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ETHNOBOTANY AND CONSERVATION STATUS OF SAPONIN RICH PLANTS OF GANGETIC PLAIN HAVING BOTH MEDICINAL AND CLEANSING PROPERTIES

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Abstract

The potential cleansing plant genetic resources of India are investigated about 108 species. These plant species mostly contain saponins which may be harmful or beneficial to health. In present paper the plants having saponins with medicinal and cleansing values are investigated from the Gangetic plain. With a wide range of climatic conditions from the torrid to the arctic, India has rich and varied vegetation. India can be divided into eight distinct–floristic-regions, namely, the Western Himalayas, Assam, the Indus plain, the Ganga plain, the Deccan, Malabar, Western Ghats and the Anadanams. The area of Gangetic plain is approximately to 196000 square miles.

Key words: saponins, Gangetic plain, cleansing and medicinal properties.

Introduction

A few reports on soap, shampoo and detergent use of plants are available from India. Agarwal (1986) recorded 28 species of plants used for washing clothes and cleaning body and hai in India; Jain (1991) noted the uses of 13 plant species of India as detergent and shampoo; Mal & Joshi (1991) reported three less-known plants with cleaning property; Banerjee & Pal (1996) noted 4 species used as soap and shampoo by the tribes of North India; Pande & Pokharia (1999) reported 12 species of plants traditionally used as detergent by Himalayan people; Sing, *et al*. (2001) listed 16 plant species used as soap and detergent by the Meitei community of Manipur, Menon (in http:// www.mtnforum.org/resouces/library/menop02a.htm) listed 4 species used as shampoo by the people of Peppara Wildlife Sancturary in Kerala; Khanna (2002) recorded 2 plant species used for cleaning purpose in terai region of Uttar Pradesh; Saklani & Rao (2002) recorded 2 species used as soap and shampoo by people of NE India. Manadhar (2001) tabulated 31 species of traditional soap, shampoo and detergent plants of Nepal, all of which are found in India (except Orneocnide) and possibly used by Nepalis in the adjoining Sikkim and mountainous West Bengal. Besides, a few stray reports on such use of plants from India (given with the mode of use of the species) are available in literature. Present search reveals that there are about 108 species of plants with potential cleaning properties belonging to 87 genera and 52 families of vascular plants in India. These include 25 species of indigenous cultivated plants with available wild forms, 31 species of introduced plants and exotic weeds and 51 species of exclusively wild plants, including 10 species of wild relatives of cultivated plants. Ten dominant families of soap plant resources traditionally used for washing and cleaning in India are: Leguminousae (15 spp.), Sapindaceae (6 spp.), Rubiaceae (5 spp.), Euphorbiaceae (5 spp.), Sapotaceae (3 spp.) and Asteraceae (3 spp.). These ten dominant families contribute 53 species (50 %) of total soap plant resources of India. The growth form of the soap plant resources include herbs (37 spp.), climbers (13 spp.), shrubs (24 spp.) and trees (33 spp.). of the 108 species of soap plant resources of India, those exclusively used as soap for cleaning body parts, as shampoo for cleaning hai and as detergent for washing clothes include 20, 33 and 41 species respectively. 3 species used both as soap & detergent, 4 species as both shampoo & detergent. Plant parts used as soap, shampoo and detergent includes : extracts of roots, rhizomes and tubers (12 spp.); leaves (11 spp.), barks (15 spp.), whole

plant (19 spp.), flowers and inflorescence (4 spp.), fruits & seeds (32 spp.), plant ash (14 spp.).

Besides this, Checklist of Medicinal Plant of South East Asia developed by Asian Regional Centre for biodiversity includes 21 species of vascular plants used for washing hai (htt://www.arcbc.org.ph/arcbcweb/medicinal_plants_page5. htm–accessed on 16.9.2017). of these 9 species viz., *Aerva lanata* (L.) A.L. Juss ex Schult., *Asplenium nidus* L., *Klenovia hospita* :, *Morinda citrifolia* L., *Ophioglossum pendulum*., *Archidendron ellipticum* (Blume) I.C. Nielsen, *Plantago major* L., *Sterculia foetida* L. and *Vitis trifolia* L. occur in India are not included here due to lack of confirmation.

Gangetic plain is bounded on the north and north-east by portion of the main chain of the western Himalaya and on the east by Bengal. On the south and south-west of the Son , and flowing into the Ganges and Yamuna from these direction , their rise . The watershed extends along the northern slopes of the numerous groups of hills known collectively as the Vindhya mountains , and which separate the Gangetic plain from the Narmada valley, Mount Abu, a solitary out-lie of the Aravalli Hills, and rising to 5,653 feet above the sea , is not included . The area thus defined, contains the whole of the upper Gangetic plain as far as the confines of Bengal, also the Siwalic range of hills , the Sub-Himalayan tracts from the Yamuna of the Gandak. The large piece of country lying to the south-west of the Gangetic Plain proper includes a portion of Bundelkhand in Centre India, also Bundelkhand , the Malwa Plateau, Eastern Rajputana and a small piece of the W. Panjab in the neighborhood of Delhi .

Material and Methods

All the plants of Gangetic plain which are in use as cleansing material, were investigated for saponins by following methods-

Collection, sample conditioning and extract preparation

Plant material (leaves and inflorescences) was collected in optimum phyto-sanitary and vegetative development condition. (The sample was cleaned, dried (48h, 45ºC), crushed and degreased (Soxhlet, n-hexane). This treated material was stirred mechanically (5h), using water, methanol, methanol-water (95:5), ethanol-water (95:5) and ethanol (1g:10ml plant/solvent) until the sample was depleted. Crude extracts were filtered and concentrated at reduced pressure in a Bûchi R114 rotary evaporator and stored (4ºC). Extracts were identified as: Aqueous extract (AE), hydromethanolic extract (HME), methanol extract (ME), hydroethanolic extract (HEE) and ethanolic extract (EE).

Preliminary assays for saponins recognition

The presence of saponosides in extracts was verified with several scientifically recognized qualitative tests for preliminary evidence of secondary metabolites: the foam test (based on the surfactant capacity of saponins), the Rosenthaler test (violet colors are obtained with pentacyclic saponins) and the Liebermann-Burchard test (pink or red colors for triterpenicgenins and blue or green for steroidal).

