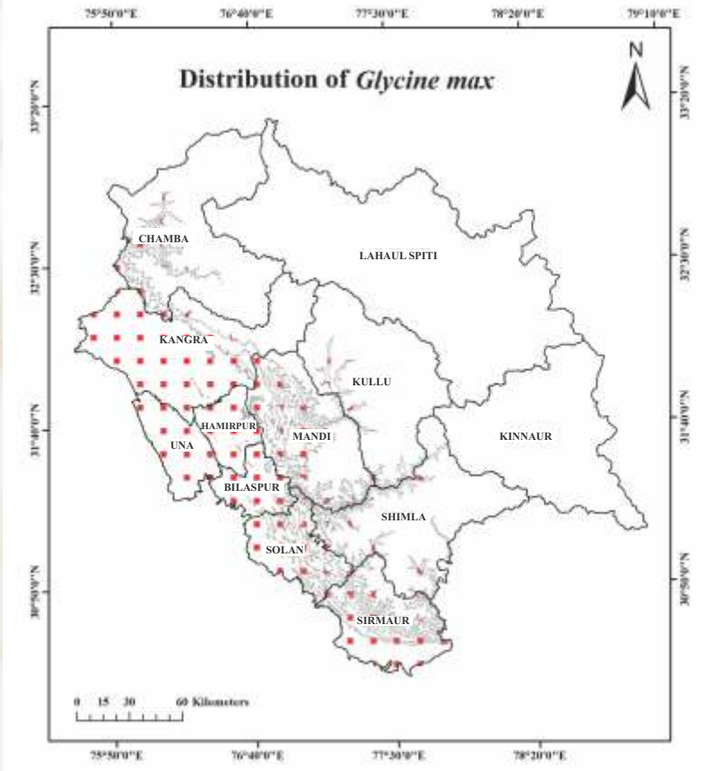
Family : Fabaceae

Native : Southeast Asia

Elevation : Up to 1500 m

Growing period : June-October

Distribution : Bilaspur, Hamirpur, Solan, Una, Kangra, Sirmaur, Mandi, Kullu, Chamba and Shimla districts of the State.



Ethnobotanical importance:

- The beans are cooked as *daal* or delicious traditional dish as *madrah,* a famous cuisine served in community meals while soaked crushed grains are stuffed in *bhaturas.*
- The beans are used to prepare various products like dietary food protein, flour, soymilk and tofu. These may be roasted and eaten as snacks, or fermented to soya sauce.
- Soya oil is used in a widespread scale as edible cooking oil and a potential source for biodiesel production and other industrial uses.
- Protein loaded oilcake, a by-product after oil extraction is used as a nutritive animal feed for livestock, swine and poultry.

Medicinal importance:

- Soybeans contain omega-3 fatty acid which lowers the cholesterol level and helps in preventing cardiovascular disorders.
- Regular consumption of soybean lowers the risk of cancer, alleviate post-menopausal problems and osteoporosis.
- Soybean diet is a good option for diabetic individuals and for patients with hypertension, hypercholesterolemia, atherosclerosis and obesity.
- It is a rich source of both proteins (38%) and fats (20%).

Nutritional value

Constituents	Value (g per 100 g)
Moisture	5.47
Proteins	37.80
Fats	19.42
Total fiber	22.63
Carbohydrates	10.16
Potassium	1.63
Phosphorus	0.49
Magnesium	0.19
Calcium	0.20
Iron	0.008
Energy (KJ)	1579

Unique value:

Soybeans are known for their high phytic acid content that causes bloating and retards nutrient absorption. But soaking and dry roasting denatures the phytic acid in soybeans thus making it fit for consumption without any adverse effects.

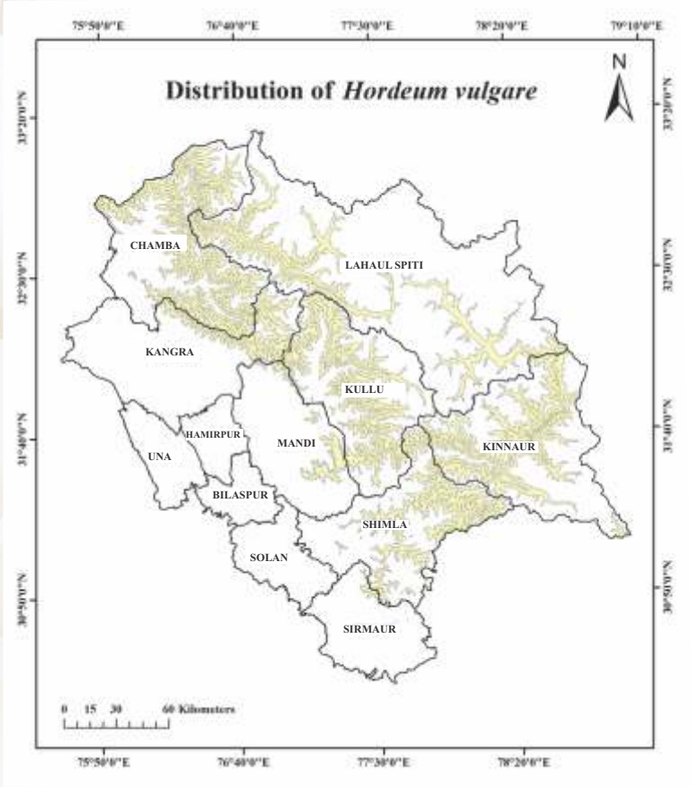
Phytochemicals:

Flavonoids, rutin, choline, fagopyritols, quercetin, orientin, homoorientin, vitexin, isovitexin, tannins and phenolic compounds.

Hordeum vulgare L.

9. *Hordeum vulgare* L.

Common name : Jau, Barley
Family : Poaceae
Native : Middle East
Elevation : Up to 4300 m
Growing period : October-March in (lower hills) and March /April-September/October (higher hills)
Distribution : Barley is the most widely adapted crop in the world and marked its presence in all twelve districts of the State including Lahaul-Spiti, however, it is more prevalent in upper temperate areas. A unique landrace of naked barley is cultivated in Kinnaur and Lahaul-Spiti.



Ethnobotanical importance:

- Barley grain is used as a food in rural areas. It is used either as a flour mixed with wheat for making *chapati* or in preparation of number of traditional delicacies as *chilra*, *bhatooru*, *marchu*, *pakk*, *pinni*, *thuktal*, *chhangpa* and *murjag* in different parts of the State.
- Roasted ground grains (*sattu*) are eaten with sugar syrup.
- Locally, barley is fermented to prepare beverages *ark*/*ara* in Kinnaur and *chhang* / *lugri* in Kullu, Lahaul-Spiti and Kinnaur.
- Barley grain is considered as sacred grain since it is used in many religious rituals for worshiping deities; performing *yagnas* and it is associated with different ceremonies from birth to the death in Hindu religion.
- It is donated along with pulses and sesame for *navgraha puja* and for offering *pind daan* to departed souls during *pitra paksha* and during cremation rituals.
- During Navratri puja, barley seedlings are raised for *kalash sathapna* and each seedling is distributed along with *parshad.*

Medicinal importance:

- Insoluble fibres promote smooth faecal movement in the intestine relieving constipation, cleansing colonic harmful bacteria and help in reducing incidence of colonic cancer.
- Selenium and vitamin E present in the grain provide beneficial antioxidant effects.
- It is also useful in reducing blood glucose in Type II diabetes.
- It has good diuretic activity and is useful in treatment of urinary tract infections.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	9.77
Protein	10.94
Fat	1.30
Total fiber	15.64
Carbohydrate	61.29
Potassium	0.27
Phosphorus	0.18
Magnesium	0.05
Calcium	0.03
Iron	0.001
Energy (KJ)	1321

Unique value:

Barley has superior nutritional qualities due to beta-glucan which is anti-cholesterol phytochemical and has acetylcholine which nourishes nervous system and recovers memory loss.

