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# **CLIMATE CHANGE, BIODIVERSITY & CONSERVATION**

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## VANISHING TRADITIONAL DIETARY AND NUTRITIONAL PLANT DIVERSITY IN UTTAR PRADESH

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### Abstract

"Let food be thy medicine,  
Thy medicine shall be thy food."

~Hippocrates

"Foolish the doctor who despises the  
Knowledge acquired by the ancients."

~Hippocrates

Vegetation are part and parcel of nature, can co-exist to the extent possible with the food and medicine available in the surrounding flora it is presumed that early wandering primates might have selected edible plants and plant parts flowers, fruits, tubers, nuts and root as their food after careful observation on the surrounding flora or observing food behavior of birds and animals. India's ancient literature Ayurveda period from, 5000BC to 25000 BC has documented the use of about 1500 species of leafy vegetable or food as well as for preventive or promotive medicine. Recently nationwide study on ethnobotany (Anonymous, 1992) revealed that the 1500 species are listed as vegetables. Out of 1500 species 300 species are worthy of attention as alternative source of food, the world may require tomorrow. Wild plants make an important contribution to the life of local and poor communities in the developing countries. They play a significant part in a wide range of necessity as a source of wild foods and fuel wood, and they have an important socio-economic role through their use in nutritive and healthy food, medicines, dyes, poisons, shelter, fibres and religious and cultural ceremonies. Yet little systematic knowledge has been gathered on the uses of wild plants. Wild resources in general are often ignored and receive little recognition from the developed community. Recently, due to dwindling forest resources and other locally available plant resource throughout the country, the rural and tribes started

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shifting from their native place (Forest) to the urban areas, to earn money and better livelihood. The introduced exotic vegetables have conquered even rural markets and wiping out the indigenous vegetable that has locally available since generations. Now these traditionally used herbs are in difficult situations. Thus it is our present duty to create awareness about quality, importance of neglected and underutilized plants for their food value and nutrition with additional health care benefits among modern society.

The present paper comprises an enumeration of 180 wild food plants consumed presently by several human societies in Uttar Pradesh in various ways. The plants are categorized in 9 groups viz. **A. Food Plants: 49** including Grains (15) and Seeds ( ); **B. Fruit Plants: (22)**; **C. Vegetable Plants: 45** including a. Aerial parts used as vegetable: (22) having i. Leaves (15) ii. Fruits and seeds (15) iii. Floral/Foliar buds (8) iv. b. Underground Parts used as vegetable: (19) having i. The tubers (12) ii. Rhizome/Root/Succors (7); **D. Oils and Fats: (11)**; **E. Spices and Condiments: (22)**; **F. Beverage or Drinks (15)**-belonging to a. Non-alcoholic beverages: (8); b. Alcoholic drinks: (5); Natural Dyes stuff and Mordents: (4); **G. Plant for Flavouring Food: (9)**; **H. Other Crops plants: (Pseudocereals, Millets)-(8)**; **I. Wild relatives: (Cereals, Legumes, Oil seeds, Vegetables)-(22)**. Nutritional evaluation of these wild food plants will be very promising by bringing them into modern food.

**Key words:** traditional Diet, Nutrition, Plant Diversity, Uttar Pradesh

### Introduction

Food has occupied the prime position among the basic needs of human beings, "bread, cloth and shelter." Plant is the basis of life on Earth since the appearance of first human not only for food but also for life saving oxygen gas. With the advent of intelligent *Homo sapiens*, the relationship between plant and people began to evolve and his heightened capacity for reasoning, his memory, his ingenuity led him to discover an incredible variety of wild plants for multifarious uses. The utility of wild plants has not been recognized in one day or in one century; it is a result of the progressive development of human culture. Over the years of observations, analysis, trial, error and experience, the primitive people has discovered 3, 50,000 plant species for varied uses of which 80,000 species derived for variety of food preparations from different

parts of wild plants such as roots, rhizomes, corms, tubers, fruits, berries, flowers, foliage, grains and seeds, cereals, millets, legumes; spices and condiments; refreshing and narcotic drinks; flavouring and dying agents for food.

Plant food is the main source of carbohydrates, proteins, minerals, vitamins, fats and various trace elements as it provides energy to work and sustain life. Nevertheless, no single plant can provide all the essential minerals, vitamins and micronutrients, required for healthy body. Depending on required nutritive value some of the plants have come into cultivation, subsequently, large numbers of wild relative of crops and primitive cultivars have been discovered. During recent years with the accelerated processes of modernization and acculturation, the knowledge and cultural value concerning to the use of wild food plant diversity, have been decreased in all the developing countries. The cause of vanishing traditional dietary knowledge about locally available wild plant diversity among tribal, rural and modern societies is probably due to increasing stigma as symbol of poverty and backwardness. Consequently, large numbers of the wild food plants **Latari-** (*Lathyrussativu*, **Pathari-** *Viciasativa*, **Madwa-** *Eleusinecoracana*, **Kakun-** *Setariaitalica*. **Poe-** *Basellaalba*, **Kodo-** *Paspalumscrobiculatum* and *Pasplumdistichum*, **Sawan-** *Echinochloacolonum* and *Echinochloacruss-galii*, **Sursari-** *Digeramuricata* etc.) and other crop diversity that coexists with domesticated species have been eroded from several areas. The replacement of local primitive land races by high yielding or exotic variety or species, simplified agriculture system and overexploitation of species, land clearing, population pressure, environmental degradation and overgrazing are also among the major driving forces responsible for the genetic erosion in crops. However, still large numbers of wild plant diversity are being consumed as food by many tribal, rural and urban people in various recipes in different parts of India. Many tribes and orthodox cultivators have not adopted all new or improved varieties of crops and have continued to grow the traditional land races (even less productive) or wild relatives of commonly cultivated crops, thereby maintaining their genetic material or germplasm.

There is still an immense wealth of edible plants diversity, containing most important genetic resources, necessary for the development of value added variety of food plants and other

*Proceedings of the National Conference on "Climate change, Biodiversity & Conservation". Edited by Rajkumar, S. D., Samuel, C. O. & Lal, J. K. 2012. Gayathri Teknological Publication, Palayamkottai, India.*



requirements of mankind, awaiting for exploration, identification and scientific research in the remaining wilderness areas. This not only opens out possibilities for expanding the rather narrow existing range of food plant base but also represents a vital security through genetic pool for hybrids. Out of about 3,50,000 plant species nearly 80,000 are estimated as edible. However, at present only 150 species are actively cultivated and of these 30 produce 95% of human calories and protein. About half of our food derived from only 4 plant species-rice, wheat, maize and potato (Menini, 1998). A legitimate case can be made for expanding crop diversity and for reversing the trend toward monoculture in many part of the world agriculture. The reinvestigation of neglected and underutilized crop are locally well adopted and constitute an important part of local diet, culture and economy (Janick et al. 1996).