These tests were supplemented by a thin layer chromatography analysis (TLC). Different chromatographic conditions were tested, but the best ones were silica gel 60 F-254 as stationary phase and chloroform/ethanol/water (8:2:0.5) as eluent. To visualize the spots, plates were sprayed with various chromogenic agents (p-anisaldehyde, vanillin, antimony trichloride, silver nitrate and iodine vapors) and put on heat. Digitonin, hecogenin, diosgenin, cholesterol, and glucose were used as positive reference standards (1 mg/ml).

Presence of the carbohydrate fraction attached to the genins was evident on 60 F-254 chromatography plates (stationary phase) and ethyl acetate/acetic acid/methanol/water (10:4:4:2) as mobile phase. Spots were visualized by spraying a diphenylamine/aniline/phosphoric acid/acetone mixture (4g:4 ml:20 ml:200 ml).

Phytochemical screening

Phytochemical screening was performed with the ethanolic extract of the plant using Molish (carbohydrates), foam, Rosenthaler, hemolysis (saponins), Folin-Ciocalteu (polyphenols), chloride ferric salt gelatin (tannins), ammonia vapors, Shinoda (flavonoids), Arnow (phenylpropanoids), Bornträger (anthraquinone), Lieberman-Burchard, Salkowski (terpenes/steroids), vanillin/HCl (iridoids), Dragendroff, Mayer, Wagner, Tanred, Erhlic, Reineckato, Valser (alkaloids), Baljet, Kedde, m-dinitrobenzene (cardiotonic agents), NaOH/heat/UV light (coumarins), m-dinitrobenzene, Raymond, Mathoud and CCD (terpene lactones) tests. The crosses system was used to specify qualification of secondary metabolites.

Indirect quantification ofsaponosides

Prior analytical determination, an acid hydrolysis process with HCl 2.5 N was performed (95 ºC, 3h with constant agitation). The hydrolyzed material was neutralized with sodium bicarbonate and the Dinitrosalicylic Acid reagent (DNS) was combined with each extract (1:1). The mixture was vigorously stirred,

heated in a water bath (100 ºC, 5 min) and cooled in an ice-water bath. Distilled water was then added (5 mL), and absorbance was read at 540 nm in a Helyos-Gama spectrophotometer and interpolated on a calibration curve prepared with glucose (50-1600 µg/ml).

Direct quantification of saponosides

In this method 2 ml of each extract (AE, HME, ME, HEE, EE), 1 mL of A reagent (p-anis aldehyde 0.5 % in ethyl acetate) and 1 mL of B reagent (H_2SO_4 in 50 % ethyl acetate) were mixed and homogenized in a vortex. The mixture was immediately heated in a water bath (60 ºC, 20 min), and then each tube was placed in a room temperature water bath and protected from light during the reaction. Optical density of samples was determined at 430 nm and interpolated into a calibration curve using digitonin (20-1 200 µg/m).

Results and Discussion

After above chemical investigation about 21 plants species were found having saponin rich -

1. ***Acacia concinna* (Willd.)DC.**

Family: Mimosaceae (Touch-me-not family)

Synonyms: Acacia hooperiana, Acacia sinuata, Mimosa concinna

Vernacular name: Shikakai, Soap-pod • Hindi: Kochi, Reetha, Shikakai • Marathi: Reetha • Tamil: Shika, Sheekay, Chikaikkai • Malayalam: Cheeyakayi, Chinikkaya, Shikai, Cheenikka • Telugu: Cheekaya, Chikaya, Gogu • Kannada: Sheegae, Shige kayi, Sigeballi • Oriya: Vimala • Urdu: Shikakai•Assamese: Amsikira, Kachuai, Pasoitenga, Suselewa• **Sanskrit:** Bahuphenarasa, Bhuriphena, Charmakansa, Charmakasa, Phenila. **Discription:** Shikakai is a climbing, most well-known for the natural shampoo derived from its fruit. Thorny branches have brown smooth stripes - thorns are short, broad-based, flattened. Leaves with caducous stipules not thorn-like. Leaf stalks are 1-1.5 cm long with a prominent gland about the middle. Leaves are double-pinnate, with 5-7 pairs of pinnae, the primary rachis being thorny, velvety. Each pinnae has 12-18 pairs of leaflets, which are oblong-lance shaped, 3-10 mm long, pointed, obliquely rounded at base. Inflorescences is a cluster of 2 or 3 stalked rounded flower-heads in axils of upper reduced leaves, appearing paniculate. Stalk carrying the cluster is 1-2.5 cm long, velvety. Flower-heads about 1 cm in diameter when mature. Flowers are pink, without or with reduced subtending bracts. Pods are thick, somewhat flattened, stalked, 8 cm long,1.5-1.8 cm wide.

Medicinal and cleansing uses: Shikakai is a commonly used herb that has many remedial qualities. It is popularly referred as "fruit for the hai" as it has a naturally mild pH, that gently cleans the hai without stripping it of natural oils. Shikakai is used to control dandruff, promoting hai growth and strengthening hai roots. Its leaves are used in malarial fever, decoction of the pods are used to relieve biliousness and acts as a purgative. An ointment, prepared from the ground pods, is good for skin diseases. Pod used as detergent in terai region of Uttar Pradesh (Khanna, 2002). Indians use decoction of pod power for washing hai & paste of pod in skin diseases (D'amelio, 1999).

Status: exclusively wild plant. Not endangered .

Photograph 1: *Acacia concinna*

2. ***Agave americana* L.**

Family: Asparagaceae

Synonyms: *Agave ramose* Moench.

Vernacular name: Rambans (Hindi), Bilatipat (Bengali), Century Plant (Eng.), Maguey, American Aloe.

Description: Solitary or slowly clumping large leaf succulent with a basal rosette (up to 4 m wide). Leaves: Thick and massive grey-blue up to 150-200 cm long and 25 cm wide, and have sharp spines on the margins and tips. The margin spines are re curved like fishhooks and the tip spines can be more than 2, 5 cm long. **Flowers:** The inflorescence of the *Agave americana* is branched can reach epic proportions, soaring 3 -7 m or more, and bears large (6-10cm) yellow-green flowers. Inflorescences look like asparagus spears as they grow.