Phytochemicals:

Tocopherol, tocotrienol, flavonoids and phenolic compounds.

Lens culinaris Medik.

10. *Lens culinaris* Medik.

Common name : Masoor daal, Masar, Red daal, Lentil

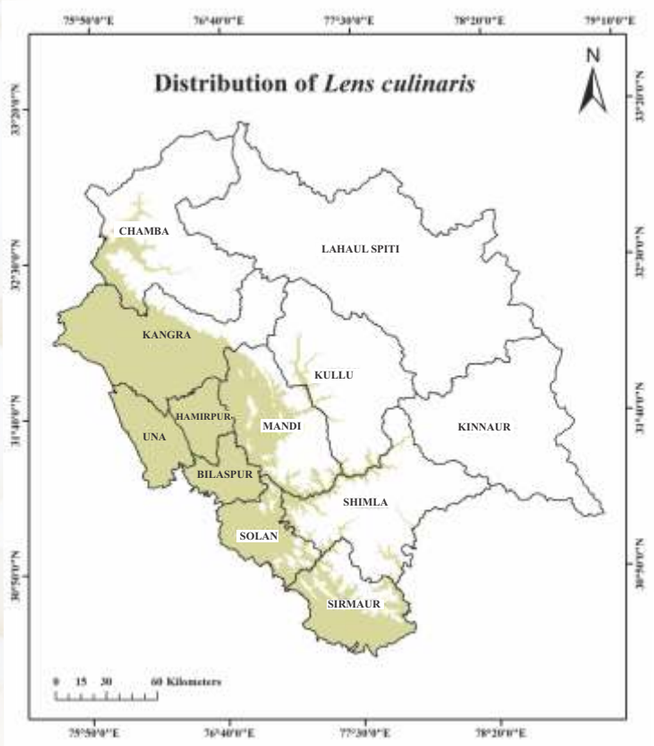
Family : Fabaceae

Native : Turkey to Southern Iran

Elevation : 500-2000 m

Growing period : October-March

Distribution : Bilaspur, Una, Hamirpur, Sirmaur, Chamba, Kangra, Kullu, Mandi, Shimla and Solan districts of the State.



Ethnobotanical importance:

- Whole as well as split grains are consumed as *daal* and also used in snacks and soup preparation.
- Lentils are poultice onto the ulcers following smallpox and healing sores.
- Dry leaves, stems and pod husk are used as valuable cattle and poultry feed.

Medicinal importance:

- Lentils are the storehouse of nutrition packed with protein, fiber, iron, folate and other important nutrients.
- Lentils have anti-carcinogenic, blood pressure lowering, hypo-cholesterolemic and glycemic lowering effects.
- Its consumption helps in the prevention of diabetes, cancer and cardiovascular disorders.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	9.71
Proteins	24.35
Fats	0.75
Total fiber	10.43
Carbohydrates	52.53
Potassium	0.76
Phosphorus	0.31
Magnesium	0.07
Calcium	0.04
Iron	0.007
Energy (KJ)	1349

Unique value:
Lentils contain considerably high amount of the pivotal folic acid, which reduces the cancer risk.

Phytochemicals:
Flavonoids, rutin, choline, fagopyritols, quercetin, orientin, homoorientin, vitexin, isovitexin, tannins and phenolic compounds.

Linum usitatissimum L.

11. *Linum usitatissimum* L.

Common name : Alsi, Flax, Linseed

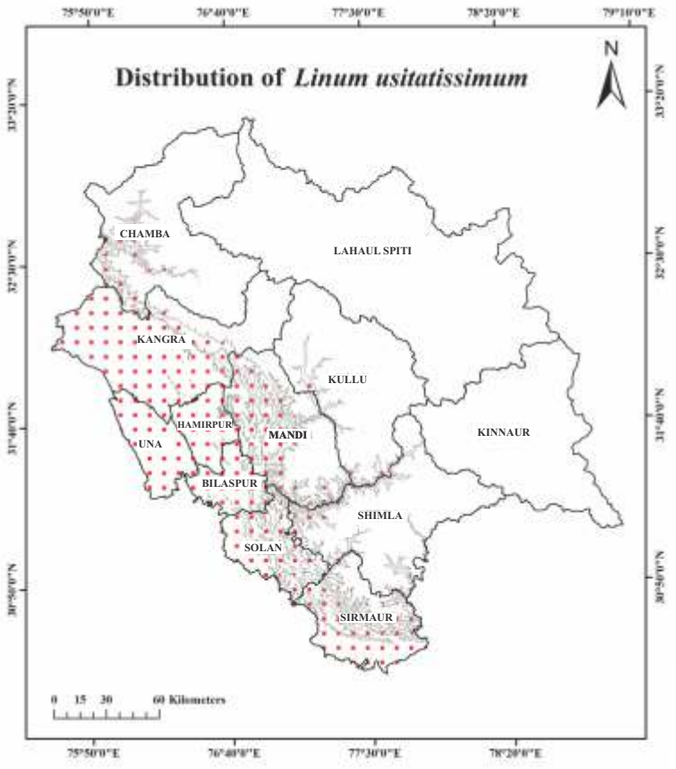
Family : Linaceae

Native : Africa

Elevation : Up to 1600 m

Growing period : October-April

Distribution : Kangra, Mandi, Bilaspur, Chamba, Kullu, Una, Hamirpur, Solan, Shimla and Sirmaur districts of the State.



Ethnobotanical importance:

- Alsi *laddu* and *pinni* prepared especially during winters are relished delicacies during Makar Sakranti and Lohri festivals.
- Spiced, crushed, roasted flex-seeds are used as stuffing material in *parantha* or its consumption with cooked rice and ghee is recommended to lactating mothers.
- Flaxseed oil is used as edible oil in some areas and also used for muscle relaxing massage.
- It is also used for cloth and waterproof fabric painting and manufacturing paints and varnishes.
- Linseed oil is used for preparation of homemade fungicides (Bordeaux Paint) a protective paste for dressing plant cuts and wounds.
- It is also considered a potential crop for biodiesel and ethanol production.
- Linseed cake, obtained after oil extraction is a very good manure and animal feed.

Medicinal importance:

- Flaxseed constitute analgesic, anticancer, antidepressant, antidiabetic, antioxidant, antipyretic, anti-ulcer, laxative, memory enhancing properties, and also affects bone development, hair growth, polycystic ovarian syndrome, cardiovascular diseases and blood pressure.
- It is a valuable soothing emollient for inflamed surfaces, boils, carbuncles and abscesses.
- Flowers are used as cardiac and nervine tonic.
- Flaxseed contains lignans and isoflavonoids, also known as phyto-oestrogens which influence oestrogen metabolism and reduce the incidence of breast cancer.
- When consumed in large quantity, alsi weakens digestion and produces adverse effect on stomach.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	5.48
Proteins	18.55
Fats	35.67
Total fiber	26.17
Carbohydrates	10.99
Potassium	0.66
Phosphorus	0.44
Magnesium	0.35
Calcium	0.26
Iron	0.005
Energy (KJ)	1857

Unique value:

It is rich source of omega-3 fatty acids which is helpful in cardio-vascular disorders.

