

Health Security in Ethnic Communities through Nutraceutical Flora of Gorakhpur District, Uttar Pradesh (India)

Manjulla Srivastava¹, Jayendra Nath Singh², Shail Pande^{1,}*

¹Department of Botany, Mahatma Gandhi PG College, Gorakhpur, Uttar Pradesh, India

²Department of Botany, Marwar Business School, Gorakhpur, Uttar Pradesh, India

Abstract

Health improvement mediated by “Nutraceuticals” has triggered an increased global interest and the current global market size of herbal Nutraceuticals is estimated between 30 and 60 billion. For the contribution to the human health and national economy, attempts were made to evaluate nutraceutical potentials of certain common plants available in the Gorakhpur district of Uttar Pradesh, India. This article justifies their use in the traditional medicines for the treatment of various diseases as well as for nutritive purposes.

Keywords: Gorakhpur, Nutraceuticals, traditional medicines

***Author for Correspondence** E-mail: shail.pande0210@gmail.com

INTRODUCTION

“Nutraceutical” name was coined by Stephan DeFelice in 1989. Nutraceuticals are nonspecific biological interventions used for health promotion, in prevention of malignant processes, and symptoms control. Owing to their safety and potential nutritional and therapeutic values, nutraceuticals have attracted considerable interest. Supplements are products derived from natural sources which are included with the diet with ingredients like vitamins, minerals, amino acids, but without any therapeutic effects. However, nutraceuticals have the additional advantage in the prevention or management of diseases or disorders and used as a conventional food [1–3].

Gorakhpur district lies between latitude 26°46' N and longitude 83°22' E. The district covers an area of 7,483.8 sq. km (2,889.5 sq. mi). It is bounded by Maharajganj district to the North, Kushinagar and Deoria districts in the East, Ambedkar Nagar, Azamgarh, and Mau districts to the South, and Sant Kabir Nagar district to the West.

A number of biological mechanisms and pathophysiological processes are influenced by Nutraceuticals and positioned well due to their safety [4, 5]. Considering the above aspects, an attempt was made to develop herbal dietary

supplements with high-nutraceutical value from commonly available plants.

MATERIALS AND METHODS

A study in the tribal villages of Gorakhpur district was carried out, during the year 2014 to 2017. During the survey, plants occurring in different regions are collected, photographed, and identified and also the general remarks like nature of growth, habit, habitat, month of collection, medicinal property were noted through interviews and discussions among the local people in and around the study area. Data were also collected through questionnaires in their local language. The identification was made with the help of expert (expert from Department of Botany, DDU Gorakhpur University, Gorakhpur), standard floras, and literature. The collected plant specimens are preserved by herbarium technique. The plants are listed alphabetically with botanical name with family. The plants with their name, family, nutritional value, medicinal value, are also mentioned.

RESULTS AND DISCUSSION

More than 100 nutraceutical floras have been collected from the study areas but 20 plants species of nutraceutical values have been described in the present article giving their botanical names with families and common names.

1. Name of the plant: *Alternanthera sessilis*

Linn.

Family : Amaranthaceae
Local name : Girni
English name : Prickly Amaranth
Locality : Maheshra village
Flowering : November-March

Taxonomy of the plant: Amaranth is an annual herb with sometimes red-tinged erect stems, sometimes ascending, 30 cm to 150 cm long, usually branched. Leaves ovate to rhombic-ovate, elliptic, lanceolate-oblong, or lanceolate, blades 1 cm to 12 cm long, 0.89 cm to 6 cm wide, smooth, leaf stalk 1 cm to 9 cm long. Flowers green, in axillary clusters in the lower part of the plant and in unbranched or branched spikes in the upper part, the lower clusters entirely without stamens as are the lower flowers of the spikes, the upper flowers in the spikes staminate.

Chemical composition: Herb contains hydrocarbons, ester, and sterols, such as stigmasterol, campesterol, β -sitosterol, a-spinasterol and β -spinasterol, a-stigmasteanol, and palmitates of sterol; it also contains 24-methylenecycloartanol and cycloeucalenol. Saponins have been isolated from the leaves. Roots contain lupeol. Young shoots contain protein and iron.

Tribe uses: It is used as Anti-inflammatory and antipyretic activity, night blindness. Mix 2 ounces of the juice of this plant with 4 ounces of goat or cow's milk. This mixture helps in building strength and vitality.

Boil together about a liter of fresh ponnanganni juice with 250 ml of sesame seed oil. Once the juice is absorbed into the oil, reduce the mixture to about 250 ml, cool and strain. Massaging this oil to the head gives good eyesight and memory.

2. Name of the plants: *Amaranthus spinosus*

Linn.