Medicinal and cleansing Uses: The heart of the plant is very rich in saccharine matter and can be eaten when baked. Sweet and nutritious, but rather fibrous. Seed - ground into a flour and used as a thickener in soups or used with cereal flours when making bread. Flower stalk - roasted. Used like asparagus. Sap from the cut flowering stems is used as a syrup or fermented

into pulque or mescal. The sap can also be tapped by boring a hole into the middle of the plant at the base of the flowering stem. The sap is diaphoretic, diuretic and laxative. An infusion of the chopped leaf is purgative and the juice of the leaves is applied to bruises. The plant is used internally in the treatment of indigestion, flatulence, constipation, jaundice and dysentry. Steroid drug precursors are obtained from the leaves. A gum from the root and leaf is used in the treatment of toothache. The root is diaphoretic and diuretic. It is used in the treatment of syphilis. All parts of the plant can be harvested for use as required, they can also be dried for later use. The dried leaves and roots store well. Plant-ash used by Himalayan people for washing clothes (Pande & Pokharia, 1999).

Status: Original habitat is unknown but it grows wild in Mexico. Introduced in Punjab and Bombay Presidency as a hedge plant. It is exotic in India. Mostly cultivated as ornamental plant.

Photograph 2: *Agave americana*

3. *Albizia lebbeck (*L.) Benth.

Family: Mimosaceae

Synonyms: *Acacia lebbeck* (L.) Willd. *Acacia lebbek* (L.) Willd. *Mimosa lebbeck* L. *Mimosalebbek* L.

Vernacular name : Siris (Hind., Beng., Ori.); Kattuvaka (Mal.); Sirisha (Sans.); East Indian walnut (Eng.)

Description: Deciduous tree, growing to 30 m tall in native forests. In open situations, trees develop a spreading, sometimes multi-stemmed habit, to 25 m tall and 30 m across, with low branching. Can develop root suckers, and produces dense coppicing from cut stumps. Bark rough, grey, somewhat flaky; inner bark reddish. Stems terete, punctate, green, puberulous or pubescent when young, rapidly becoming grey brown with time. Leaves bipinnate with (1 -) 2 - 4 (- 5) pairs of pinnae along a rachis 8 - 9 cm long. Pinnae comprise rachilla 5 - 10 cm long, bearing 3 - 11 pairs of asymmetric (midrib closer to the abaxial margin), oblong to elliptic-oblong leaflets 1.5 - 6.5 cm long and 0.5 - 3.5 cm wide, nyctinastic when young, fixed in older leaves. Inflorescence a terminal or axillary (often 2 or more per axil), 5 - 9 cm diameter semi-globular cluster of 15 - 40 flowers; peduncles 5 - 10 cm long. Flowers, fragrant, with pedicels 1.5 - 4.5 (- 7) mm long; calyx puberulous, 3.5 - 5 mm long; corolla 5 - 11 mm long, terminating in 5 triangular lobes pubescent at the apex; filaments numerous, 1.5 - 3 cm long, fused at the base, predominantly white to cream in colour, tipped with pale green, and becoming dark yellow with age. Pods flat, glabrous, coriaceous, indehiscent, 12 - 35 cm long, and 3 - 6 cm wide, undulating along the sutures, light yellowish-brown when mature, containing 3 - 12 seeds.

Medicinal and cleansing uses: The bark contains saponins and tannins, used for making soap and in tanning, respectively. Bark used as detergent in Karnataka, Tamil Nadu, Goa, Kerala & Lakhadeev (Jain, 1991). Various parts of the tree are used in folk remedies for many ailments. It is also used as an ornamental and avenue tree, and sometimes as a shade tree in coffee and tea.

Status: Native to India, Pakistan, Bangladesh, the Andaman Islands, Burma, S China, NE Thailand, and Malaysia; possibly also Sri Lanka, the eastern islands of Indonesia, Africa and N Australia. Naturalized in: Many countries of the tropics and subtropics. Found in deciduous and semi-deciduous monsoon forests, and rainforests in its native habitat, and in a variety of situations in the humid and semi-arid tropics and subtropics.

Photograph 3: *Albizia lebbeck*

4. *Albizia procera* (Roxb.)Benth.

Family: Fabaceae - Mimosoideae

Synonym(s): *Acacia procera* (Roxb.) Willd. *Mimosa elata* Roxb. *Mimosa procera* Roxb.

Vernacular names: (Bengali): koroi (English): East Indian Walnut : (Hindi) : gurar, karak, safedsiris (Nepali): dun siris, setosiris, (Tamil): kondavagei, velvagai.

Description: *Albizia procera* is a tree with an open canopy, up to 30 m tall and trunk of 35 (60 max.) cm in diameter; bole straight or crooked, up to 9 m. Bark smooth, pale grey-green, yellowish-green, yellowish-brown or brown with horizontal ridges; under bark green, changing to orange just below the surface; inner bark pink or straw coloured; branches terete, glabrous. Leaves bipinnate with 2-5 pairs of subopposite pinnae; rachis 10-30 cm, glabrous with a gland 1-2.5 cm above the base; gland narrowly elliptical, 4-10 mm long, sessile, flat and disclike or concave with raised margins; pinnae 12-20 cm long, glabrous; leaflets 5-11 pairs per pinna, opposite, rigidly chartaceous to sub-coriaceous, asymmetrically ovate to sub-rhomboid, 2-4.5 (6 max.) × 1-2.2 (3.2 max.) cm; base asymmetrical; apex rounded or sub truncate, often emarginate, mucronate; both surfaces sparsely appressed puberulous, rarely glabrous on top side. Inflorescence composed of pedunculate glomerules collected in an axillary, sparsely puberulous panicle up to 30 cm long; peduncle (0.8 min.) 1.5-2.3 cm long, 2-5 together; flowers 15-30 per glomerule, sessile, uniform (central flowers usually larger than marginal ones), bisexual. Fruits rich red or reddish-brown, flattened pods 10-20 × 1.8-2.5 cm, chartaceous, glabrous, with distinct marks over the seeds; mature pods each containing 6-12 seeds, usually remaining on the tree until the whole twig bearing the pods is shed; seeds small, greenish-brown, elliptical to round, flat, with a hard, smooth seed coat, 7.5-8 × 4.5-6.5 × 1.5 mm. The genus is named after the 18th-century *Florentine nobleman* and *naturalist Filippodel Albizzi*. The species name is derived from the Latin word 'procerus', meaning very tall or high, possibly alluding to the height the species can attain.