Phytochemicals:

Flavonoids, rutin, choline, fagopyritols, quercetin, orientin, homoorientin, vitexin, isovitexin, tannins and phenolic compounds.

Macrotyloma uniflorum Lam.






12. *Macrotyloma uniflorum* Lam.

Common name : Kulth, Kulthi, Gehat, Horsegram

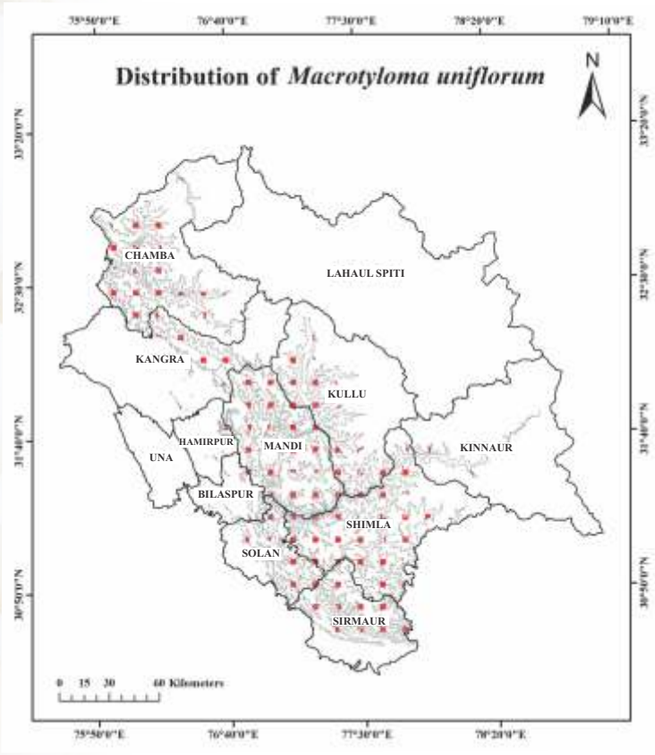
Family : Fabaceae

Native : Southern Asia

Elevation : Up to 2000 m

Growing period : June-October

Distribution : Drought prone areas of Kullu (Ani, Nirmand), Mandi, Chamba (Bhatiyat and Chowari), Kangra, Bilaspur, Hamirpur, Una, Sirmaur, Solan, Kinnaur and Shimla districts of the State.



Ethnobotanical importance:

- It is consumed as a whole seed, as sprouts and as whole meal in India.
- Horse gram *daal* is considered good for patients suffering from piles, urinary and kidney troubles.
- Soup prepared from horse gram is recommended for patients with bad cold, sore throat, skin disorders and kidney stones.
- The seeds are used as a concentrated feed for cattle and horses, which gave legume the name 'horse gram'. Green crop residue is used as fodder to livestock.
- *Khichadi* of kulthi grains is prepared with rice on auspicious occasions like *Makkar sankranti/Lohri* and paste of soaked kulthi seeds is used as stuffing material for preparing *bhatooru.*
- Crop is generally grown when farmer fails to sow any other crop during monsoon failure

Medicinal importance:

- Kulthi is rich in antioxidants and is used as a nutraceutical and food for malnourished populations.
- Its seed water is also prescribed for treating jaundice.
- It is mainly used as a tonic, astringent, diuretic and also recommended in rheumatism, neuralgia and several other diseases. Kulthi also helps in eliminating kidney stones.
- Kulthi seeds reduce blood sugar levels, hypercholesterolemia, obesity and are useful in treating amoebic dysentry, bowel hemorrhage and colic pains.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	9.28
Proteins	21.73
Fats	0.62
Total fiber	7.88
Carbohydrates	57.24
Potassium	1.06
Phosphorus	0.30
Magnesium	0.15
Calcium	0.27
Iron	0.009
Energy (KJ)	1379

Unique value:

Aqueous extracts of seed undertakes higher dissolution of calcium oxalate and helps in treatment of kidney stones and eczema and is an excellent source of iron and molybdenum.

Phytochemicals:

Flavonoids, 3, 4-dihydroxybenzoic acid, vanillic acid, 4-hydroxybenzoic acid, caffeic acid, pcomaric acid, ferullic acid, syringic acid, sinapic acid, kaempferolglucosid, beta-sitosterol and stigmasterol.

Oryza sativa L.

13. *Oryza sativa* L.

Common name : Lal dhan, Red rice

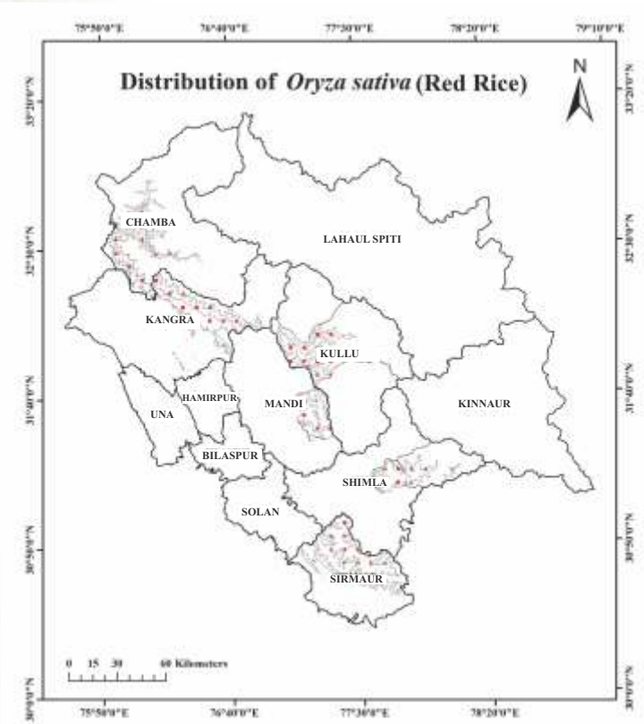
Family : Poaceae

Native : Asia

Elevation : 1100-2400 m

Growing period : June-November

Distribution : Shimla (Rohru, Chirgaon), Kullu (Jagatsukh, Inner Seraj), Mandi (Jeuni Khad, Outer Seraj), Sirmaur, Kangra (Bhanghal) and Chamba districts of the state. Different landraces like bhrigu, sukra, jattu, matali, jhinjan, juin, desi dhan, karad, roda dhan, begmi, chuhartu, lalu dhan are distributed in the State.



Ethnobotanical importance:

- In Himachal, rice is used in many traditional recipes e.g. *bhaat* (cooked rice), *meetha bhaat* (sweet scented rice) and *chilra* which is a pancake prepared from rice flour batter.
- Excess water decanted after cooking red rice is given to pregnant ladies and children as a health supplement.
- *Lugdi* (rice beer) is brewed from red rice.
- Puffed rice (*moodi* and *indri*) prepared from raw lal dhan is consumed during religious ceremonies in the State.
- Some traditional cultivars of lal dhan are used to treat skin diseases, blood pressure, fever, paralysis, rheumatism and also as a health tonic especially during pregnancy and lactation.