Family : Amaranthaceae
Local names : Katali Chaulai
English name : Prickly Amaranth, Spiny pigweed.
Locality : Moharipur village
Flowering : Nov-Mar

Taxonomy of the plant: An annual spinescent herb, 30 cm to 60 cm high. Leaves 3.75 cm long, ovate or oblong, obtuse. Flowers very numerous, sessile, in dense axillary clusters and in terminal dense or interrupted spikes.

Chemical composition: Leaves and stems contain n-alkanes, hentriacontane, octacosanoate, sterols including a-spinasterol, fatty acids, free alcohols, proteins and mixture of saponins, composed of oleanolic acid, D-glucose and D-glucuronic acid. It is a good source of calcium, also contains phosphorus, iron, nicotinic acid, ascorbic acid, and protein. Roots contain a-spinasterol, octacosanoate and a number of saponins, β -sitosterol, stigmasterol, campesterol, cholesterol and stearic, oleic and linoleic acids, quercetin and rutin also isolated from the plant.

Tribe uses: Considered sudorific and febrifuge, also used as lactagogue, leaves emollient. Infusion of shoots used in eczema.

3. Name of the plant: *Amaranthus viridis*

Linn.

Family : Amaranthaceae
Local Names : Jangali chauli
English name : Green Amaranth, Wild Amaranth, Green pigweed.
Locality : Sahararri village
Flowering : March-September

Taxonomy of the plant: An annual herb with stems erect or occasionally ascending, 10 cm to 80 cm long with branched stems. Leaves are triangular-ovate to narrowly rhombic, 2 cm to 7 cm long, 1.5 cm to 5.5 cm wide, hairless. Tip usually narrow and stalks 1 cm to 10 cm long. Flowers are green, in slender, panicle spikes, in leaf axils or at the end of branches. Both sexes are mixed throughout the spikes, but female flowers are more numerous.

Chemical composition: Principal constituents of this plant are saponins. It is rich in minerals and contains sterols and fatty acids in the seeds. The stem and leaves contain oxalic acid.

Tribe uses: The leaves act as emollient. Useful in scorpion bite. Found to be antipyretic, diuretic, antirheumatic, and treats ulcer. Plant has analgesic, antiemetic, laxative, and appetite stimulatory property. A decoction of the entire

plant is used to stop dysentery and inflammation. The plant is emollient and vermifuge. The root juice is used to treat inflammation during urination. It is also taken to treat constipation.

4. Name of the plant: *Basella rubra* Linn.

Family : Chenopodiaceae
Local name : Poi sag
English name : Water hyssop
Locality : Aharioulay Village
Flowering : September to December

Taxonomy of the plant: The leaves of this plant are succulent, oblong and 4 to 6 millimeters thick. Leaves are oblanceolate and are arranged oppositely on the stem. The flowers are small and white, with four or five petals. Its ability to grow in water makes it a popular aquarium plant. It can even grow in slightly brackish conditions. Propagation is often achieved through cuttings.

Chemical composition: The best characterized compounds in *Bacopa monnieri* are dammarane-type triterpenoid saponins known as bacosides, with jujubogenin or pseudo-jujubogenin moieties as aglycone units. Bacosides comprise a family of 12 known analogs. Other saponins called bacopasides I-XII have been identified more recently. The alkaloids brahmine, nicotine, and herpestine have been catalogued, along with D-mannitol, apigenin, hersaponin, monnierasides I-III, cucurbitacin, and plantainoside B.

The constituent most studied has been bacoside A, which was found to be a blend of bacoside A3, bacopacide II, bacopasaponin C, and a jujubogenin isomer of bacopasaponin C. These assays have been conducted using whole plant extract and bacoside concentrations may vary depending upon the part from which they are extracted. In one *Bacopa monnieri* sample, Rastogi et al. found this bacoside profile—bacopaside I (5.37%), bacoside A3 (5.59%), bacopaside II (6.9%), bacopasaponin C isomer (7.08%), and bacopasaponin C (4.18%).

Tribe uses: Leaves and young stems are cooked as vegetable. Plant is found to be laxative, diuretic, aphrodisiac, and tonic.

5. Name of the plant: *Boerhaavia diffusa*

Linn.
Family : Nyctaginaceae
Local name : Gadeapurena
English name : Horse Purslane
Locality : Ticaria forest
Flowering : September-December

Taxonomy of the plant: A perennial herb from a fusiform root. Leaves are opposite or subopposite, two of a node unequal, broadly ovate or suborbicular, obtuse to rounded or subcordate at the base. Flower is pendunculate, glomerulate clusters arranged in slender, long stalked, axillary, or terminal corymbs. Fruits are obovoid or subellipsoid, rounded above, slightly cuneate, below, broadly and bluntly 5-ribbed, very glandular throughout.