### **Methodology**

In view of the above facts the author has made ethnobotanical study in different parts of Uttar Pradesh such as Gorakhpur, Basti, Bahraich, Shravasthi, Siddharthanagar, Lkhipur, Dudhwa, Sonbhadra, Banda, Chitrakut, Mirzapur, Pilibhit with an aim to preserve the local knowledge about various uses of plants, in the form of document for identification of new potential health beneficial future food, from less known wild edible plants being used in various ways and forms by tribals, rural and urban people and various land races and wild relatives of crop plant still being grown in the area to promote knowledge about biodiversity heritage and to create awareness about its quality, importance and sustainable utilization among tribal, rural and urban people. In order to achieve the target of present study the authors have made numerous field trips and thousands of inquiries about the plants utilized as food in the area, and documented enormous information about plants used for wide varieties of wild food plants (cereals, millets, pulses and legumes, fruits, vegetables, oil and fats, spice and condiments, beverages, dyeing and flavoring agents, pseudocereals, wild relatives, land races) are being consumed even today by several human societies in the area.

### **Result**

#### **Edible Plants**

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Plant is the basis of life on earth. With the advent of intelligent *Homo sapiens* the relationship between plant and people began to evolve and developed their knowledge about multifarious applications of their ambient vegetation including food, medicine, fuel, etc., for basic subsistence. Humans seem to have an inborn love of nature. This concept was termed “biophilia” by the great Harvard biologist Edward O. Wilson. It was therefore a natural reaction for human to develop a close relationship with plant and with the landscape around them. Carbohydrates, all amino acids, minerals, vitamins, fats and condiments are all provided by plant foods. No single plant can provide these essential things required for the body. However, of the 18,000 known species, over the centuries, fewer than 20 species of the plants now supply about 90% of our food requirements. It is all the more necessary to relieve pressure on the crops being practiced today by adopting the other varieties of some of the wild plants which have been used by the tribal people on which the tribal community subsists. There is an incredible variety and abundance of edible plants available to us having all essential nutrients. Plants of different uses are categorized as under:

#### **A. Food Plants:**

Food is the primary need of all life forms as it provides energy to work and sustain life. During the quest of food, the earliest people might have experimented on various edible plants and discovered a wide variety of food as wild roots and tubers, fruits, berries, grains and seeds, flowers, foliage and stems. Nutritional evaluation of these wild food plants will be very promising by bringing them into modern food.

##### **1. Grains-**

**1a. Cereals:** Cereals are grasses cultivated for the edible components of their grain (a type of fruit called a caryopsis). Cereal grains are grown in greater quantities and provide more food energy worldwide than any other type of crop; they are therefore staple crops. In their natural form (as in whole grain), they are a rich source of vitamins, minerals, carbohydrates, fats, oils, and protein. However, when refined by the removal of the bran and germ, the remaining endosperm is mostly carbohydrate and lacks the majority of the other nutrients. In some developing nations, grain in the form of rice, wheat, millet, or maize constitutes a majority of



daily sustenance. The first cereal grains were domesticated about 12,000 years ago by ancient farming communities in the Fertile Crescent region. Emmer wheat, einkorn wheat, and barley were three of the so-called Neolithic founder crops in the development of agriculture.

Several wild grains occurring in rain fed areas are used as staple energy foods such as *Avena sativa*, *Oryza rufipogon*, *Triticum compactum* and *Triticum sphaerococcum*-dwarf drought tolerant. Three important species of wheat are *Triticum aestivum* (common wheat), *Triticum durum*, and *Triticum compactum*; *Triticum aestivum* is used to make bread, *Triticum durum* is used to make pasta, and *Triticum compactum* is also used to make softer cakes.

#### PLATE 1

**1b. Pseudocereals:** Pseudocereals were extensively used in India during prehistoric times. The pseudocereals are broadleaf plants (non-grasses) that are used in much the same way as cereals (true cereals are grasses). Their seed can be ground into flour and otherwise used as cereals. Examples of pseudocereals are amaranth, red amaranth, *Chenopodium* and buckwheat (*Fagopyrum esculentum* & *Fagopyrum tataricum*).

#### PLATE 2

**1c. Millets:** The millets are a group of small-seeded species of grasses grown in difficult production environments such as those at risk of drought. They have been in cultivation in East Asia for the last 10,000 years. Millets have been important food staples in human history, particularly in the poor, semi-arid tropics of Asia and Africa. They grow in harsh environments where other crops do not grow well. Improvements in production, availability, nutritional content, storage and utilization technology for millets may significantly contribute to the household food security and nutrition of the inhabitants of these areas.

The most popular staple amongst millets is the pearl millet. India is the world's largest producer of millets. All of the millet crops harvested in the area are used as food staple. The majority of millets produced in the area is being used for alternative applications such as livestock fodder and alcohol production. *Pennisetum glaucum*, *Setaria italica* (Kakun), *Panicum miliaceum*, *Eleusine coracana* (Nachani or Mandwa)

#### PLATE 3

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**1d. Minor millets include:** Sawa millet (*Echinochloa colomum* & *Echinochloa crus-galli*), Kodo millet (*Paspalum scrobiculatum* & *Paspalum disticum*), Little millet (*Panicum sumatrense*), Guinea millet (*Brachiaria deflexa* = *Urochloa deflexa*), Browntop millet (*Urochloa ramosa* = *Brachiaria ramosa* = *Panicum ramosum*), *Eragrostis trimula* and *Dactyloctenium aegyptium* are also often called millets, as more rarely are sorghum (*Sorghum spp.*) and Job's Tears (*Coix lacrimajobi*), *Panicum miliaceum*, *Pennisetum alopecuroides*, *Paspalum flavidum*, *Setaria glauca*, *Setaria italica* and *Sorghum halepense*. These have excellent nutritive value with high protein content and are known as the "poor man's protein."

**2. Seeds:** Ripe seeds of several wild plants are very nutritious and rich in protein value. They are also planted with other crops specially to improve nitrogen content in the soil through root nodules. These seeds are eaten raw or cooked.

**i. Eaten raw:** *Buchanania lanzan*, *Euryale ferox*, *Nelumbo nucifera*, *Trapa bispinosa*, etc.

**ii. Eaten cooked:**

**Pulses:** *Bauhinia purpurea*, *Bauhinia variegata*, *Bauhinia vahlii*, *Moghania vestita*, *Moghania bracteata*, *Mucuna capitata*, *Trigonella emodi*, *Mucuna pruri*, *Vigna capensis*, *Vigna radiata* var. *sublobata*, *Vigna umbellata*, *Atylosia scarabaeoides*, *Trigonella corniculata*, *Vigna corymbosa*, *Vigna aconitifolia*, *Vigna pilosa*, *Vigna trilobata*, *Nymphaea nouchali*.

#### PLATE- 4

**Others:** *Nymphaea nouchali*, *Nymphaea stellata*, *Artocarpus heterophyllus*, *Nelumbo nucifera*.

The seeds of above plants are very rich in protein content and very much similar to Almond. The seeds of *Bauhinia vahlii* may eventually become as popular as seeds of *Buchanania lanzan*, which were once uncared in the forest, but adopted later for human exploitation. Similarly, large numbers of seeds grow waste in the forests and can be utilized by urban population.

**iii. Made into coarse flour:** *Polygonum glabrum*, *Fagopyrum esculentum*, *Fagopyrum tataricum* and *Trapa bispinosa*, *Nelumbo nucifera*.