Medicinal and cleansing Uses: Leaves are poulticed onto ulcers in India. Bark considered useful in pregnancy and stomachache. Bark given with salt as a medicine for water buffalo.Bark, leaf, and root contain saponin. Hydrolysis of the saponin yields machaerinic acid.Pod and stem bark used as shampoo by tribals in NE India (Saklani & Rao, 2002).

Status: *A. procera* is introduced species in India. It is widely distributed from India and Myanmar through Southeast Asia to Papua New Guinea and northern Australia. The habitat ranges from monsoon forest, mixed deciduous forest, savannah woodlands, pyrogenic grassland, roadsides and dry gullies, to stunted, seasonal swamp forest. It is commonly found in open secondary forest and in areas with a pronounced dry season. It is susceptible to frost and has moderate light requirements. Once established, it becomes drought tolerant. Best development occurs in areas with more than 2500 mm annual rainfall and mean annual temperature of 21-32 deg. C. If the area is not burned, *A. procera* will colonize alang-alang (*Imperata cylindrica*) grassland. Good survival and rapid early growth have been reported in afforestation trials on both saline and alkaline soils, which are widely cultivated in agroforestry systems. Native of Australia, Brunei, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Taiwan, Province of China, Thailand, Vietnam.

Photograph 4: *Albizia procera*

5. *Anagallis arvensis* L.

Family: Primulaceae

Vernacular name: Jainghani (Hind.); Dhabbar (Punj.); Sabunejhar (Nep.); Scarlet Pimpernel, Blue Pimpernel (Eng.)

Description: Perennial or annual, without rosettes, not stoloniferous; stems creeping to weakly erect, 5–30 cm long, glabrous, angular with 4 longitudinal keels.Leaves opposite, ovate to oblong-ovate, occasionally narrowly so, usually 5–25 mm long; sessile. Corolla 5-lobed, 5–12 mm diam., red, pink, orange or blue. Filaments villous with multicellular hais; staminodes lacking. Capsule 5-ridged, 3–5 mm diam.

Medicinal and cleansing Uses : Diuretic, diaphoretic and expectorant . Doctors have considered the herb remedial in melancholy and in the allied forms of mental disease, the decoction or a tincture being employed. The expressed juice has been found serviceable

in the beginnings of dropsies and in obstructions of the liver and spleen. A tincture has also been used for irritability of the urinary passages, having been found effective in cases of stone and gravel. The distilled water or juice is much celebrated by French dames to cleanse the skin from any roughness, deformity or discolourings thereof. Plants used for bathing in Nepal (Manandhar, 2001)

Status: The native range of the species is Europe and Western and North Africa. The species has been distributed widely by humans, either deliberately as an ornamental flower or accidentally. A. arvensis is now naturalised almost worldwide, with a range that encompasses The Americas, Central and East Asia, the Indian Subcontinent, Malesia, the Pacific Islands, Australasia and Southern Africa. In India, it is wildly distributed.

Photograph 5: *Anagallis arvensis*

6. *Asparagus racemosus* Willd.

Family: Asparagaceae

Vernacular name: Satawar (Hind.); Satamuli (Beng.); Shatavali (Mal.); Shimaishadavari (Tam.)

Discription: The plant is a climber, climbs upto 1-3 m high. It is an extensively scandent spinous, much branched under shrub. Roots are numerous fusiform, succulent and tuberous with a diameter of 0.5 to 1.5 cm arises as a cluster from the basal end of the stem. Stem is woody, sparsely covered with recurved spines. Leaves are reduced to small scales called as cladode which are in tufts of 2-6 in a node, finely accuminate, falcate divaricate and constitute the main photo-synthetic organs . Inflorescence is a branched raceme. Flowers are white, fragrant, solitary or fascicles have a width of 0.3-0.4 cm . Berries are globoseor obscurely 3 lobed. Seeds are black in color and hard with brittletesta.

Medicinal and cleansing uses: Two new steroidal saponins, shatavaroside A and shatavaroside B together with a known saponin, filiasparoside C, were isolated from the roots of *Asparagus racemosus*. Five steroidal saponins, shatavarins VI-X, together with five known saponins, shatavarin I (or asparoside B), shatavarin IV (or asparinin B), shatavarin V, immunoside and schidigerasaponin D5 (or asparanin A), have been isolated from the roots of *Asparagus racemosus Asparagus racemosus* (Shatavari) is recommended in Ayurvedic texts for the prevention and treatment of gastric ulcers, dyspepsia and as a galactogogue. *A. racemosus* has also been used by some Ayurvedic practitioners for nervous disorders.Roots used for washing clothes in Nepal (Manandhar, 2001).

Status: *Asparagus racemosus*is common throughout Sri Lanka, India Indonesia, Australia & tropical Africa, and the Himalayas. India: tropical & subtropical parts, common in Upper Gangetic plains, Bihar plateau, Andamans & ascending to 1500 m in Himalayas. Introduced but wildly distributed in India.

Photograph 6: *Asparagus racemosus*

7. *Balanites aegyptiaca* (L.) Del

Family: Balanitaceae

Synonym: *Xymenia aegyptiaca* L.

Vernacular name: Desert date, soap berry tree or bush, Throntree (Eng.) Hingan (hind., Beng.); Ingudihala

(Mal.); Nanjunda (Tam.); Angavriksha (Sans.).

Description: Desert Date is a thorn tree growing up to 30 ft tall, with a generally narrow form. The branches are thorny. The dark green compound leaves are made up of two leathery leaflets which are variable in size and shape. Leaf-stalk is channeled, 0.5-2 cm with a short rachis. Leaflets are entire, generally up to 6 cm long, 4 cm broad, although can be smaller (1-3 × 0.3-1.5 cm). Greenish stalkless flowers are borne in few-flowered fascicles. Flower buds are ovoid and velvety. Individual flowers are 8-14 mm in diameter and generally greenish-yellow. Flower-stalks are densely greyish, velvety and rarely reaching 1 cm in length. Fruit is ellipsoid, up to 4 cm long, green. Ripe fruit is brown or pale brown with a brittle coat enclosing a brown or brown-green sticky pulp and a hard stone seed.