Chemical composition: Punarnava contains b-Sitosterol, a-2-sitosterol, palmitic acid, ester of b-sitosterol, tetracosanoic, hexacosanoic, stearic, arachidic acid, urosilic acid, Hentriacontane, b-Ecdysone, triacontanol, and so on.

Tribe uses: Leaf decoction useful in alleviating swelling of limbs during pregnancy. Leaf juice is applied to cure eye infection. Leaves in combination with other plants are useful in nephritis syndrome and low blood pressure. The leaves are eaten as a vegetable. The root juice is used to treat asthma, urinary disorders, leukorrhea, rheumatism, and encephalitis. In addition, the plant has many antimicrobial properties.

6. Name of the plants: *Bauhinia purpurea*

Linn.
Family : Caesalpiniaceae
Local name : Kachnar
English name : Butterfly tree, Geranium tree, Orchid tree.
Locality : Gonakpura Village
Flowering : August to November

Taxonomy of the plant: Plant is a small to medium-sized evergreen to semi-evergreen tree. Leaves rather longer than broad, shallowly cordate, two-lobed. Flowers large, rosy-purple, in few flowered terminal and axillary, brown-tomentose corymbs. Petals oblanceolate, with a long claw, twice the calyx. Pods 15-25 cm long, ligulate, flat pointed.

Chemical composition: The tree yields a gum (polysaccharides) and the bark contains large quantities of tannic acid, glucose, and gum. Plant also contains 25.6% crude protein consisting of a large number of essential and other amino acids (Ghani, 2003[**AQ: Please provide complete reference details for Ghani, 2003 or allow us to delete the citation.**]). Flowers contain astragalin, isoquercitrin, quercetin, pelargonidin 3-glucoside, and 3-triglucoside butein galactoside. Seeds yield alkaloids, trypsin, and chymotrypsin inhibitors; also two chalcone glycoside.

Tribe uses: Leaves and flowers are eaten as vegetables. Roots carminative. Leaves are laxative and anthelmintic. The plant is used in dropsy, pain, rheumatism, thigh swelling, convulsion, delirium febris, Datura intoxication, and blackness of lip or tongue. Bark acts as an astringent in diarrhea; its decoction is used as a wash in ulcers. The roots are carminative and the flowers laxative.

7. Name of the plant: *Cassia tora* Linn.

Family : Caesalpinaceae
Local name : Chakor
English name : Ringworm shrub
Locality : Ticaria forest
Flowering : August to November

Taxonomy of the plant: A large shrub. Leaves compound, 30 cm to 60 cm long; leaflets 8 to 12 pairs, oblong-obtuse, 5 cm to 15 cm long. Flowers showy, in spiciform, pedunculate, erect, racemes; petals bright yellow, broad-ovate. Pods 10 cm to 20 cm long, linear-oblong, with a broad wing down the middle of each valve, membranous.

Chemical composition: Leaves and fruits contain anthraquinone glycosides, chrysophanol, emodin, rhein, aloe-emodin, and chrysophanic acid. Leaves also contain essential oil composed of sesquiterpene and phenolic compounds, a xanthone, cassiollin (pinselin), kaempferol, 6-OH-muszizin glycoside, and tinnevellin glycoside. Root contains quinine pigments.

Tribe uses: Leaves are purgative and antiparasitic; bruised into paste is specific for

ringworm; decoction is a general tonic, considered cure for herpes, venereal diseases, and poisonous insect bites. Leaf juice is used to eradicate small helminthes. Marma also use to rub leaves into ringworms to cure. Decoction of the leaves and flowers is used as a mouthwash, wash for eczema, expectorant in bronchitis, and astringent in stomatitis. Stem bark is also efficacious against eczema. Effective in intestinal disorder, popular drug for Jaundice, cures night blindness.

8. Name of the plant: *Centella asiatica* Linn.

Family : Apiaceae
Local name : Brahamini
English name : Indian Pennywort
Locality : Moharipur village
Flowering : June-January

Taxonomy of the plant: A slender creeping herb. Leaves with long petiole, 1 to 3 from each node of the stems, lamina 1.3 cm to 6.3 cm diameter, orbicular-reniform, rather broader than long, shallowly crenate. Flowers in fascicled umbel, consisting of 3 to 4 pink, small, sessile flowers. Fruit 4 mm, ovoid, hard, and flat.

Chemical composition: The herb contains the alkaloids brahmine, herpestine, and a mixture of three bases. The herb also contains the saponins, hersaponin, and bacosides A and B. Bacosides A and B possess haemolytic activity. Hersaponin has cardiotoxic and sedative properties.