**B. Fruit :**



Vegetables and fruits are the source of vitamins and minerals, necessary for good health and growth. Even before their intrinsic value was realized, Stone Age men were using several vegetables cultivated today. Fruits are the most delicious, naturally sweet and nutritive plant food eaten raw or made in to pickles and chutney or after cooking. Over hundreds of the wild fruits such as *Eriobotryajaponica*, *Mangiferaindica*, *Musa accuminata*/*Musa balbisiana*, *Phyllathusemblica*, *Euodiafraxinifolia*, *Ficusplamata*, *Fragariaindica*, *Prunusspp*, *Morusspp*, *Dilleniaindica*, *Madhucalongifoliavar. latifolia*, *Madhucalongifoliavar. longifolia*, *Olex nana*, *Syzygiumjambos*, *Syzygiumcumini*, *Eiobotrya japonica*, *Phoenix sylvestris*, *Borssusflabellifer*, *Zizyphusmauritiana*, *Zizyphusjube*, *Zizyphusxylopyrus*, *Zizyphusoenoplea* etc., are used in various ways by local people and tribal communities throughout the India for sweet drinks, pickles, seasoning material, jellies and jams, brewing local beer, and chutneys.

#### PLATE- 5

##### C. Vegetable Plants:

Large number of wild plants, of which aerial and underground parts are used as vegetable:

##### Ca. Aerial parts used as vegetable:

The aerial parts of the number of wild plants are being used by various tribal communities and other people in the forests, rural and urban areas of the country which may be exploited for better and larger uses. Some examples are given as :

**Ca1. Youngfoliages with tender stems cooked as vegetable:** *Cassia tora*, *Amaranthusblitum*, *Basella alba*, *Ipomoea aquatica*, *Ipomoea batata*, *Celosia argentea*, *Chenopodium album*, *Chenopodiummurale*, *Digeramuricata*, *Fagopyrumesculanta*, *Lathyrus sativa*, *Lathyrussphaericus*, *Lathyrusaphaca*, *Moghaniamacrophylla*, *Ophioglossum reticulatum*, *Helminthostachyszeylanica*, *Tetrastigmalanceolarium*, *Vicia sativa*, *Viciahirsuta*, etc.

#### PLATE- 6

**Ca2. Leaf/Floral buds and flowrs cooked as vegetable:** *Bauhinia variegata*, *Sespaniagrandiflora*, *Crotalaria juncea*, *Cucurbita maxima*, *Bauhinia pupurea*, *Moringaoleifera*, *Luffa cylindrical*, *Luffaacutangula*, *Cucumismelo*, *Ficustectoria*, *Ficustiela*, *Ficusracemosa*.

**Ca3. Fruits and seeds cooked as vegetable:** *Madhucalatifolia* var. *indica*, *Ipomoea alba*, *Artocarpus heterophylla*, *Artocarpus lakoocha*, *Abelmoschus manihot* (tetraphyllus forms), *Luffa graveolens*, *Solanum incanum*, *Solanum indicum*, *Trichosanthes cucumerina*, *Cordia dichotoma*, *Caturanegam spinosa*, *Tamilnadiau liginosa*.

#### PLATE 7.

#### **Ca4. Fruits eaten in the form of pickle or chutney:**

*Dillenia indica*, *Spondias pinnata*, *Phyllanthus emblica*, *Phyllanthus acidus*, *Averrhoa carambola*, *Solanum pimpinellifolium*, *Carissa macrocarpa*, *Feronia limonia*

#### PLATE 8

#### **Cb. Underground Parts used as vegetable:**

Underground parts of a large number of plant species are known for vegetable of which roots, tubers, bulbs and rhizomes are used in various ways, and they may be eaten raw or cooked.

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**Cb1. The tubers** of *Aponogeton* natans, *Aponogeton crispum*, *Potamogeton* natans, *Scirpus grossus*, *Scirpus tuberosus*. The giant taros and *Manihot esculenta* are eaten raw or cooked after repeated washing to get rid of the bitterness and pungency. Tuberous roots and aerial bulbils of *Dioscorea alata*, *Dioscorea bulbifera*, *Dioscorea esculenta*, *Dioscorea hispida*, *Dioscorea aculeata*, *Dioscorea pentaphylla*, etc., are eaten cooked.

**Cb2. Rhizome/Root/Succure** of *Nymphaea pubescens*, *Nelumbo nucifera* and roots of *Phaseolus adenanthus* and *Pueraria tuberosa* are eaten after boiling. The fusiform roots of *Phoenix acaulis*, *Borassus flabellifer* and rhizome of *Zathosoma sp.* are consumed raw or cooked. Likewise, hundred of plants are still left uncared in the forests of which underground parts are consumed by wild animals. They may be exploited for human use.

#### **D. Oils and Fats:**

The saturated fats and the animal fats consumed today are believed to be one of the causes for heart attacks. It is usually advised by doctors to the heart patients to consume less animal fat (saturated oil) exclusively. The unsaturated fat, which occurs in oil derived from plants should be used by heart patients. We have traditional oil plants, the seeds of which are rich in oil, used widely in cooking food such as mustard, coconut, groundnut, etc. Ethno botanical studies bring



to light that oils for cooking medium can be derived from forest trees and shrubs such as *Pongamiapinnata*, *Schleicheraoleosa*, etc. The oil extracted from seeds of wild plant- *Perillafrutescens*, and *Ventilagomaderaspata* are largely used by tribes in the forest of as cooking medium. Apart from vegetable oils, even butter as cooking medium can also be extracted from some other trees such as *Moringaoleifera*, *Mimusopselengi*, *Shorearobusta* (Roy, 1998). Other plants are- *Abelmoschusmanihot* (tetraphyllus forms), *Solanumincanum*, *Solanumindicum*.

#### PLATE- 9

Thus, the popularization of vegetable oil through establishment of cottage industry in rural and tribal areas can be beneficial for socio-economic development of ethnic communities as well as to civilized people for medical point of view. Wild plants like *Guizotiaabyssinica* and *Carthamustinctorious* have recently brought under cultivation for its oil, which is used as cooking medium. Thus, to get away from several diseases related to heart caused by animal fats, it would be good to make use of the tribal expertise for vegetable oil and butter.

#### E. Spices and Condiments:

Spices are aromatic flavourings made from different parts of the variety of plants. Archaeologists estimate that by 50,000 B.C., primitive man had discovered certain aromatic plants, which help him to make their food in better taste. With few exceptions, the spices and condiments known today were used early in human history. Fragrant leaves of *Allium hooker*, *Allium wallichii*, *Ocimumbasilicum*, wild coriander, *Trachuspermum roxburghianum*, *Mentha piperata* and *Eryngium foetidum*; roots of *Allium stracheyi* barks of cinnamon. Vanilla, the essence of which is drawn in ice cream, chocolates and cakes, comes from an orchid. The rhizomes of *Alpinia galangal*, *Alpinia zerumbet*, and flowers of *Zinziber zerumbet* and *Acacia farnesiana* are used for flavouring food. Other plants are *Allium cepa*, *Alliumsativa*, *Curcuma zedoaria* (Kachoor), *Alpinia speciosa*, *Amomuma romaticum*, *Curcuma amada*, *Piper longum*, *Piper nigrum*, *Curcuma angustifolia* (Tikhur), *Curcuma . aromatic*.