Medicinal and cleansing uses: Desert date fruit is mixed into porridge and eaten by nursing mothers, and the oil is consumed for headache and to improve lactation. Oil from the fruit is used to dress. Bark extracts and the fruit repel or destroy freshwater snails and copepods, organisms that act as intermediary hosts host the parasites Schistosoma, including Bilharzia, and guinea worm, respectively. Existing worm infections are likewise treated with desert date, as are liver and spleen disorders. A decoction of the bark are also used as an Abortifacient. The seed contains 30-48% fixed (non-volatile) oil, like the leaves, fruit pulp, bark and roots, and contains the sapogenins diosgenin and yamogenin. Saponins likewise occur in the roots, bark wood and fruit. Diosgenin can be used to produce hormones such as those in combined oral contraceptive pills and corticoids. Fruit juice used in cleaning silk and cloth due to mild acid in it (Agarwal, 1986, Jain, 1991).

Photograph 7: *Balanites aegyptiaca*

Status: Natural distribution is obscured by cultivation and naturalization. It is believed indigenous to all dry lands south of the Sahara, extending southward to Malawi in the Rift Valley, and to the Arabian Peninsula, introduced into cultivation in India. It has wide ecological distribution, but is mainly found on level alluvial sites with deep sandy loam and free access to water. After the seedling stage, it is intolerant to shade and prefers open woodland or savannah for natural regeneration. It is a lowland species, growing up to 1000 m altitude in areas with mean annual temperature of 20 to 30°C and mean annual rainfall of 250 to 400 mm. India: throughout drier parts of peninsular India particularly in Karnataka & Tamil nadu, W. Rajasthan& from Punjab to West Bengal & Sikkim; NE Africa & Arabia.

8. *Balanites roxburghii* Planch.

Family: Balanitaceae

Synonym(s): *Agialidaa egyptiaca* Kuntze, *Balanites ferox* G. Don. *Balanites racemosa* Chiov., *Balanites roxburghii* Planch, *Ximeniaa egyptiaca* L.

Vernacular names: Hin (Bengali) ,Desert date, Egyptian myrobalan, heglig, Jericho balsam, simple thorned torch tree, simple-thorned torchwood, soap berry tree, torch wood (English), Engua, hingan, hingn, hingot, hingota, hongot, ingudi (Hindi) Ingudi (Sanskrit), Nanjunda (Tamil), Desert date (dried fruit), Egyptian myrobalan, heglig berries (Trade name).

Description: *Balanites aegyptiaca* is a multibranched, spiny shrub or tree up to l0 m high. Crown rounded, dense (but still seen through) with long stout branchlets. Trunk and bark grey, deeply fissured longitudinally. Leaves compound and spirally arranged on the shoots, dark green with 2 firm coriaceous leaflets; dimensions and shapes varying widely. Petiole canaliculate, from 5 mm to 20 mm with a short rachis. Most accounts indicate a maximum length of 8 mm for Uganda. Margin of each leaflet entire; lamina generally up to 6 cm long, 4 cm broad, although apparently smaller (1-3 × 0.3-1.5 cm) in the Sahara and in Palestine. Inflorescence a sessile or shortly pedunculate fascicle of a few flowers. Flower buds ovoid and tomentose. Individual flowers hermaphroditic, pentamerous an actinomorphic, 8-14 mm in diameter and generally greenish-yellow. Pedicels densely greyish, pubescent and rarely reaching 10 mm in length. The usual length is about 8 mm. Fruit ellipsoid, up to 4 cm long, green. Ripe fruit brown or pale brown with a brittle coat enclosing a brown or brown-green sticky pulp and a hard stone seed.

Medicinal and cleansing uses: Decoction of root is used to treat malaria. Roots boiled in soup are used

against oedema and stomach pains. Roots are used as an emetic; bark infusion is used to treat heartburn. Wood gum mixed with maize meal porridge is used to treat chest pains. The bark is used to deworm cattle in Rajasthan. An emulsion made from the fruit or bark is lethal to the freshwater snails that are the host of miracidia and cercaria stages of bilharzia and to a water flea that acts as a host to the guinea worm. A fish poison can be obtained from the fruit, root and the bark. The active agent of the poison is saponin. The compound is toxic to fish but does not affect mammals and rapidly becomes inert, so that fish retrieved are edible. Pulp of fruit used for cleaning silk & cotton (Singh & Singh, 1998).

Status: *B. aegyptiaca* has wide ecological distribution. Natural distribution is obscured by cultivation and naturalization. It is believed indigenous to all dry lands south of the Sahara, extending southward to Malawi in the Rift Valley, and to the Arabian Peninsula. Introduced into cultivation in India. In India, it is particularly found in Rajasthan, Gujarat, West Bengal, Sikkim, Madhya Pradesh, and Deccan.

Photograph 8: *Balanites roxburghii*

9. *Borago officinalis* L.

Family: Boraginaceae

Vernacular names: Bee plant, Borage (Eng.)

Description: Borage is an annual self seeding plant, borago officinalis, that bears many leafy, branched, hollow succulent stems covered with stiff white hais. Its sprawling habit makes it difficult to contain as a decorative plant, but its delightful blue, star shaped flowers with their cone of prominent black anthers, are about 3/4 inch in diameter, and are certainly a decorative element. The whole plant looks grayish green, due to the hais on every surface.

Medicinal and cleansing uses: Diuretic, laxative, depurative and sudorific. The infused flowers are effective against colds and bronchitis. Flowering tops used in cleaning of skins and helps remove impurities from clogged pores (D' Amelio, 1999).

Status: Borage (*Borago officinalis* L.), is an annual herbaceous plant and native to Europe, North Africa, and Asia Minor. It is animportant vegetable crop which cultivated in some countries including Iran. The plant found mostly in Mediterranean region, Europe, Northern Asia, it is also report to be planted in Indian gardens. The plant occurs during November to January. In India plant is sparsly distributed in North estern Himalayas from Kashmir to Kumaon at altitudes of 3,500-4,500m.

Photograph 9: *Borago officinalis*

10. *Cyathula capitata* Moq.

Family: Amaranthaceae

Synonym (s): *Achyranthes hamata* H. Lév. & Vaniot; *Polyscalis capitata* Wall. (Unresolved);

Vernacular names: Kuro (Nep.), Roundhead Pasture weed (Eng.)