Tribe uses: Decoction is used in treating leprosy, useful in tuberculosis and popular brain tonic. Centella promotes intelligence, particularly, the power of retention. It relieves nervous irritation or agitation. It is used traditionally for enhancing memory and for treating psychosis, epilepsy, and anxiety.

9. Name of the plants: *Chenopodium album* Linn.

Family : Chenopodiaceae
Local name : Bathua Sag
English name : Lamb's Quarters, Goose Foot.
Locality : Aharioulay Village
Flowering : February-June

Taxonomy of the plant: It tends to grow upright at first, reaching heights of 30 cm to 80 cm, but typically becomes recumbent after flowering (due to the weight of the foliage and seeds) unless supported by other plants. The opposite leaves can be very varied in appearance. The first leaves, near the base of the plant, are toothed and roughly diamond-shaped, 3 cm to 7 cm long and 3 cm to 6 cm broad. The leaves on the upper part of the flowering stems are entire and lanceolate-rhomboid, 1 cm to 5 cm long and 0.4 cm to 2 cm broad. The leaves are waxy-coated, unwettable, and mealy in appearance, with a whitish coat on the underside. The tiny flowers are radially symmetrical and grow in small cymes on a dense branched inflorescence 10 cm to 40 cm long.

Chemical composition: Aerial parts contain essential oil, mineral salts, albuminoids, and other nitrogenous compounds, carotene, and vitamin C. Oxalic acid is also present in the aerial parts. Roots contain ecdysteroids, β -ecdysone, and polypodine B. These are very nutritious, high in protein, vitamin A, calcium, phosphorus, and potassium.

Tribe uses: The plants are laxative and diuretic; used in piles, dysentery, anorexia, and hiccup. Decoction of the plant is aperient, tonic, diuretic, and aphrodisiac. Leaves are anthelmintic; given in hepatic disorders and in splenic enlargement; infusion is used for curing intestinal ulcers. Flowers and buds are used in stomach trouble, weakness in children, and for fattening. It is considered to possess laxative and anthelmintic properties.

Bathua can be eaten as a vegetable, either steamed in entirety, or the leaves cooked like spinach as a leaf vegetable. Each plant produces tens of thousands of black seeds. These are very nutritious, high in protein, vitamin A, calcium, phosphorus, and potassium.

10. Name of the plant: *Cleome viscosa* Linn.

Family : Capparidaceae
Local name : Hurhuria sag
English name : Wild mustard
Locality : Ticaria forest
Flowering : May to September
Fruiting : August to November

Taxonomy of the plant: Terrestrial, annual, erect, aromatic (fetid smell) herb, up to 120 cm tall. Taproots white or brown. Stem erect, rounded, solid, (glandular) hairy. Stipules absent. Leaves compound, trifoliolate, alternate spiral, stalked, leaflets elliptic, (glandular) hairy on both side, margin entire, apex acute, base acute, pinnately veined. Flowers bisexual, single, axillary, stalked, yellow, 4 petals, free. Fruits a capsule.

Chemical composition: The plant contains eriodictyol-5-rhamnoside, a new glycoflavanone, new maringenin glycoside and the diterpene lactone, cleomeolide. Roots contain kaempferide-3-glucuronide, dihydrokaempferide-3-glucuronide, naringenin galactoside, dihydrorobinetin pyranoside, dihydro-kaempferol, xyloside, lupeol, betulin, betulinic acid, docosanoic acid, β -amyrin and β -sitosterol. Seeds contain umbelliferone derivative, cleosandrin and coumarino-lignans, cleomiscosins A-D. Seed oil is rich in linoleic acid.

Tribe uses: The plant is anthelmintic and used to increase sweating to reduce fever. The leaf juice is digestive and good for ear pain. The sap of leaves mixed with water or milk is applied to the eye in Java. The whole herb is rubbed on the body against rheumatism. The seeds contain an appreciable quantity of alkaloids. Leaf decoction is used for eyesore. Whole plant and its parts (leaves, seeds, and roots) are widely used in traditional and folkloric systems of medicine. Plant is reported to possess beneficial effects as an anthelmintic, antiseptic, carminative, antiscorbutic, sudorific, febrifuge, and cardiac stimulant.

11. Name of the plant: *Corchorus olitorius* Linn.

Family : Tiliaceae
Local names : Birnarcha, Pat sag
English name : Jew's Mallow, Jute
Locality : Ticaria forest
Flowering : August-October

Taxonomy of the plant: A tall annual, up to 2 m or more high. Leaves 6.3 cm to 10 cm long, elliptic-lanceolate, acute or acuminate, serrate, the lower serratures on each side prolonged into a filiform appendage, Flowers pale yellow.