#### PLATE- 10

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## F. Beverages (Drinks)

### Fa. Non-alcoholic beverages:

Tea from Asia, coffee from Africa and cocoa from South America are the world's favourite beverages. They all contain caffeine, a stimulant. Tea is the world's most popular beverage after water. China was the main source of tea, whose cultivation spread through trade to other parts of the world. *Camellia assamica*, a wild tea plant, growing in Assam, was later discovered by Britishers. Tribal communities inhabiting in forest areas use the leaves of *Cymbopogon citratus* and *Basella alba* for preparation of tea like drink. Cooling drink is made from hairy seeds of *Lepidagathis incurva* and *Ocimum basilicum*. The juice of various fruits, vegetables and the clear water of the tender coconut are used as naturally sweet and refreshing drinks. Toddy or palm liquor obtained from *Borassus flabellifer*, *Caryota urens*, *Phoenix dactylifera* and *Phoenix sylvestris* is commonly used in the area.

### Fb. Alcoholic drinks:

Tribal uses the fleshy petals of *Madhuca latifolia*, rhizomes of *Imperata cylindrica*, fruits of *Syzygium cumini*, *Oryza sativa* and rhizome of *Cissampelos pareira* in the fermentation of rice beer. The flowers of *Madhuca latifolia* are also used to prepare country liquor by all tribes.

### G. Natural Dyes:

There is no dearth of wild plants from which dyes have been extracted and used by the tribes to dye yarn and cloths made of both cotton and silk and colour their food items. Most of the natural dyes come from bark, berries, flowers, leaves and roots of the plants. Being of natural origin, many of these colours are safe to colour food as well. It is also used in colouring and flavouring food, especially sweets. Turmeric, a yellowish powder obtained by grinding the rhizomes of *Curcuma longa* has been used for hundreds of years as a dyestuff and as a spice. 'Abir' or 'Gulal' is the finely powdered rhizomes of *Curcuma zedoaria* mixed with powder of *Caesalpinia sappan*. It is suggested that a large-scale cultivation of these dye-yielding plants should be encouraged in order to obtain natural dye in place of synthetic dyes.

### H. Plant for Flavouring Food:

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Fragrant flowers of jasmine, lavender, frangipani, rose, lilies, vetiver, etc., have always been used for making sacred offerings, adorning hair, floral arrangements, garlands, bouquets and floral decoration industry. However, the leaves of *Eyngiumfoetidum*, *Murrayakoenigii* and *Premnalatifolia* and flowers of *Zingiberzerumbetare* are used to flavour curries and food.

#### I. Wild relatives; (Cereals, Legumes, Oil seeds, Vegetables)-

Many tribals and orthodox cultivators have not adopted all new or improved varieties of crops and have continued to grow the traditional (even less productive) land races or wild relatives of commonly cultivated crops, thereby maintaining their genetic material or germplasm (Arora, 1996, 1997). Specific characters of hardiness, disease resistance and adaptability to special conditions like waterlogging, extreme drought or cold, etc. in the land races. They may be utilized by the plant breeders for improvement of crop varieties. The floristic diversity available in the wild relatives and related types of cultivated plants in India is estimated to about 320 species, of which about 60 are endemic taxa. The diversity in wild relatives is largely distributed in the warm humid tropical, sub-tropical regions of U. P. (Arora and Nayar, 1984).

*Oryzanivara*, *Orryzaruffipogon*, The wild forms of Job's tears (*Coixlacryma-jobi*), *Saccharum* spp., *Erianthus*, *Triticumsphaerococum*, *Triticumhybernum* (Beardless winter wheat), *Vignaradiatasubsp. sublobata* provide sources of resistance to yellow-vein-mosaic virus, *Sesamummulayanum*, wild okra, *Abelmoschustuberculatus* (related to the cultivated okra, *Abimoschuseculentus*). The wild forms of bringal, *Solanumincanum* and *Solanummelongena* var. *incanum*. The wild form of tomato *Solanumpimpinellifolium*, Other wild germplasm includes species of *Momordica*, *Trichosanthes* and *Cucumis* (wild cucumber), and wild ginger and turmeric (*Zingiber*, *Hedychium*, *Curcuma*), wild yams (*Dioscorea*) and Taros (*Alocasia*, *Colocasia*).

#### DISCUSSION

The study reveals enormous information on modern crops, landraces, wild relatives of crops and other utilities of wild plants which have been preserved by various tribal and rural communities. About 180 wild plant species have been classified in to 9 utility groups viz. A. Food Plants: 49 including Grains (15) and Seeds ( ); B. Fruit Plants: (22); C. Vegetable Plants: 45

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including a. Aerial parts used as vegetable: (22) having i. Leaves(15) ii. Fruits and seeds (15) iii. Floral/Foliar buds (8) iv. b. Underground Parts used as vegetable: (19) having i. The tubers (12) ii. Rhizome/Root/Succors (7); **D. Oils and Fats: (11); E. Spices and Condiments: (22); F. Beverage or Drinks (15)**-belonging to a. Non-alcoholic beverages: (8); b. Alcoholic drinks: (5); Natural Dyes stuff and Mordents: (4); **G. Plant for Flavouring Food: (9); H. Other Crops plants: (Pseudocereals, Millets)-(8); I. Wild relatives; (Cereals, Legumes, Oil seeds, Vegetables)-(22)**. This vast repository of knowledge related to plants has been cared and nourished by the tribal communities as a common property since thousands of years. Many plants used today by us were originally identified and developed through indigenous knowledge. The utility of wild plants for diverse purposes has not recognized in one day or in one century; it is a result of the progressive development of human culture. The cereals, vegetables and root crops that we have cultivated as source of food, fiber and oil for our subsistence, are all gifts of tribal to our modern civilized society. Infact, the civilized society should be indebted to primitive people for they had during the last several thousands years, screened the wild plant life and determined its usefulness. Though tribal communities have treasure of knowledge about multifarious uses of plants, however, many of these plants have not been adequately studied, and sometimes not even identified. Several of them of food values are still unknown to the modern civilization and they have yet not received the due attention by agricultural scientists for yield enhancement and varieties improvement in food and forage plants. Recently with the rapid adoption of modern culture, the tribal culture and traditional knowledge concerning useful plants, that has developed in and around the forests since beginning of civilization, is also disappearing very fast. Thus, one of the most pressing and important task is documentation of plant resources should be done as rapidly as possible to provide a firm factual base for conservation measures of vanishing plant resources for elimination of poverty and new sources of nutraceuticals.