Medicinal importance:

- Lal dhan gets its rich colour from anthocyanin which is an antioxidant that can reduce inflammation and allergy. It also reduces the cancer risk and also helps in weight management.
- The manganese present in red rice helps in strengthening metabolism, while magnesium along with calcium helps in maintaining healthy bones/teeth and prevent risks of arthritis/osteoporosis. It also helps in curing migraine, lowers blood pressure as well as risks of heart attack.
- Selenium present in the red rice protects the body against infections.
- Matali and Lal dhan varieties are used for curing blood pressure and fever.
- Kafalya, a variety of lal dhan is used for treating leucorrhoea and abortion complications.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	12.51
Proteins	10.53
Fats	1.49
Total fiber	1.19
Carbohydrates	74.40
Phosphorus	0.21
Calcium	0.02
Iron	0.004
Zinc	0.005
Energy (KJ)	1425

Unique value:
The zinc and iron content of red rice is two to three times higher than the white rice varieties.

Phytochemicals:
Oligomericprocyanidins, carotenoids, γ-oryzanol, flavones, flavonols and anthocyanins.

Panicum miliaceum L.

14. *Panicum miliaceum* L.

Common name : Cheena, Cheeni, Proso millet

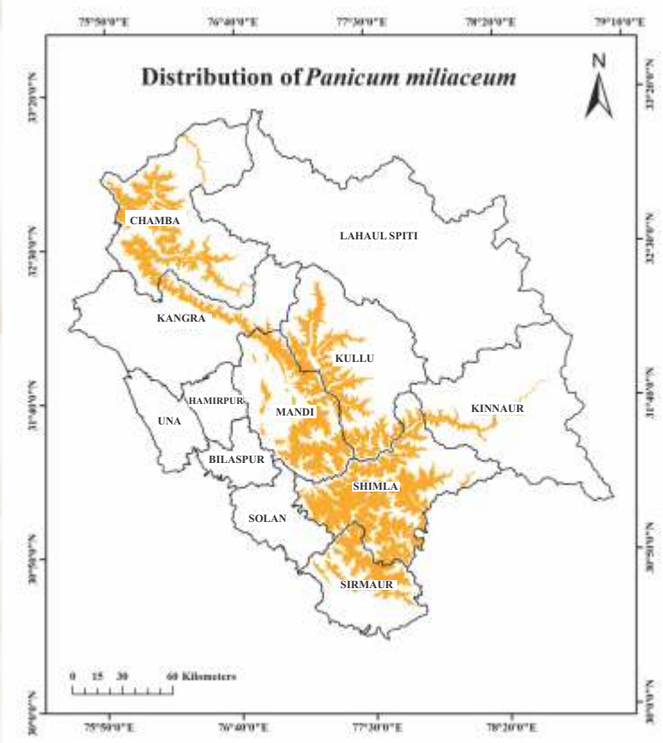
Family : Poaceae

Native : East Asia

Elevation : Up to 3000 m

Growing period : June- September

Distribution : It is distributed in temperate parts of Kinnaur, Shimla, Kangra, Sirmaur, Chamba, Mandi and Kullu districts of the State.



Ethnobotanical importance:

- The grains are primarily used for human consumption.
- The whole grains are boiled like rice, roasted, cooked into porridge; ground and baked into flat bread or *chapatti* and cooked with milk to prepare *kheer*.
- Various preparations of proso millets are consumed during religious and ceremonial fasts.
- Crop residue is a nutritive fodder with 7% protein which has very high digestibility coefficient up to 45%.
- The grain is also used as feed for animals including ruminants, pigs, poultry and pet birds.

Medicinal importance:

- *Cheena* contains higher protein than other millets whereas amino acids like lysine, methionine and tryptophan are two times higher than wheat and rice.
- Its protein is a potential therapeutic intervention in type-II diabetes.
- Proso millet is rich source of B vitamins, especially vitamin-B6 and folic acid.
- It has the ability to reduce cholesterol levels. Thus, reduces the risk of heart diseases and also prevents breast cancer.
- Antioxidants present in proso millet play important role in body immune system.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	8.67
Proteins	12.5
Fats	1.1
Total fiber	2.2
Carbohydrates	70.4
Potassium	0.20
Phosphorus	0.21
Magnesium	0.11
Calcium	0.01
Iron	0.001
Energy (KJ)	1582

Unique value:
It is a short duration (65-70 days), drought resistant crop which is well adapted to less fertile soils.

Phytochemicals:
Phenolic acid, ferulic acid, chlorogenic acid, syringic acid and caffeic acid.

Phaseolus vulgaris L.

15. *Phaseolus vulgaris* L.

Common name : Rajmah, Bali, Kidney Bean

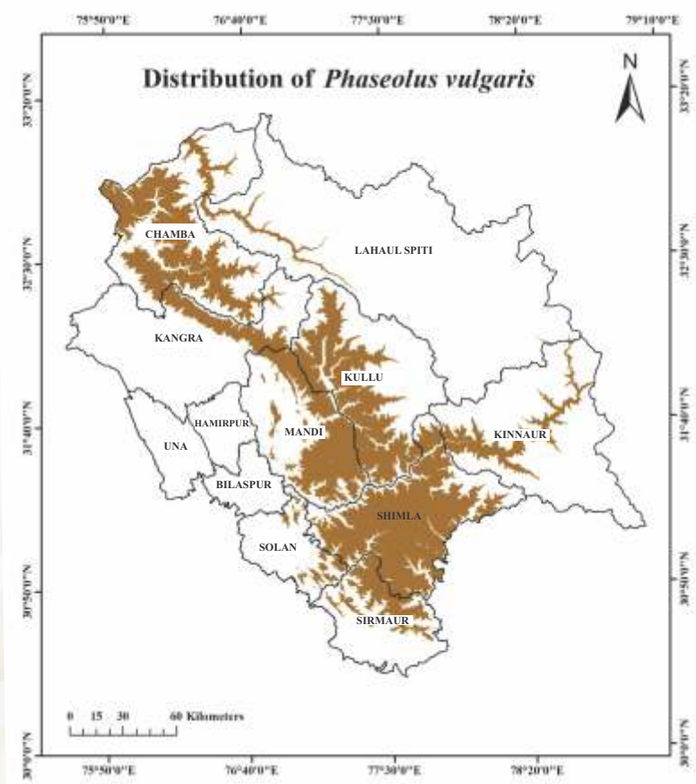
Family : Fabaceae

Native : Central America and Southern Mexico

Elevation : 1700- 3000 m

Growing period : June- October

Distribution : Kullu, Mandi, Chamba, Sirmaur, Kangra, Shimla, Solan, Lahaul Spiti and Kinnaur districts of the State.



Ethnobotanical importance:

- Rajmah are consumed as whole grain in the form of *daal*. It is rich in protein. Traditional cuisines of rajmah, named *paldah* and *madra* are served in traditional community meals (*dhaam*) in the State.
- Rajmah along with rice is cooked to prepare *khichadi* in some areas of Sirmaur.
- The leaves, pod and crop residue are palatable protein-rich animal feed.
- In temperate regions, the green immature pods are also cooked as vegetable.