Capsule 3 cm to 6.3 cm long, linear, cylindrical, erect.

Chemical composition: Seeds contain a cardiac glycoside, olitoriside. They also contain coroloside, deglucocoroloside, erysimoside, veticoside, helveticoside, corchoroside A, corchoroside, B, evonoside, strophanthidol, strophanthidin, and olitorin. Roots contain a triterpene, corosin and β -sitosterol.

Tribe uses: Leaves are used for ascites, pain, piles, and tumors. Plant is a folk remedy for aches and pains, dysentery, enteritis, fever, dysentery, pectoral pains, and tumors. Young leaves are added to salads while older leaves are cooked as a pot-herb. High in protein. The dried leaves can be used as a thickener in soups. A tea is made from the dried leaves. Immature fruits are added to salads or used as a potherb.

12. Name of the plants : *Euphorbia hirta*

Linn.

Family : Euphorbiaceae

Local names : Dudhi sag

English name : [AQ: Please provide the

English name for “*Euphorbia hirta* Linn.”]

Locality : Moharipur village

Flowering : Flowering and fruiting throughout the year.

Taxonomy of the plant: Terrestrial, annual, erect herb, up to 60 cm tall. Taproot white or brown. Stem rounded, solid, hairy, with abundant milksap. Stipules present. Leaves simple, not lobed or divided, opposite, sessile or stalked, elliptic, less than 2 cm long/wide, hairy on both sides, denser pilosity along the veins in the lower face, more scattered on the upper side; leaf base asymmetric, margin finely dentate, apex acute, base acute, 3-veined not to the top. Flowers unisexual, solitary or grouped together in an axillary cyme, stalked, petals absent. Fruit a capsule opening with 3 valves.

Chemical composition: Afzelin (I), quercitrin (II), and myricitrin (III) have been isolated from the methanolic extract of *E. hirta*. The chemical investigation of *E. hirta* has led to the isolation of rutin (IV), quercitin (V), euphorbin-A (VI), euphorbin-B (VII), euphorbin-C (VIII), euphorbin-D (IX), 2,4,6-tri-*O*-galloyl- β -D-glucose, 1,3,4,6-tetra-*O*-galloyl- β -D-glucose,

kaempferol, gallic acid, and protocatechuic acid. *E. hirta* also contains β -amyrin, 24-methylenecycloartenol, β -sitosterol, heptacosane, nonacosane, shikmic acid, tinyatoxin, choline, camphol, and quercitol derivatives containing rhamnose and chtolphenolic acid.

Tribe uses: Leaves capable of regulating heart beat and breathing rate. It improves lactation and cures tuberculosis. Helps in removing worms from children stomach. The latex of the plant is used to cure some wounds. The stalks and leaves are used to prepare a drink flavoring the milk of young mothers. It is also popular remedy for coughs, coryza, hay fever, bronchial infections, and respiratory disorders. In traditional Cambodian medicine, it is given to expel worms, bowel complaints and as a paste for gonorrhoea and other venereal diseases. A tincture is suitable for spasmodic dyspnea due to asthma, bronchitis, emphysema and pulmonary, cardiac disorders. Decoction of dry herbs is used for skin diseases. Decoction of fresh herbs is used as gargle for the treatment of thrush. Root decoction is also beneficial for nursing mothers deficient in milk. Roots are also used for snake bites [1]. The polyphenolic extract of *E. hirta* has antiamebic [6] and antispasmodic activity [7]. Quercitrin, a flavanoid glycoside, isolated from the herb showed an antidiarrheal activity [8]. It is reported to have a relaxation effect on respiration. The alcoholic extract of whole plant shows hypoglycemic activity in rats [9,10]. It has a sedative effect on the genitor-urinary tract.

13. Name of the plants : *Ipomea aquatica*

Forssk.

Family : Convolvulaceae

Local name : Kalmi sag

Common name: Swamp Cabbage

Locality : Ticaria forest

Flowering : July-November

Taxonomy of the plant: A glabrous trailer on ground or floating on water, stem hollow, rooting at the nodes. Leaves 5 cm to 12.5 cm long, ovate, ovate-oblong, deltoid, lanceolate or linear, base cordate, sagittate or hastate. Flowers 1-few in axillary cymes. Corolla 2.5 cm to 5 cm long funnel-shaped, pink of pale lilac. Capsule 8 mm, ovoid to globose.

Chemical composition: Leaves and young stems contain a high amount of protein. They are also rich in pigments, lutein and β -carotene.