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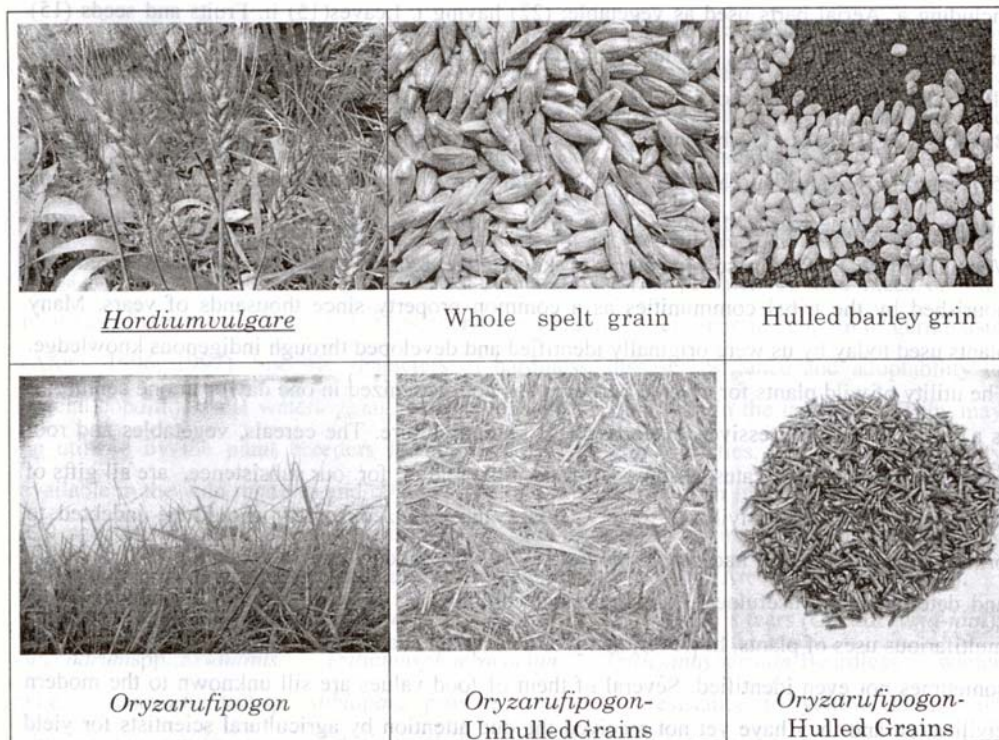


PLATE - 1: FOOD – CEREAL

There are hundreds of other species that grow and utilized at a local level, either through cultivation or harvesting in many parts of state. This hidden harvest of indigenous species enables many tribal and local people to survive in periods of drought and famine. Rural families also earn cash by collecting wild fruits, seeds, flowers, tubers, barks, leaves, fibres, etc., and selling them in local markets. Many of them have great market potential for the growing urban centres. Many under-utilized plants have potential for more widespread use, and their promotion could contribute to food security, agricultural diversification, and income generation, particularly in areas where the cultivation of major crop is economically marginal.

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*Fagopyrum esculentum*-Habit of the plants "Kottu", "Phahar"



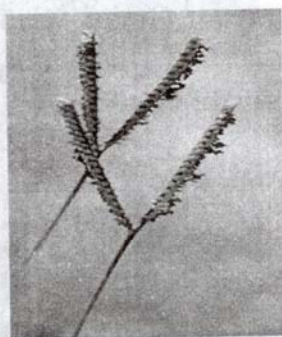
*Fagopyrum esculentum*-Hulled "Grains"-Kottu", "Phahar"



*Amaranthus caudatus* -Plant- "Lalsag"



*Amaranthus caudatus*-Hulled Grains- "Lal Sag"



*Paspalum scrobiculatum*- Inflorescence- "Kodo"



*Paspalum scrobiculatum*-mixture of hulled & unhulled grains- "Kodo"