Medicinal importance:

- Kidney beans are a rich source of proteins, carbohydrates, vitamin B complex (thiamine, riboflavin, niacin) and folic acid.
- It provides iron, copper, zinc, phosphorus, potassium, magnesium, calcium and high fiber content.
- Kidney beans are credited with diuretic and hypoglycemic action and considered beneficial for kidney, heart, rheumatism and diabetes.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	9.57
Proteins	19.93
Fats	0.92
Total Fiber	23.40
Carbohydrates	43.46
Potassium	1.30
Phosphorus	0.48
Magnesium	0.20
Calcium	0.08
Iron	0.004
Energy (KJ)	1155

Unique value:

Kidney bean contains a glycoprotein known as phaseolin which causes problems in digestibility due to its low hydrophilic potential that limits its accessibility to proteolytic enzymes.

Phytochemicals:

Flavonoids, isoflavones, glycosides, anthocynins, proanthocyanidins, lectins, thytates, oligosaccharides, polyphenols, tripsin, alpha amylase inhibitors and phytohaemagglutinins.

Sesamum indicum L.

16. *Sesamum indicum* L.

Common name : Til, Sinsim, Gingelly, Sesame

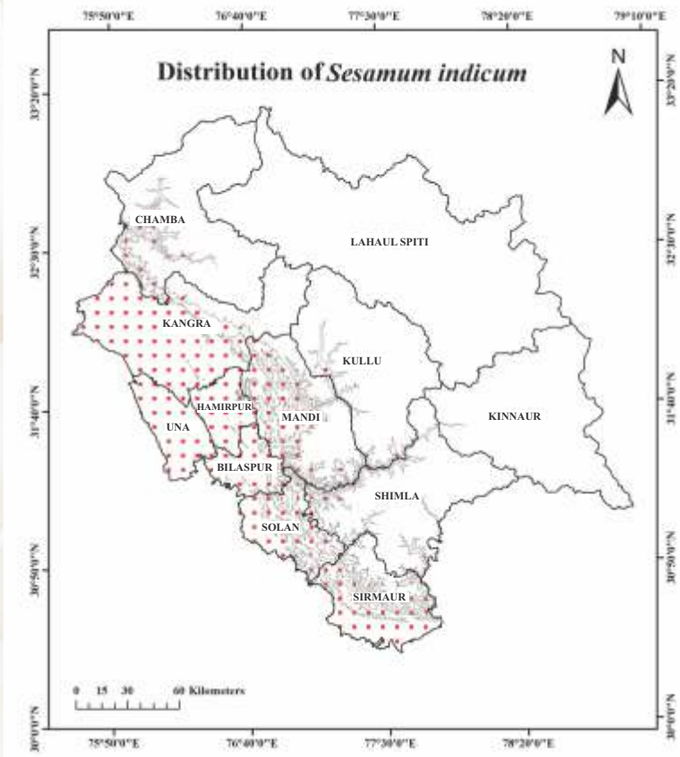
Family : Pedaliaceae

Nativity : India

Elevation : Up to 1500 m

Growing period : August- November

Distribution : Bilaspur, Hamirpur, Shimla, Solan, Kullu, Kangra, Sirmaur, Una, Mandi and Chamba districts of the State.



Ethnobotanical importance:

- Til grains are consumed in different preparations during various festivals and ceremonies. During Lohri, sesame is used to prepare *til bugga* with milk solids (*khoa*), *tilari gutika* and *til laddoo* with sugar syrup or jaggary.
- Til is considered most sacred seed and has religious importance and is used in religious ceremonies, festivals and rituals for performing *yagnas/ havan.*
- It is donated along with pulses and barley for *navgraha puja* and for offering *pind daan* to departed souls during *pitra paksha*.
- The leaves are highly mucilaginous and are used as a remedy for chronic diarrhoea and other intestinal and urinary disorders. It is also applied in ophthalmic and skin complaints.
- Externally, poultice and decoction of leaves and roots is useful as a hair wash. Leaves are also useful in burns, bleeding, piles, constipation and cough.
- Seeds are emollient, nourishing, tonic, lactagogue, laxative, aphrodisiac, diuretic and expectorant.
- Sesame oil is quality cooking oil particularly for patients of hypertension. In large doses it may act as abortifacient.
- Oil is used for treatment of migraine, vertigo and muscle relaxing massage.

Medicinal importance:

- Sesame seeds contain sesamin and sesamolin known to have a cholesterol lowering effect in humans and to prevent high blood pressure.
- Sesame seed oil maintains good cholesterol (HDL) and lowers the bad cholesterol (LDL) in the body.
- Til encompasses antioxidant, antidiabetic, antitumor, antiulcer, anti-inflammatory, cardio tonic and analgesic properties.
- Sesame possesses antibacterial activities against *Staphylococcus* and *Streptococcus* as well as common skin fungi, such as athlete's foot fungus.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	3.30
Proteins	21.70
Fats	43.05
Total fiber	16.99
Carbohydrates	10.83
Potassium	0.40
Phosphorus	0.75
Magnesium	0.37
Calcium	1.28
Iron	0.02
Energy (KJ)	2174

Unique value:

Sesame seeds are replete with essential fatty acids- omega-3, omega-6 and omega-9 which play a vital role in improving the body metabolism by increasing good cholesterol.

Phytochemicals:

Sesamin, sesaminol, gamma tocopherol, cephalin, lecithin, flavonoids, phenolic acids, alkaloids, tannins, saponins, steroids and terpenoids.

Setaria italica (L.) P. Beauv.

17. *Setaria italica* (L.) P. Beauv.

Common name : Kangni, Kauni, Foxtail millet

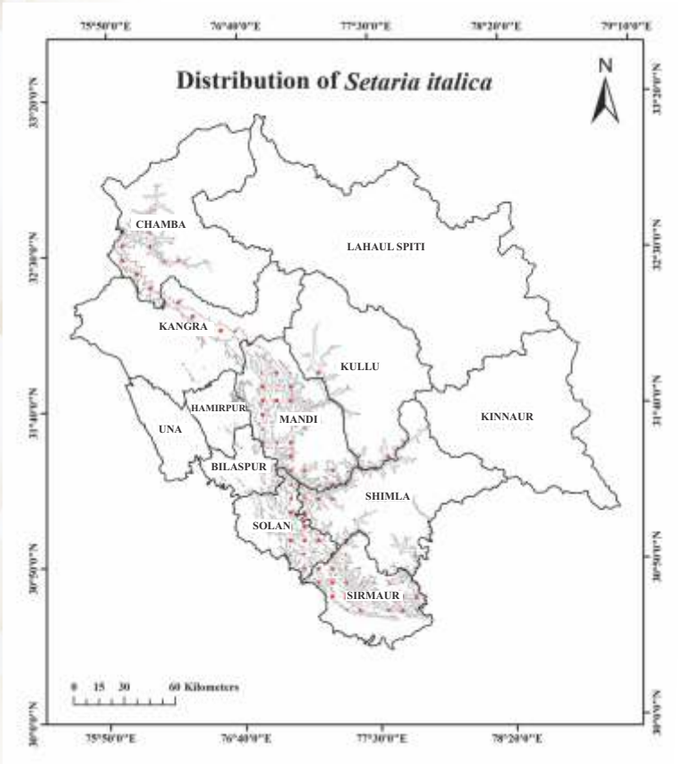
Family : Poaceae

Native : East Asia

Elevation : Up to 2000 m

Growing period : June-September

Distribution : Cultivated sporadically as a mixed crop with rice/maize and occasionally as sole crop in Sirmaur, Bilaspur, Solan, Shimla, Mandi, Kangra, Hamirpur, Una, Kullu and Chamba districts of the State.