Tribe uses: Plants are anthelmintic and carminative; useful in leukoderma, leprosy, fever, jaundice, biliousness, bronchitis, and liver complaints. It is considered very wholesome for females who suffer from nervous and general debility. The juice of the plant is used as an emetic in cases of arsenic or opium poisoning; it is also used in liver complaints. Leaves and seeds are cooling. The buds are used in the treatment of ringworm. Flower juice is given to inflamed eyes as a drop. The root juice is administered in cases of diarrhea. Juice of the plant is emetic and purgative and antidote to poisoning. Decoction used to remedy hemorrhoids. Leaf: Crushed leaves are applied to hardened pimples.

14. Name of the plants: *Melochia corchorifolia* Linn.

Family : Sterculiaceae

Local names : Dela sag

English name : [AQ: Please provide the English name for “*Melochia corchorifolia* Linn.”]

Locality : Aharioulay Village

Flowering : August-November

Taxonomy of the plant: *Melochia corchorifolia* has ovate leaves; the petioles are generally 5 cm long with linear stipules of 6 mm long. The veins extend to be from 7 cm long to 5 cm long [3]. This plant is an annual or perennial type of herb. It usually develops to be up to 1.3 m to 2.0 m tall; stem with line of stellate hairs. It's simple, ovate leaves are normally arranged spirally with the margins very intensely serrated. The blade of the leaves range from narrow to broad to the tip.

Chemical composition: Its leaves have been analyzed to have triterpenes (friedelin, friedelinol, and β -amyryn), flavonol glycosides (hibifolin, triflin, and melocorin), aliphatic compounds, flavonoids (vitexin and robunin), β -D-sitosterol, β -D-glucoside, and alkaloids. These naturally occurring alkaloids help in plant growth and contains nitrogen. The dried leaves of *Melochia corchorifolia* L have been shown to have high crude amount of protein, as

well as small amounts of lipids. It also contains critical dietary minerals such as potassium, calcium, and magnesium.

Tribe uses: Leaf and root are antidiysenteric. Leaf is applied as poultice for swellings of abdomen and sores. Leaf and stem boiled in oil is used to prevent bad consequences from bites of water snakes. The leaves have traditionally been utilized for several remedies. For example, it was used to reduce ulcers, abdominal swelling, headache, and chest pain. Among other benefits of the plants, its roots and leaves can help with snakebites, sores, and the sap can be treated on wounds due to Antaris.

15. Name of the plants: *Moringa oleifera* Linn.

Family : Moringaceae

Local names : Munga

English name : [AQ: Please provide the English name for “*Moringa oleifera* Linn.”]

Locality : Ticaria forest

Flowering : Between April and June

Taxonomy of the plant: The flowers are fragrant and bisexual, surrounded by five unequal, thinly veined, yellowish-white petals. The flowers are about 1.0 cm to 1.5 cm (1/2") long and 2.0 cm (3/4") broad. They grow on slender hairy stalks in spreading or drooping later flower clusters which have a length of 10 cm to 25 cm.

Flowering begins within the first 6 months after planting. In seasonally cool regions, flowering only occurs once a year between April and June. In more constant seasonal temperatures and with constant rainfall, flowering can happen twice or even all year-round.

Chemical composition: Different parts of *Moringa* contain a profile of important minerals and are a good source of protein, vitamins, beta-carotene, amino acids, and various phenolics. *Moringa* provides a rich and rare combination of zeatin, quercetin, beta-sitosterol, caffeoylquinic acid, and kaempferol.

Tribe uses: All parts of the tree is used in the treatment of venomous bites, rheumatism, and as cardiac and circulatory stimulant. Leaves are used in scurvy and catarrhal infection, also used

as emetic and helpful in hypertension. The young seed pods are most commonly eaten, while in others, the leaves are the most commonly used part of the plant. The flowers are edible when cooked and are said to taste like mushrooms. The bark, sap, roots, leaves, seeds, oil, and flowers are used in traditional medicine in several countries.

16. Name of the plants: *Oxalis corniculata*

Linn.

Family : Oxalidaceae

Local name : Khatibutti

English name : Yellow Wood Sorrel, Indian Sorrel

Locality : Moharipur village

Flowering : September-December

Taxonomy of the plant: A small creeping herb; stems rooting. Leaves palmately 3-foliolate, with very long, slender petioles; leaflets 1.2 cm to 2.5 cm long, obcordate cuneate. Flowers axillary, subumbellate on solitary long peduncles; petals 6 mm to 9 mm long, yellow, oblong, rounded, emerginate. Capsules 2 cm long, linear-oblong, 5-angled. All parts of the plant sour.