## PLATE-2 : PSEUDOCEREAL



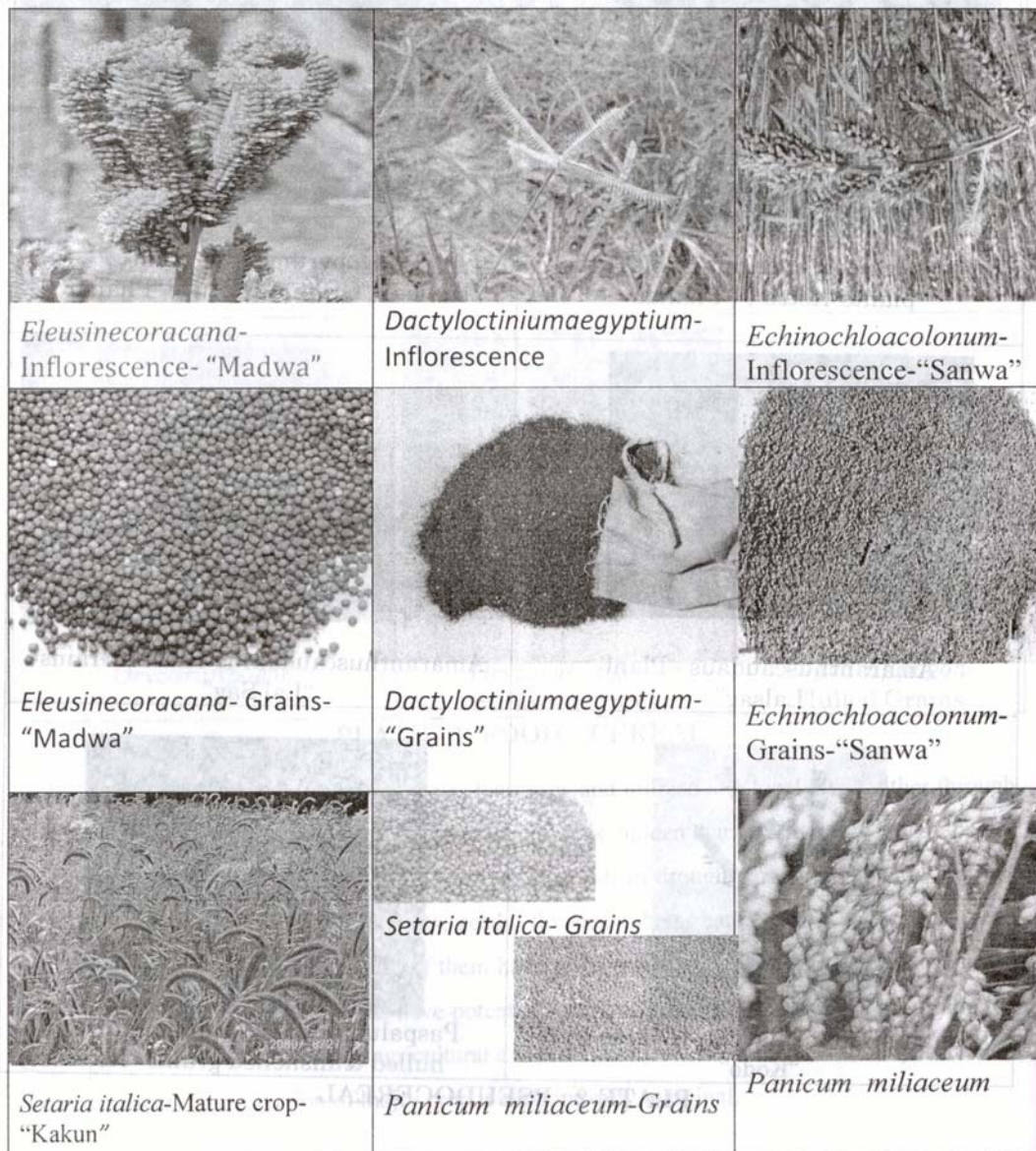


PLATE 3: FOOD PLANT:MILLET

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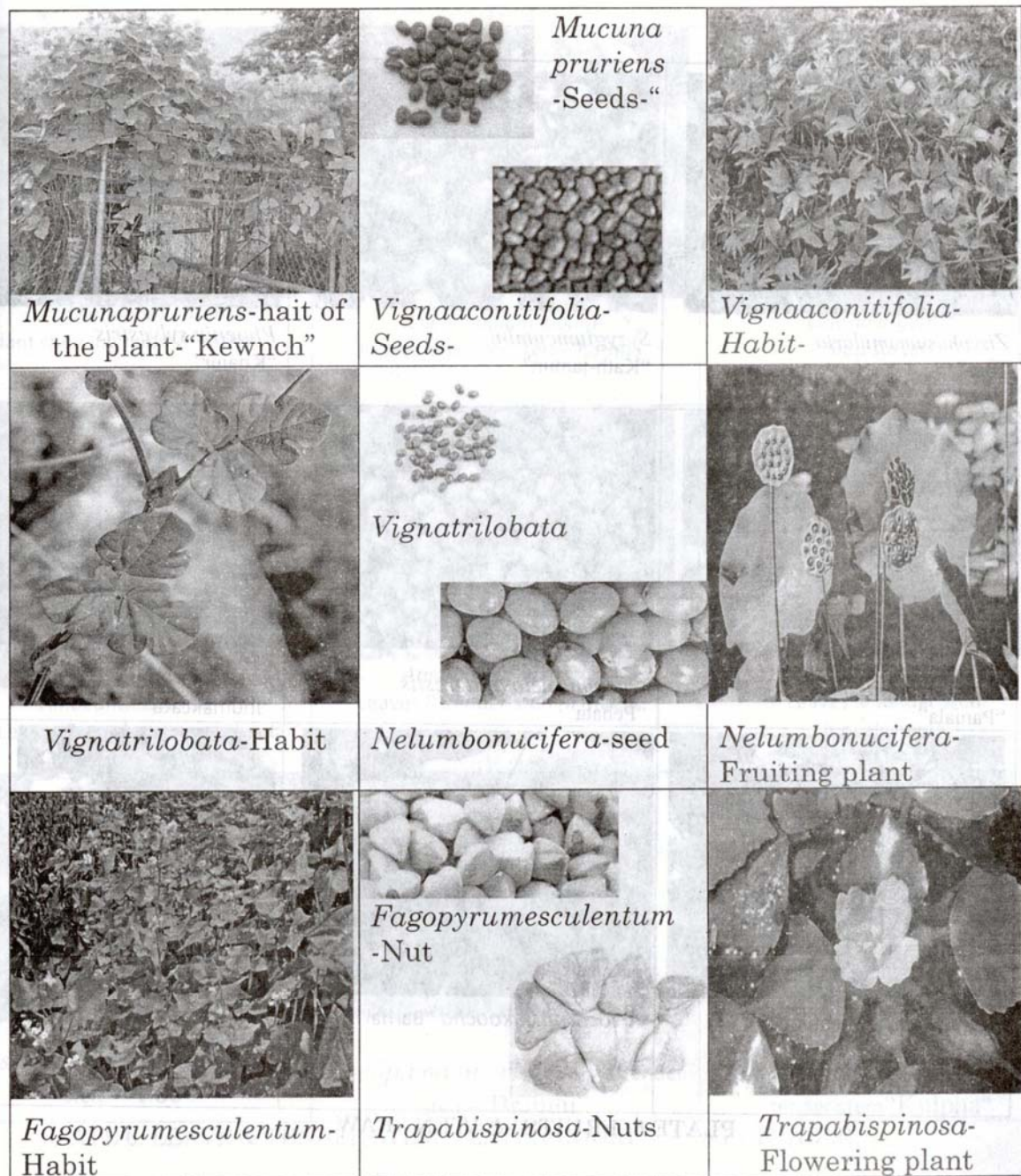
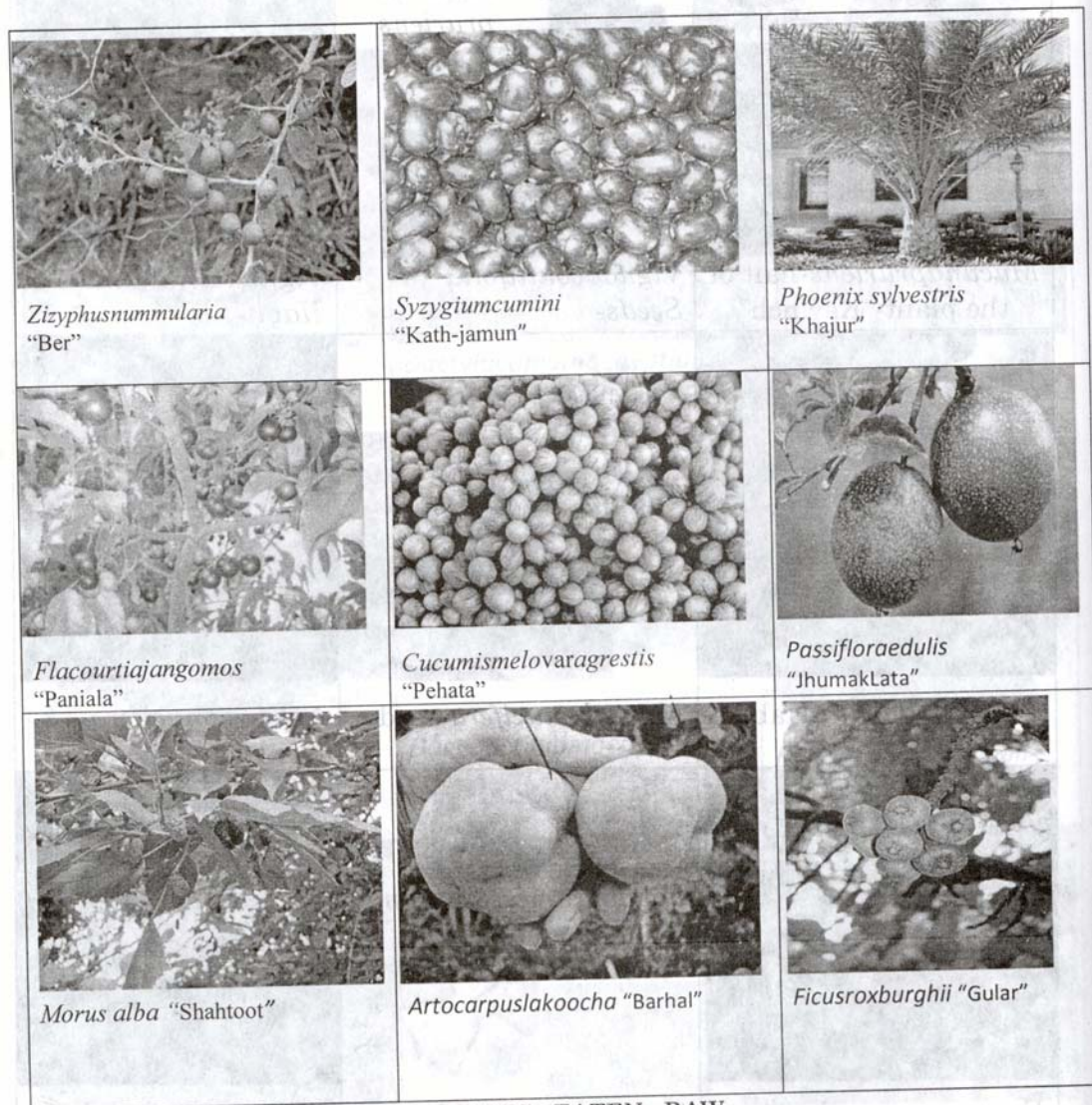