Ethnobotanical importance:

- Grains can be cooked as rice and consumed particularly on religious occasions or fasts.
- Grains cooked in water and mixed in milk cream are consumed to cure chicken pox.
- White coloured grains are specially used for curing fever and cholera.
- It is widely used as nourishing gruel/ soup for pregnant and nursing women.
- Grains are powdered and one spoon of powder is taken with warm water to cure fever and headache.
- Leaves are used as fodder to increase lactation of the milch animals.

Medicinal importance:

- Foxtail millet has low glycemic index which helps in controlling blood sugar level therefore an ideal food for patients with diabetes and gastric problems.
- It lowers triglycerides level, thus reduce the risk of heart attack.
- Linoleic acid and tocopherols present in foxtail millet enriches its antioxidant activity.
- It is an excellent source of fiber and protein rich in isoleucine, methionine, lysine, cystine, luecine and tryptophan.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	14.23
Proteins	8.92
Fats	2.55
Total fiber	6.39
Carbohydrates	66.19
Potassium	0.09
Phosphorus	0.10
Magnesium	0.12
Calcium	0.02
Iron	0.002
Energy (KJ)	1388

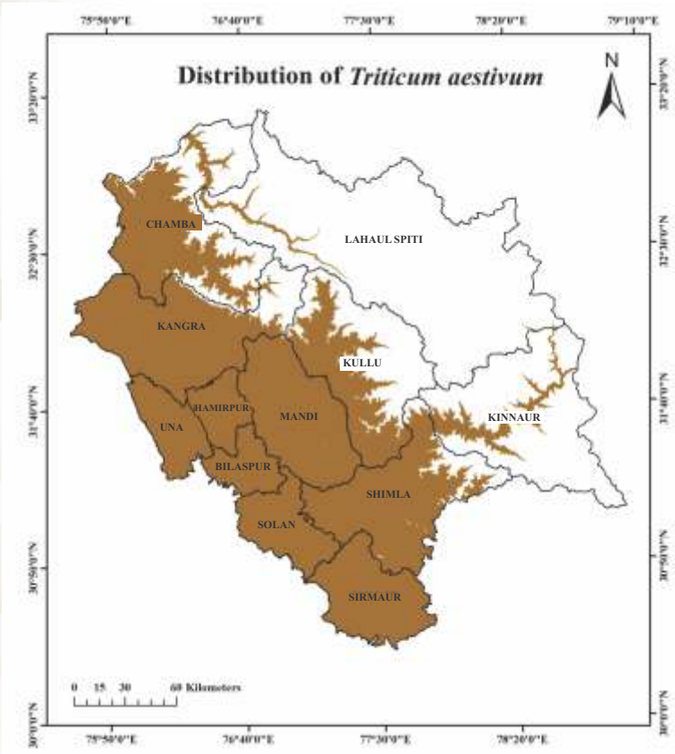
Unique value:
Kangni is rich in minerals and is a good source of copper and iron that keep the body strong and enhances the endurance and strength.

Phytochemicals:
Alkaloids, phenolics, reducing sugars and flavonoids.

Triticum aestivum L.

18. *Triticum aestivum* L.

Common name : Kanak, Genhu, Wheat
Family : Poaceae
Native : Central Asia
Elevation : Up to 3500 m
Growing period : October-November to April (lower hills) and March-April to September-October (higher hills)
Distribution : Traditional landraces of wheat are Dharmori, Lalpuri, Kankoo, Shruin, Misri, Gazariya, Mandleu, Bhangroo, Daru, Dharon, Paluwa, Jhuldi, Rundan, Latar, Kihali, Trimundi, Brahdoo, Kalodi, Kiawali, Lal kanak, Marodu, Chawera, Chiti kanak, Brada kanak, Kathi and Rigaliya, which are grown in different zones of Himachal Pradesh.



Ethnobotanical importance:

- Wheat is second among cereals after rice to meet the energy/ food requirement of the population of the State. Wheat is milled into flour and used as staple food in many forms like *chapatti*, *roti*, *puri* etc.
- Various preparations like *bhatoora, kachauri, babroo* are made with fermented flour dough whereas *chilra/ chilroo* (a pancake) is prepared from wheat flour batter and is relished throughout the state.
- *Siddu*, *gulgule*, *ghayor* and *batabhru* etc. are some preparations of wheat flour served on special occasions.
- *Sheera*, a starchy white solid prepared from wheat is famous delicacy in most parts of the state and a traditional gift to bride during marriage.
- Roasted grains (*moodi*) are consumed along with roasted cannabis and kangni seeds or with the kernels of *akhrot* and *chuli* especially during winter season.
- Juice of fresh seedlings is used as a cure to anaemia and cancer, whereas sprouted grains are used as a medicine for diabetes.

Medicinal importance:

- Wheat bran is used as a source of dietary fiber that prevents colon diseases (including cancer), gastric cancer, reduce the risk of haemorrhoids and hernia, hypercholesterolemia, hypertension, breast cancer, gall bladder disease and also helps in treating Irritable Bowel Syndrome (IBS).
- Wheat germ oil is widely used for external application for treating skin irritation, dryness and cracking.
- Wheat seeds are used in the treatment of malaise, sore throat, abdominal coldness and spasmic pain, constipation and cough. The plant also has anticancer properties.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	10.58
Proteins	10.59
Fats	1.47
Total fiber	11.23
Carbohydrates	64.72
Potassium	0.37
Phosphorus	0.32
Magnesium	0.13
Calcium	0.39
Iron	0.003
Energy (KJ)	1347

Unique value:

Gluten accounts for up to 80% of the total protein content and imparts unique elasticity and stickiness to wheat dough for making bread.

Phytochemicals:

Alkaloids, flavonoids, tannins, terpenoids and glycosides.

Vigna mungo (L.) Hepper








19. *Vigna mungo* (L.) Hepper

Common name : Mash, Maah, Urad, Black gram

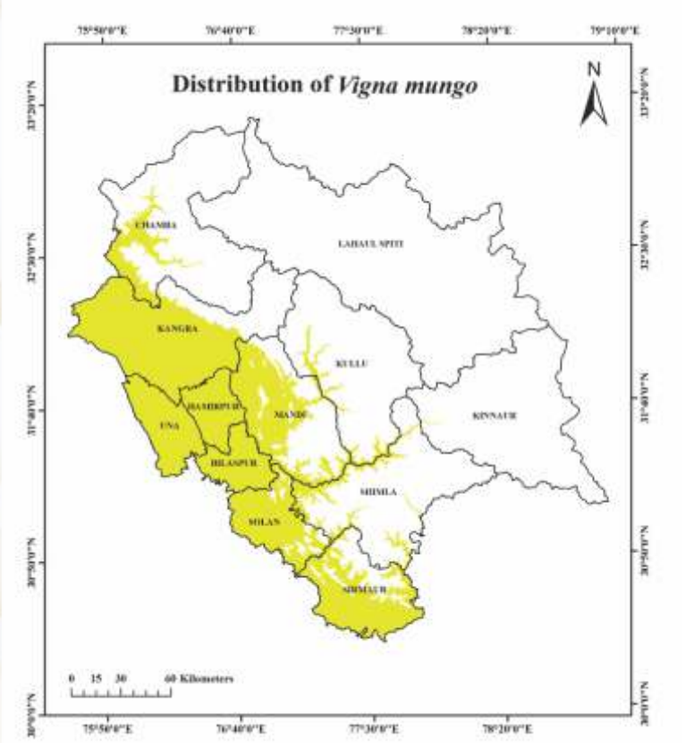
Family : Fabaceae

Native : India

Elevation : Up to 1800 m

Growing period : July- September

Description : Cultivated as mixed crop with maize as well as sole crop in Bilaspur, Chamba, Kullu, Kangra, Hamirpur, Mandi, Shimla, Solan, Sirmaur, Una and Kilba area of Kinnaur district of the State.