Chemical composition: The leaves contain oxalic acid, which gives them their sharp flavor. Perfectly all right in small quantities, the leaves should not be eaten in large amounts since oxalic acid can bind up the body's supply of calcium leading to nutritional deficiency. The quantity of oxalic acid will be reduced if the leaves are cooked. People with a tendency to rheumatism, arthritis, gout, kidney stones, or hyperacidity should take especial caution if including this plant in their diet since it can aggravate their condition.

Tribe uses: Leaves are eaten as salad and cooked as vegetable. Seeds consumed at the time of scarcity. Fresh juice of plant is given in dyspepsia, piles, anemia, and tympanitis. Infusion of leaves is used to cure opacity of cornea. *Oxalis Corniculata* plant is anthelmintic, anti-inflammatory, astringent, depurative, diuretic, emmenagogue, febrifuge, lithontripic, stomachic, and styptic. It is used in the treatment of influenza, fever, urinary tract infections, enteritis, diarrhea, traumatic injuries, sprains, and poisonous snake bites. An

infusion can be used as a wash to rid children of hookworms. The plant is a good source of vitamin C and is used as an antiscorbutic in the treatment of scurvy. The leaves are used as an antidote to poisoning by the seeds of *Datura* spp., arsenic, and mercury. The leaf juice is applied to insect bites, burns, and skin eruptions. It has an antibacterial activity. Yellow, orange, and red to brown dyes are obtained from the flowers. The boiled whole plant yields a yellow dye. An infusion of leaves is used to remove opacities of the cornea and is dropped into the eyes for itching lids. A decoction of leaves is used as a gargle.

17. Name of the plant: *Portulaca oleracea*

Linn.

Family : Portulacaceae

Local name : Kulfa

English name : verdolaga, pigweed [AQ: Did you intent to keep "verdolaga" as an

English name here. Please verify.]

Locality : Moharipur village

Flowering : August-October

Taxonomy of the plant: It has smooth, reddish, mostly prostrate stems and alternate leaves clustered at stem joints and ends. The yellow flowers have five regular parts and are up to 6 mm wide. Depending upon rainfall, the flowers appear at anytime during the year. The flowers open singly at the center of the leaf cluster for only a few hours on sunny mornings. Seeds are formed in a tiny pod, which opens when the seeds are mature. Purslane has a taproot with fibrous secondary roots and is able to tolerate poor, compacted soils, and drought.

Chemical composition: Purslane contains more Omega-3 fatty acids (alpha-linolenic acid in particular [4]) than any other leafy vegetable plant. Studies have found that Purslane has 0.01 mg/g of eicosapentaenoic acid (EPA). This is an extraordinary amount of EPA for a land-based vegetable source. EPA is an Omega-3 fatty acid found mostly in fish and some algae. It also contains vitamins (mainly vitamin A, vitamin C, Vitamin E [alpha-tocopherol] and some vitamin B, and carotenoids), as well as dietary minerals, such as magnesium, calcium, potassium, and iron. Also present are two types of betalain alkaloid pigments, the reddish betacyanins (visible in the coloration of the

stems) and the yellow betaxanthins (noticeable in the flowers and in the slight yellowish cast of the leaves). Both of these pigment types are potent antioxidants and have been found to have antimutagenic properties in laboratory studies.

Tribe uses: Cooked as sag mixed with other pot herbs available. Plant is refrigerant (reduces body heat), mild spasmodic, diuretic, and antiscorbutic. Used in scurvy and in diseases of liver, spleen, kidney, and bladder.

18. Name of the plants: *Spinacea oleracea*
Linn.

Family : Chenopodiaceae
Local name : Palak Sag
English name : Spinach, Garden Spinach
Locality : Maheshra village
Flowering : August-October

Taxonomy of the plant: A succulent herb; stem erect, up to 60 cm high. Leaves alternate, the lower ones very long petioled, attenuate, variously lobed or entire, fleshy. Flowers dioecious; males sessile, very numerous in terminal leafless spikes; females in axillary clusters. Capsules 1-celled, 1-valved, armed with two opposite short horns and crowned with the small remaining calyx.

Chemical composition: Leaves are rich in mucilage, fat, sugar, oxalic acid, iodine, lecithin, chlorophyll, and carotene. Leaves also contain stigmasterol, stigmastanol, α -spinasterol, patuletin, spinacetin, saponins, fatty acids, and hexadecenic acid. Spinacosides C and D have been isolated from the fresh aerial parts. Germinating seeds contain a number of enzymes. Spinasaponins A and B have been isolated from roots. Plant also contains spilanthol. The vitamin C, vitamin E, beta-carotene, manganese, zinc, and selenium present in spinach all serve as powerful antioxidants that combat the onset of osteoporosis, atherosclerosis, and high blood pressure. Anti-inflammatory.