PLATE 4: SEED-EATEN RAW AND COOKED





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PLATE 5: FRUITS - EATEN RAW

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*Chenopodium rubrum*-  
Plant showing habit -"Bathua"



*Chenopodium album*-  
Leaves & tender stem-"Bathua"



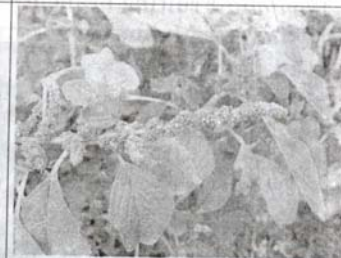
*Celosia argenta*  
"Badisursari"



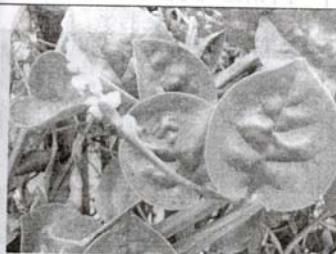
*Amaranthus viridis*-  
Leaves & tender stem -"Chaulai"



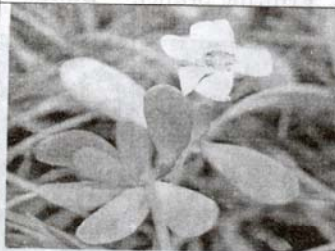
*Amaranthus caudatus*-  
Leaves & tender stem -"Marsa "



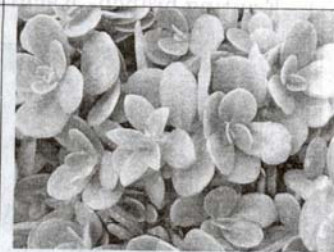
*Amaranthus blitum*-  
Leaves & tender stem  
"Jungalichaulai"



*Basella alba* — Leaves & tender  
stem—"Poe"



*Bacopa monnieri*- Leaves & tender  
stem-"Bramhi"



*Portulaca oleracea*- Leaves &  
tender stem "Kulpha"

PLATE 6: LEAF & TENDER STEM - EATEN COOKED AS VEGETABLE



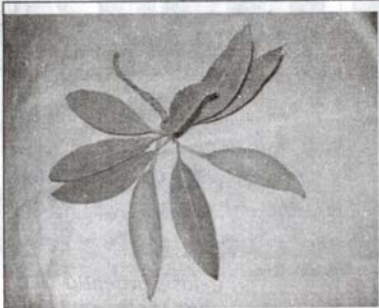
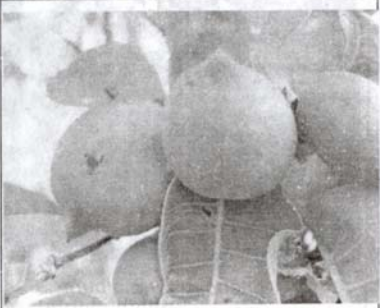
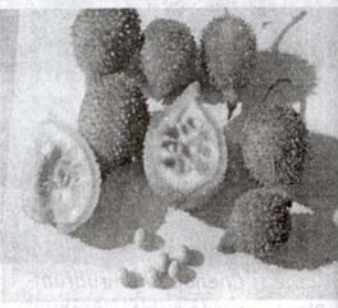