Description: Roundhead Pasture weed is a perennial herb, 50-100 cm long. Stem is erect, dark purple or yellowish brown, nearly 4-angled, branched, haiy. Leaf stalks are 0.5-1.5 cm long, haiy. Leaves are broadly ovate or obovate- oblong, 5-14 cm long, 3-7 cm wide, papery, both surfaces haiy with haiy margin, base wedge-shaped, tip with a tail-like end. Flowers are borne in spherical or ellipsoid clusters, 2-4 cm in diameter, simple or clustered in spikes. Stalk carrying the head is velvety. Bracts is 3-4 mm, hailess, long-pointed. Flower clusters at axils of bracts, with some perfect flowers and 1 or 2 unisexual ones. Tepals of perfect flowers dark purple, lanceolate,

3-4 mm; imperfect ones yellow, lanceshaped, about 3 mm, rigid, apex hooked. Seed pods are grayish yellow, ovate-oblong, about 3 mm, hailess. Seeds are shiny, ellipsoid, about 2 mm, smooth. Roundhead Pastureweed is found in the Himalayas, at altitudes of 1300-2900 m.

Medicinal and cleansing uses: Leaves, fruits are used as medicine by local people in U.P. .Roots used for washing clothes in Nepal (Manandhar, 2001).

Status: C*yathula capitata* Moq. *(*Amaranthaceae*)* is a frequent shrub in mid hills of Uttarakhand. It is also common along Valley of Flower track above Govind Ghat. Wild in distribution.

Photograph 10: *Cyathula capitata*

11. *Dioscorea deltoidea* Wall. ex Griseb

Family: Dioscoreaceae

Synonym (s):

Vernacular names: Kniss, Kriss, Tar, Ritra (Punj.); Kildri, Kithi, Krish (Kash).

Description: Tubers ligneous, irregular. Stems glabrous, twining clockwise. Leaves alternate, simple, 5-11.5 cm long, 4-10.5 cm broad, ovate or subdeltoid-ovate, often cordate, the basal lobes rounded or sometimes dilated outwards, 7-9-nerved, acuminate, glabrous above, pubescent on the nerves beneath; petiole 5-10 cm long, slender. Male spikes solitary, axillary, simple or sometimes branched, slender, lax, 7.5-25 cm long; flowers in small distant clusters; stamens 6, antheriferous. Female spikes solitary, slender, up to 15 cm long, few-flowered. Capsule 2 cm long, 3 cm broad, obovate or obcordate. Seeds winged unequally all round.

Medicinal and cleansing uses: One class of toxins found in many species is steroidal saponins, which can be converted through a series of chemical reactions into steroid hormones for use in medicine and as contraceptives. Tuber used as soap for body wash to kill lice (Singh & Kachroo, 1976); also used in washing silken clothes in Western Himalayan region.

Status: In India it is distributed in Kashmir and Punjab eastward to Nepal &Khasi hills. Rarely distributed in north parts of Gangetic plain near foothill of Himalaya.

Photograph 11: *Dioscoria deltoidea*

12. *Diploknema butyracea* (Roxb.)H.J.Lam.

Family: Sapotaceae

Synonyms: *Bassia butyracea* Roxb.; *Madhuca butyracea* (Roxb.) J.F.Macbr.; *Aesandra butyracea* [(Roxb.) Baehni]

Vernacular names: Phulwara (Hind.); Nepali: Chiuri:Chyura (Kum.); Indian butter tree, Hill mahua (Eng.).

Description: Indian Butter Tree is a tree up to 25 m tall. Branchlets are thick, round, channeled, and with warts, yellowish brown or brown velvety to hailess. Stipules are lance-shaped, about 5 mm, brown to pale yellow pubescent, falling off early. Leaves are elliptic-oblong, ovate, or ovate-oblong, 17-35 × 8-17 cm, leathery, yellowish-brown to brown velvety, base wedge- shaped, tip blunt to blunt with a narrow point. Flowers are borne in clusters in leaf axils. Flower stalks are 2-4.5 cm long, up to 5 cm in fruit. Sepals are 4 or 5 or 6, ovate, 0.9-1.5 × 0.6-1 cm. Flowers are 1.5-2 cm, petals 8-10, oblong, ovate, or narrowly obovate, 8-10 × 5-8 mm, tip blunt to pointed, margin usually irregularly toothed. Stamens are 20-40, 0.9-1.2 cm long, anthers arrow-shaped. Fruit is ovoid-globose to oblong, 2-2.5 × 1-1.5 cm, smooth, tip pointed, exocarp fleshy, 1-3-seeded.

Medicinal and cleansing uses: Seed meals used for washing clothes by Himalayan people (Nigam & Misra, 1996; Wealth of India, 1952; Negi *et al.,* 1988; Pande & Pokhariya, 1999). Its seed kernel contains saponins. Bark of the tree is used in the treatment of

rheumatism, ulcers, itching, and hemorrhage, inflammation of the tonsils, leprosy and diabetes. The oil cake contains saponins and act as fertilizer, fish intoxicant, pesticide and detergent (Negi *et al.,* 1988).

Status: Wildly distributed in India. Indian Butter Tree is found in the Himalayas, at altitudes of 1600 m, from Uttarakhand to Sikkim, also in Andaman & Nicobar. Having such a great economic and medicinal value *Diploknema* is facing extinction because of relentless anthropogenic pressure. These species are failing to regenerate in spite of reasonable seed production (Negi *et al.,* 1988).

Photograph 12: *Diploknema butyracea*

13. *Entada rheedii* Spreng.

Family: Leguminosae- Mimosoideae

Synonym (s): Entada pursaetha DC.

Vernacular names: Gardul (Hind.); Chui (Arc.),African Dream Herb (Eng.)

Description: Liane, mostly glabrous. Pinnae 2-jugate. Leaflets 3–4 (–5)-jugate, oval and oblanceolate, ±equilateral basally; petiol ulespuberulous; lamina narrowed with an obtuse tip, 3–7.5 cm long, 1.5–3 cm wide, retuse to emarginate; surfaces ±concolorous. Inflorescence axillary spikes, 8–22 cm long; peduncle 2–8 cm long, flowering axis with scattered, long, straight hais; bracteoles subulate, 0.8–1.5 mm long, persistent. Flowers sessile, yellow, glabrous; calyx broadly cupular, 0.6–1 mm long; petals 2.5–3 mm long. Pod compressed, straight to slightly curved, to 2 m long and 7–15 cm wide, woody throughout. Seeds compressed, circular to oblong, 3.8–4.5 cm diam., 1.5–1.7 cm thick, chestnut brown.