Ethnobotanical importance:

- Urad is consumed in the form of *daal*. Urad differs from other pulses in its peculiarity of attaining a mucilaginous pasty character when soaked in water.
- Paste of soaked and ground black gram is used to prepare stuffed fermented roti, known as *bhatooru* (Kullu) to *kachauri* (Mandi) and *behdi roti* (Hamirpur and Kangra).
- Mash is also used to prepare other traditional cuisines as *teliya maah*, *bhalle*, *khadi badi* (along with colocasia stem) and *sepu badi*, a special dish served in marriages and community feasts.
- Crop residue is also used as a nutritive feed to cattle.
- It possesses high adaptability to different abiotic stresses, thus a suitable crop for rainfed conditions.
- In traditional medicine, black gram is recommended for diabetes, like other pulses, however, excessive consumption causes flatulence.
- Roots are narcotic and are used for nostalgia, abscess and inflammations.
- Seeds are donated along with sesame seeds in *navgraha pooja, shivratri*, and many other religious festivals.

Medicinal importance:

- Seeds are used in rheumatism, nervous system and liver disorders.
- The seeds of mash are hepatoprotective, immunostimulators, anticonvulsant and possess antioxidant activity.
- The seeds are sweet, emollient, thermogenic, diuretic, aphrodisiac, tonic, galactagogue, appetising, laxative and nerve tonic.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	8.70
Proteins	21.97
Fats	1.58
Total fiber	20.41
Carbohydrates	43.99
Potassium	1.09
Phosphorus	0.34
Magnesium	0.19
Calcium	0.08
Iron	0.006
Energy (KJ)	1219

Unique value:

Black gram provides quality fat-burning protein, other essential antioxidants and nutrients which delay the ageing process.

Phytochemicals:

Alkaloids, flavonoids, tannins, terpenoids and glycosides.

Vigna radiata (L.) R. Wilczek

20. *Vigna radiata* (L.) R. Wilczek

Common name : Moong, Mungi, Golden gram, Green gram

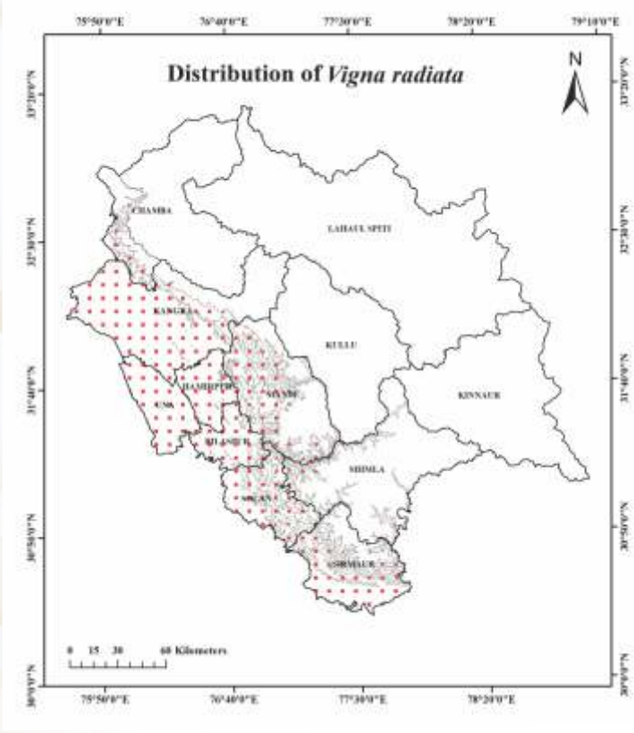
Family : Fabaceae

Native : India

Elevation : Up to 1850 m

Growing period : July- September

Distribution : Bilaspur, Una, Hamirpur, Mandi, Chamba, Kangra, Shimla, Solan and Sirmaur districts of the State.



Ethnobotanical importance:

- It is consumed as whole as well as split grains as *daal* in variety of ways in homes. It is an excellent source of high quality protein with high digestibility coefficient and is referred to patients.
- *Khichdi* prepared by mixing rice and moong grain is recommended diet for stomach disorders.
- *Moong halwa* is very nutritious. *Moong daal* (split) and dehusked fried in oil and spiced goes very well as a snacks with tea or drinks.
- Whole grain moong is donated along with cereals and sesame for *Navgraha puja.*
- After pod harvesting crop residue is a palatable cattle feed.

Medicinal importance:

- Seeds and sprouts of moong have health-promoting effects.
- It is used in various ailments such as hepatitis, gastritis, heat rash *etc*. and is also reported as anticancer food.
- Regular consumption of *moong* could regulate the flora of enterobacteria, decreases the absorption of toxic substances, and reduce the risk of hypercholesterolemia and coronary heart disease.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	9.95
Proteins	22.53
Fats	1.14
Total fiber	17.04
Carbohydrates	46.13
Potassium	1.18
Phosphorus	0.35
Magnesium	0.20
Calcium	0.09
Iron	0.005
Energy (KJ)	1229

Unique Value:

Moong seeds are free from anti-nutritional factors such as trypsin inhibitor, phyto-hemagglutins and tannin.

Phytochemicals:

Catechin, epicatechin, p-coumaric acid, ferulic acid, syringic acid, p-hydroxy benzoic acid, protocatechuic acid, gallic acid, vitexin, isovitexin, sinapic acid, quercetin, robinin, rutin, kaempferol, quercetin and isoquercitrin

Vigna unguiculata (L.) Walp.

21. *Vigna unguiculata* (L.) Walp.