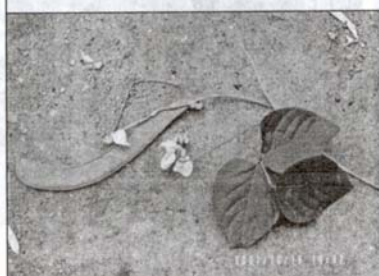


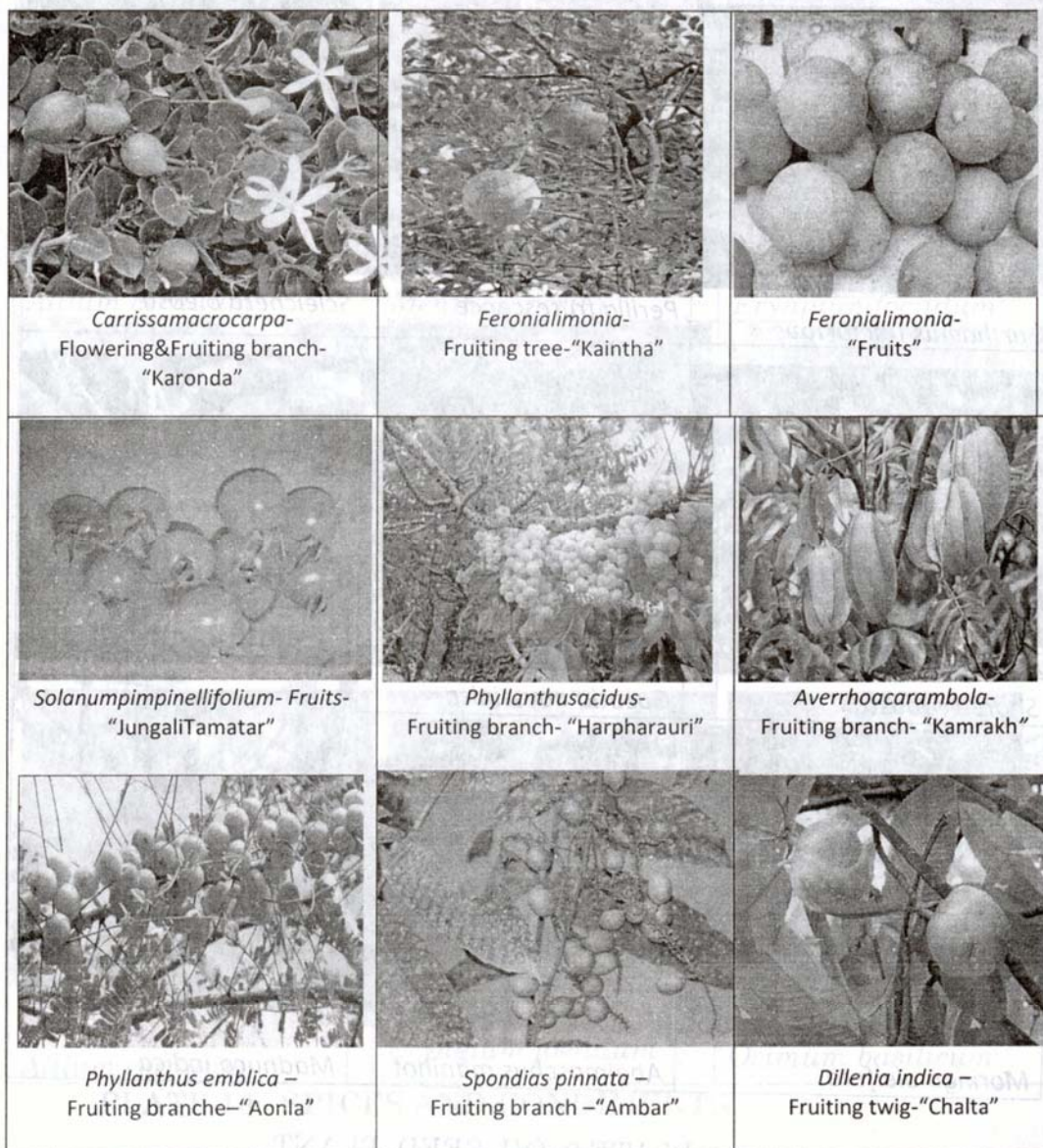
		
<i>Madhuca longifolia</i> var. <i>longifolia</i> -Fruiting branch- "Madrassi Mahua"	<i>Madhuca latifolia</i> var. <i>longifolia</i> -Fruiting branch- "Mahua"	<i>Momordica dioica</i> - Fruits- "Kheksi"
		
<i>Cucumis melo</i> var. <i>momordica</i> - Fruiting branch-"Kachra"	<i>Luffa graveolens</i> - Fruiting branch-- "Bandal"	<i>Tamilnadia uliginosa</i> - Fruits-"Prdar, Manhar"
		
<i>Canavalia ensiformis</i> Fruit in g twig	<i>Cordia dichotoma</i> - Fruits-"Lasors"	<i>Cordia dichotoma</i> - Fruiting branch-"Lasora"

PLATE 7 :FRUIT EATEN COOKED AS VEGETABLE



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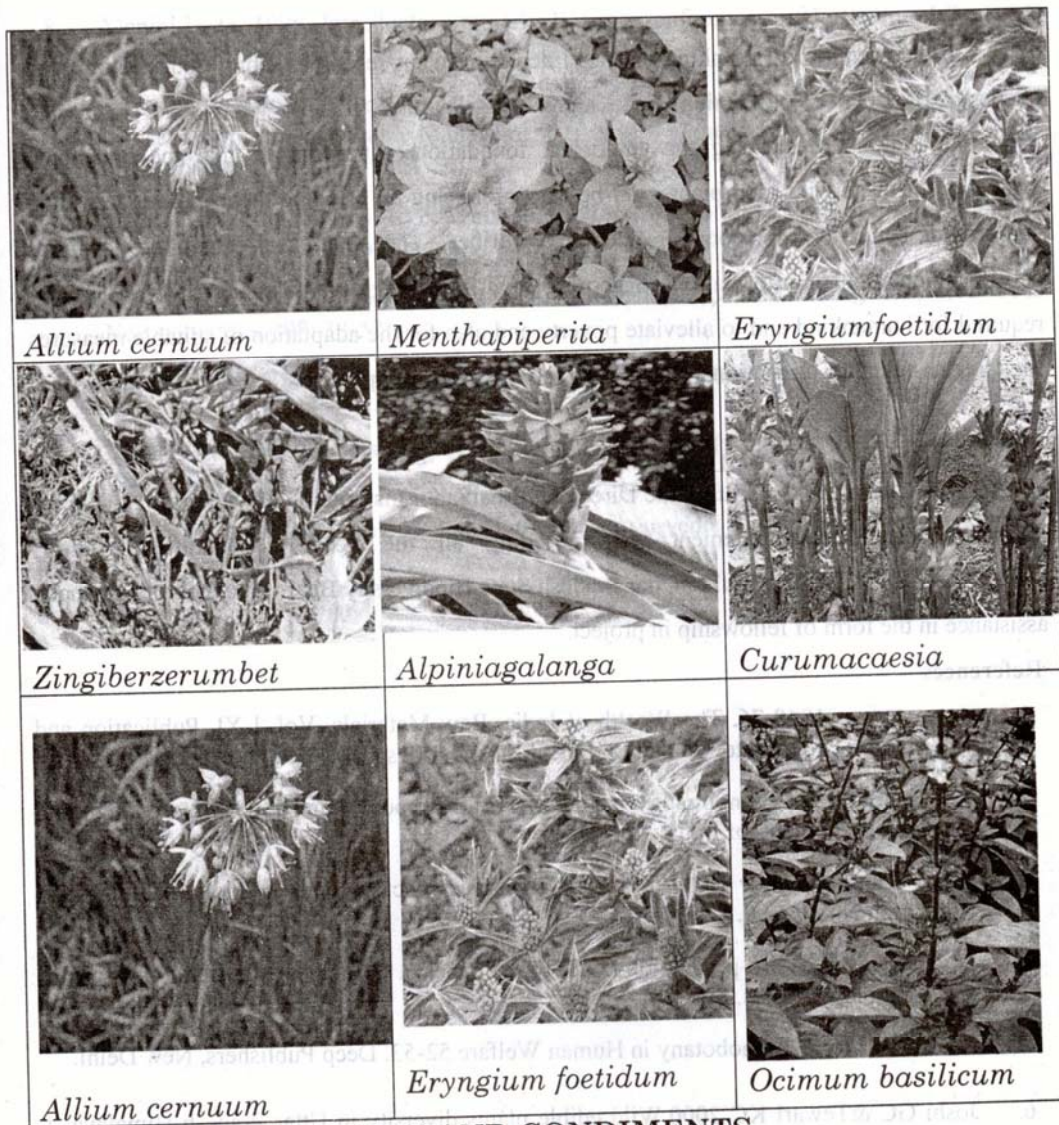
PLATE :8. FRUITS EATEN IN THE FORM OF,PICKLE AND CHUTNEY





# PLATE 9: OIL SEED PLANT

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**PLATE 10: SPICES AND CONDIMENTS**



In the scenario of shrinking land and depleting plant resources along with ecology, the challenge of the new millennium is to increase agricultural yield to feed the ever-growing population without destroying the ecological foundation. It is hoped that the nutritional evaluation of these wild food plants will be very promising by bringing them into modern food and provide better food for poor rural people and tribes. The survey of some more localities and documentation of information concerning food and forage plant, in the state is urgently required for humankind and to alleviate poverty and also for the adaptation of suitable measures for their sustainable utilization towards the socio-economic upliftment of the tribal and rural people.

#### ACKNOWLEDGMENTS

The authors are thankful to the Director, Birbal Sahni Institute of Palaeobotany, Lucknow for his constant encouragement and providing all the necessary facilities. Authors (S.K., D.K.G. & G.K.M) thankful to Uttar Pradesh State Biodiversity Board Lucknow for financial assistance in the form of fellowship in project.

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4. Diversifying U.S. crop-production CAST issue paper 6. Council of Agricultural science and technology, Ames, Iowa.
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