Medicinal and cleansing uses: The plant is also used as a topical ointment against jaundice, toothache, ulcersand to treat muscular-skeletal problems. Seeds used in washing hai in Manipur (Saklani & Rao, 2002); saponins in bark & seeds used as soap (Nielsen, 1992).

Status: Wildly distributed in India, Bangladesh, Bhutan, Myammar, Nepal, Sri Lanka; China, Indo-China, Malesia & Africa. In India it is distributed in Arunanchal Pradesh, Andhra Pradesh, Bihar, Gujrat, Karnataka, Kerala, Madhya Pradesh, Maharastra, Manipore, Meghlaya, Nagaland, Orissa, Sikkim, Tamilnadu, Tripura, West Bengal, U.P.

Photograph 13: *Entada rheedii*

14. *Gardenia campanulata* Roxb.

Family: Rubiaceae

Synonym: *Ceriscoides campanulata* (Roxb.) Tirveng.

Vernacular names: Lam beibi (Mani.); Dhubhikhola, Rukhawak (Hind.), bitwara, dhubiukhola, bitmara (Assamese).

Description: A large shrub or small tree, 4.5-6 m high, with spinescent abortive branches. Leaves membranous, 3.8-7.5 cm long, elliptic-obovate or oblanceolate. Male flowers fascicled, under 1.3 cm diam., female, 7.5-13 mm, solitary, sessile, with very short lobes, both campanulate. Fruits 2-3.2 cm diam., ellipsoid or subglobose, obscurely 5-ridged.

Medicinal and cleansing uses: *Gardenia companulata* Roxb. is used for curing diabetes. The

products of *Gardenia campanulata* Roxb. is used for the preparation of traditional soap and detergents by the Meitei community of Manipur. Extract of green fruits stirred in water to foam & used to clean clothes by Meitei community of Manipur (Singh, *et al*. 2001); fruits used for removing spots on silk fabrics (Agarwal, 1986).

Status: Rare and wildly in distribution. In India it is distributed in Sikkim Himalaya, North East India and Bihar. Distributed in Bangladesh, Myanmar & Java.

Photograph 14: *Gardenia campanulata*

15. *Gardenia turgid* Roxb.

Family: Rubiaceae

Synonym: *Ceriscoides turgid* Roxb

Vernacular name: Karhar, Thanella (Hind.); Gulgal (Guj.); Bhuru (Kandh, Kohl); Bharangi (Sans.)

Description: Plant-armed small trees upto 4m. Height, spines opposite. Leaves- ovate-oblong, tomentose beneath, stipules ovate, deciduous. Flower- Axillary, Male flowers in 3-4 flowered fascicles, female flower solitary, greenish white, turning yellow. Fruit- Globose, brown.

Medicinal and cleansing use: Pulp of fruit used as hai wash for removing sebum from the scalp by the tribes in North India (Banerjee & Pal, 1996); as detergent in Sikkim, Bengal, Bihar & Orissa (Jain, 1991). Root used as remedy for indigestion. Kharhar posses wide range of therapeutic properties for the treatment of various ailments in tribal area. The tribal traditional healers used Kharhar as single drug or in combination with other herbs like *Smilax zeylanica* L., *Piper longum* Linn., *Cordia macleodii*(Griff.) Hook. F. & Thoms, *Cassia fistula* L. etc. to enhance the efficacy of preparation. Traditional healers use this herb for a variety of ailments such as Leucorrhoea, Dogbite, Scorpion string, Epilepsy, Stone, Stomachache, Snake bite, Diminished breast milk secretion (Lack of Lactation), Tuberculosis and Gout.

Status: In India it is wildly distributed in tropical Himalaya: from Garhwal to Bhutan and peninsular India. It is observed from Bihar & Madhya Pradesh southwards to Tamil Nadu. Rare, in interior parts of forests at medium elevation.

Photograph 15: *Gardenia turgid*

16. *Quillaja saponaria Molina*

Family: Quillajaceae

Synonym:

Vernacular name: Soap-bark tree, Soap bush (Eng.).

Description: The tree is up to 18 m tall. The leaves are smooth, glossy, short petioled, and oval. The bark is thick, dark, and very hard. It is odorless, very bitter, and astringent. The terminal inflorescence consists of white androgynous flowers with a calyx and corolla but no epicalyx. They are arranged in groups of 3 to 5 on the peduncle. The flower head is 5-lobed, splayed flat, and formed into a disc on the upper surface. The many-seeded carpels spread into a star shape in the ripe fruit. The seeds are winged with little or no endosperm.

Medicinal and cleansing uses: The inner bark of *Quillaja saponaria* can be reduced to powder and employed as a substitute for soap, since it forms a lather with water, owing to the presence of a glucoside saponin, sometimes distinguished as quillaia saponin. The saponins of this tree are also considered to have adjuvant properties for vaccine solutions. QS21 adjuvant is a saponin obtainable from *Quillaja saponaria* extract. Powdered bark gives foams for washing fine fabrics & cleaning hais (Agarwal, 1986); also used to make a dandruff shampoo (D'Amelio, 1999).

Status: Native to Peru & Chile in South America; introduced in India in Nilgiris and south India (Samraj, 1981). In India it is in cultivation.

Photograph 16: *Quillaja saponaria*

17. *Sapindus emarginatus* Vahl.

Family: Sapindaceae

Synonym:

Vernacular name: Notched Leaf Soapnut (Eng.), Reetha (Hindi), Arishta, arishtaphalam, Aristam, Phenila (Sanskrit)

Description: Notched Leaf Soap nut is a medium to large size deciduous tree growing up to 18 m tall, with a 1.5 m trunk girth. Bark is grey, shiny, covered with rough falling scales. Leaves are pinnate, 12-30 cm long. Leaflets are 2-3 pairs, lance-shaped, elliptic or oblong, long pointed or with a notched tip, dull above. Flowers are white, polygamous, male flowers, numerous, a few bisexual, both found in the same rusty-velvety panicles. Bisexual flowers provide ample pollen and nectar to bees. Fruits are fleshy, 2-3 partially united, seeds pea-size, enclosed in a blackish, hard endocarp.