Common name : Rongi, Lobia, Cowpea, Black-eyed pea

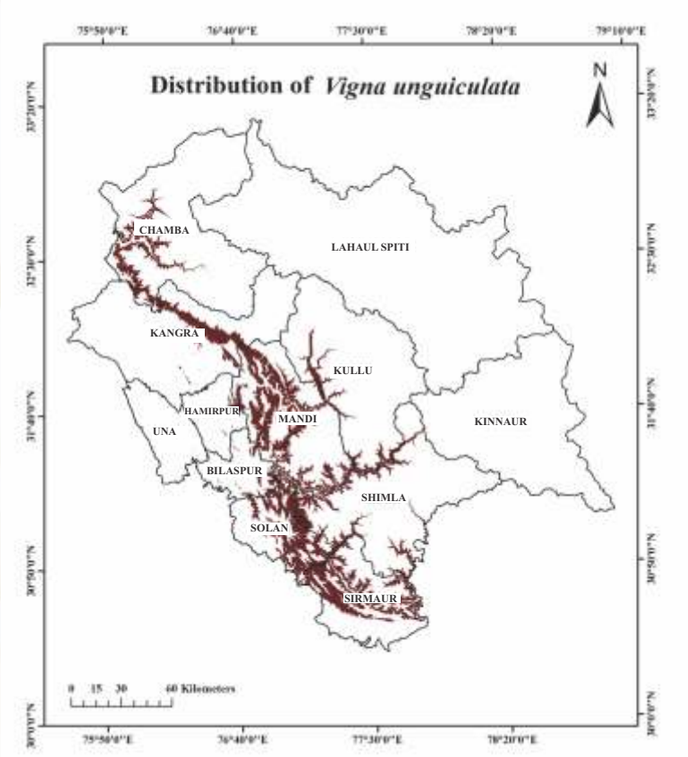
Family : Fabaceae

Native : West Africa

Elevation : 1700- 3000 m

Growing period : May-September

Distribution : Bandla area of Bilaspur, Changar area of Hamirpur, Kangra, Shimla, Chamba, Solan, Kullu, Sirmaur, Una and Mandi districts of the State.



Ethnobotanical importance:

- Seed is a nutritious component in the human diet and livestock feed as well.
- A famous traditional delicious dish of cowpea known as *rongi ka madra* (cowpea cooked in spicy yogurt based gravy) is served in social occasions/ community feasts (*dhaam*).
- Roasted seeds are used to treat neuritis, insomnia, weakness of memory, indigestion, dyspepsia, sensation of pins and needles in limbs, periodic palpitation, congestive cardiac failure *etc.*
- Fresh leaves and fast growing twigs are often picked up and eaten like spinach.
- Immature pods are used as snap beans and often being mixed with other foods.
- Decoction of leaves is used to treat hyperacidity, nausea and vomiting.

Medicinal importance:

- It is used to treat epilepsy, chest pains and constipation.
- It is an excellent medicine for stomatitis, corneal ulcers, coleic diseases, kwasiorkar, marasmus, and also reduces fat accumulation in liver.
- Rongi contains some anti-nutritional elements, notable phytic acid and protease inhibitor which reduces the nutritional value of the crop but roasting/ soaking/ cooking reduces the anti nutritional factors.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	9.32
Proteins	21.25
Fats	1.14
Total fiber	11.70
Carbohydrates	53.77
Potassium	1.24
Phosphorus	0.38
Magnesium	0.21
Calcium	0.84
Iron	0.005
Energy (KJ)	1340

Unique value:
Cowpea is often been referred to as "poor man's meat" due to the high levels of protein found in the seeds and leaves.

Phytochemicals:
Flavonoids, alkaloids, tannins, sterols and terpenoids.

Zea mays L.








22. *Zea mays* L.

Common name : Makki, Chhali, Kukdi, Maize

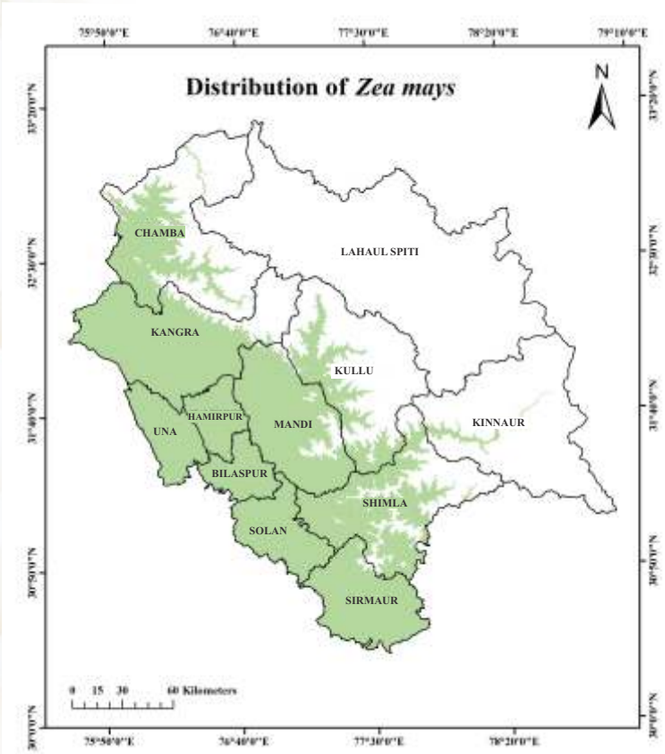
Family : Poaceae

Native : South America and Mexico

Elevation : Up to 2000 m

Growing period : June-September

Distribution : Maize is cultivated in all twelve districts of the State. Traditional landraces; Zea mays are Chidkoo, Salhu, Desi Kukari, Temta, Gadda, Rohdu, Doni and Tedi etc. are distributed in the State.



Ethnobotanical importance:

- Dried mature seeds are ground into flour to make *makki ki roti*. Roasted/boiled grains are also consumed. Boiled grains are distributed to children during *lohri* festival.
- The dried seed of some varieties are used to make popcorn.
- Maize along with other grains is used to prepare a gruel called *fimbra*.
- Maize flour cooked in water and ghee (*baadi*) like *upma* enriched with *akhrot /chuli* kernals is given to women after child birth.
- The seed is diuretic, mild stimulant, demulcent and tonic.
- It is a good emollient, poultice for ulcers, swellings and rheumatic pains and is widely used in the treatment of cancer, tumours and warts.
- Dried grains are used as animal and poultry feed. Green forage and cob husk is used as animal fodder directly and is used for silage preparation.

Medicinal importance:

- From the ancient time corn has been used to pacify kapha, pitta, anorexia and piles.
- It is a potent antioxidant that guards body from free radicals responsible for cellular damage and/or cancer.
- It has the potential to alleviate pain and possess analgesic activity as well.
- It subsides rheumatism as vitamin B-complex in the grain improves joint motility.
- Corn silk is used to treat urinary tract infections and kidney stones as its major nutrient is potassium which is powerful diuretic.

Nutritional value

Constituents	Value (g per 100 g)
Moisture	9.26
Proteins	8.80
Fats	3.77
Total fiber	12.24
Carbohydrates	64.77
Potassium	0.29
Phosphorus	0.28
Magnesium	0.15
Calcium	0.008
Iron	0.002
Energy (KJ)	1398

Unique value:

The maize grain contains allantoin (a cell-proliferant and wound-healing substance), an herbal medicine which hasten the healing process.

Phytochemicals:

Tannins, phlobatannins, flavonoids, terpenoids and alkaloids.

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About UNEP GEF MoEFCC ABS Project:

UNEP-GEF and MoEF Project on Strengthening the implementation of the Biological Diversity Act and Rules with focus on its Access and Benefit Sharing (ABS) Provisions is the first ever global project - a programmme to access genetic resources, assess their economic value and share the benefits arising out of them among the local people. The executing organisation includes National Biodiversity Authority (NBA) in collaboration with State Biodiversity Boards (SBBs), UNEP-Division of Environmental Law and Conventions (UNEP/DELC), United Nations University – Institute of Advanced studies (UNU-IAS).

The Objective of the UNEP-GEF MoEF project on ABS is to increase the institutional, individual and systemic capacities of stakeholders to effectively implement the Biological Diversity Act, 2002 and the Rules 2004 to achieve biodiversity conservation through implementing Access and Benefit Sharing Agreements in India.

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