Neoxanthin and violaxanthin are two anti-inflammatory epoxyxanthophylls that play an important role in regulation of inflammation and are present in unusual amounts in spinach.

Flavonoids—a phytonutrient with anti-cancer properties abundant in spinach.

Tribe uses: Leaves cooked as sag with several vegetables. Seeds are cooling and laxative. Used during jaundice. Diet one cup of spinach has nearly 20% of the RDA of dietary fiber, which aids in digestion, prevents constipation, maintains low blood sugar, and curbs overeating. Herb is mildly laxative and used as an emollient, demulcent, diuretic, and astringent; useful in fevers, scalding urine, joint pain, inflammations of the lungs, and bowels. Fresh plant is given for urinary calculi. Leaf juice is used as a gargle in sore throat. Seeds are laxative and cooling; used in difficult breathing, inflammation of the liver and in jaundice.

19. Name of the plant: *Trianthema monogyana* Linn.

Family : Aizoaceae
Local name : Pathari
English name : Horse purslane, carpetweed
Locality : Maheshra village
Flowering : August-October

Taxonomy of the plant: An annual, prostrate or ascending, succulent herb up to 60 cm tall, often much branched, glabrous, or finely pubescent, with a firm taproot. Leaves opposite, simple, those of the same pair very unequal in size; stipules small; petiole 0.5 cm to 3 cm long, dilated and sheathing at the base, pairwise connate into a funnel-shaped sheath; blade ovate-obovate to obcordate-oblong, 1 cm to 5 cm \times 0.5 cm to 4.5 cm, entire, purple or green. Flowers solitary, axillary, the lower part hidden by the sheath, bisexual, regular, pale pink.

Chemical composition: *Plant* contains the alkaloid trianthemine and the steroid ecdysterone. The flavonoid C-methylflavone has been isolated from the dichloromethane extract of the herb. The seeds contain 12.5% of a fatty oil, and the leaves contain carotene and oxalates. Pharmacological investigations of extracts revealed effects on the liver.

Tribe uses: Consumed as sag. Root is deobstruent. Used for treating asthma. Found effective in hepatitis and amenorrhea.

20. Name of the plant: *Tridax procumbens*

Linn.

Family : (Asteraceae)**Local name** : Manya arkha**English name** : Mexican Daisy, Coat

Buttons.

Locality : Ticaria forest**Flowering** : August-October

Taxonomy of the plant: Annual or biennial somewhat patently hispid herbs. Stem branched, creeping at base, suberect, or trailing above. Leaves ovate-lanceolate, or elliptic-rhomboid, with a cuneate base, obtuse or subacute, coarsely serrate or lobed, patently hispid, 2.5 cm to 7 cm long. Heads solitary, 1.2 cm to 1.5 cm across, on erect, 10 cm to 30 cm long peduncle. Marginal flowers 5 to 6 with pale yellow, 0.3 cm long ligules; disc flowers bright yellow.

Chemical composition: Aerial parts of the plant contain sterols, campesterol, stigmasterol, β -sitosterol and saturated and unsaturated C12-C22 fatty acids. Flowers contain flavonoids, luteolin, glucoluteolin, and quercetin.

Tribe uses: Tender plant parts consumed as sag. Leaves is styptic, antidiarrheal, and antidysenteric. The leaf juice exhibits antiseptic, insecticidal and parasitocidal properties. Leaf juice possesses antiseptic, insecticidal, and parasitocidal properties. The crushed leaves are applied to arrest bleeding in bruises and cuts. Leaves are also used for the treatment of bronchial catarrh, dysentery, diarrhea and for the restoration of hairs.

CONCLUSION

Nutraceutical herbs are considered to be a good source of dietary supplement on account of carbohydrates, proteins, fats, oils, and so on. Out of the huge numbers of herbs, hardly 24 to 26 types of herbs are consumed by the common people. Very recently, worldwide attention has been drawn toward the Lesser known or underutilized vegetables, widely consumed by the ethnic communities, which additionally provide health security. Such herbs are integral part of their diet as they get these plants in their immediate surroundings without any investment. Since both the nutritional and

health are guarded by these resources, therefore, such herbs are considered as "Nutraceutical." They possess preventive or curative properties against cardiovascular disease, ageing, diabetes, obesity, hypertension, insomnia, ageing, cancer, and so on. In addition to their nutra-medicinal properties, they also show biotic and abiotic tolerance, thrive well without any input, give new palatable taste, and are free of any insecticides or pesticides. Agro-technique should be developed for their mass cultivation, so that employment could be generated. Consumption of such valuable herbs should be encouraged through awareness so that larger section of population could include these herbs in their dietary menu to get immunity from different kinds of diseases automatically.

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