Medicinal and cleansing uses: Fruits used for washing clothes and cleaning body (Agarwal, 1986; Pant, 2000).Fruits possess several medicinal properties and are widely used for example in the treatment of asthma, colic and dysentery, and during childbirth.

Photograph 17: *Sapindus emigrinatus*

Status: In India it is distributed to Gangetic plain, Western Ghats, Deccan Plateau, in deciduous & dry evergreen forests, occasionally planted on roadsides & gardens.

18. *Sapindus mukorossi* Geartn.

Family: Sapindaceae

Synonym:

Vernacular name: Soapnut, Soap Nut, Soapberry, Soap Berry, Washnut, and Wash Nut (Eng.) Ritha, Reetha, Aritha, Dodan, Doadni, Doda, Kanma and Thali (Hindi).

Description: The trunk is straight and cylindrical, nearly 4 to 5 m (13 -16 ft) in height. The canopy comprising side branches and foliage constitutes an umbrella-like hemispherical top measuring about 5 m (16 ft) in diameter. The tree can reach a height of 25 m (82 ft) and a girth of 3 to 5 m (9-16 ft) in nearly 70 years of its existence. It flowers during summer. The flowers are small and greenish white, polygamous and mostly bisexual in terminal thyrses or compound cymose panicles. These are sub-sessile; numerous in number and at times occur in lose panicles at the end of branches. The fruit appears in July-August and ripens by November-December. These are solitary globose, round nuts 2 to 2.5 cm (1 in) diameter, fleshy, saponaceous and yellowish brown in color. The seed is enclosed in a black, smooth and hard globose endocarp.

Medicinal and cleansing uses: Fruit pulp or dried fruit skin soaked in warm water used for washing hai, silk & woolen garments for extra gloss by the tribes of north India, Himalayas, Manipur & other places of India (Negi& Pant, 1994; Banerjee & Pal, 1996; Pande & Pokhariya, 1999; Singh, et al., 2001; Agarwal, 1986). Saponin is a natural detergent commonly used for cleaning among many other things. Soap nuts have been used medically as an expectorant, emetic, contraceptive, and for treatment of excessive salivation, epilepsy, psoriasis, head lice and migraines. Studies have shown that saponin from soap nuts inhibit tumor cell growth. Soap nuts are among the list of herbs and minerals in Ayurveda. They are a popular ingredient in Ayurvedic shampoos and cleansers. They are used in Ayurvedic medicine as a treatment for eczema and psoriasis. Soap nuts have gentle insecticidal properties and are traditionally used for removing lice from the scalp. Soap nuts have long been used in the Western world for soap production, usually together with many chemical additives which are not necessary for the actual washing process and are

damaging to the user as well as our environment. Soapnuts have become a very popular environmentally friendly alternative to these manufactured chemical detergents.

Status: The species is widely grown in upper reaches of the Indo-Gangetic plains, Shivaliks and sub-Himalayan tracts at altitudes from 200m to 1500m. It is also in cultivation for its commercial use.

Photograph 18: *Sapindus mukorossi*

19. *Sapindus trifoliatus* L.

Family: Sapindaceae

Synonym: *S. laurifolius Vahl.*

Vernacular name: South India soapnut, three-leaf soapberry, trijugate-leaved soap-nut (Eng.) phenil, risht, rishtak (Hindi), phenil, rinthi, ritha (Marathi), ritha (Oriya) hrishtah, phenaka, phenil, rishtah, rishtak, rita, sarishta, urdhvashodhanah (Sanskrit).

Description: A large tree. Leaves 15-30 cm long; leaflets sub-sessile, 2-3 pairs, 8-18 cm long, 5-7.5 cm broad, elliptic-lanceolate, glabrous, entire, acute, base slightly oblique, terminal pair longest. Flowers greenish-white, in terminal, slightly pubescent panicles; bract 1; bracteoles 2, 1 mm long, subulate, pubescent; pedicel 3 mm long, pubescent. Sepals 5, slightly connate at the base, 4-5 mm long, ovate-oblong, pubescent. Petals 5, free, 5-6 mm long, lanceolate-ovate, clawed, hispid. Disc 5-lobed, concave hirsute. Stamens 8, free; filaments 2-3 mm long, villous; anthers 1.5-2 mm long, basifixed, apiculate. Ovary 3-locular, 3-lobed, ovoid, c. 3 mm long, tomentose, with 1 ovule in each locule; style 1.5 mm long. Fruit 2-3 lobed, 1.3-2 cm long, pubescent when young, hard and glabrous when mature. Seed 1 in each cell, 6-9 mm long, black.

Medicinal and cleansing uses: The saponins A and C and sapindosids A and B extracted from the rind of the fruit showed antifungal activity. The pericarp contains two new triterpenoid saponins, emarginatoside -B and emarginatoside- C. Fruit posses emetic, tonic, astringent and antihelmintic properties and are used in treatment of asthma. Roots and bark are employed as a mild expectorant and demulcent. It is used in Revitalizing Hai Oil. The fruits possess tonic and astringent properties. Fruit extract used especially for washing clothes; kernel oil used in soap industry (Agarwal, 1986; D'Amelio, 1999; Pant, 2000).

Status: Grows wild in south India. Distributed also in plains of Northern Western & Central India, Western Ghats, common in evergreen forests. Sometimes planted in U. P., Bihar and W. Bengal etc.

Photograph 19: *Sapindus trifoliatus*

20. *Trigonella foenum-graecum* L.

Family: Leguminosae-Favodeae

Synonym:

Vernacular name: Methi (Hind., Beng., oriya.); Methika (Sans.); Fenugreek (Eng.)

Description: Stem – erect or ascending and attains a height of 4-6 m. Leaf – short-petiolated, the leaflets are obovate to lanceolate, the stipules are large, ovate pointed and finely pubescent. Flower – singly or in pair are born in leaf axils, calyx is tube-like, pale yellow corolla is twice the length of the calyx, wings are as long as the banner, the keel is rounded at the tip fruit–elongated sabre-like pods are free from hais, straight or distinctly curved, seeds are yellow to light brown, 10–20 of seeds per pod.

Medicinal and cleansing uses: It is consumed raw as a good quality vegetable with a high content of ascorbic acid .Seeds of this aromatic legume are used as medicine and for food employment (digestive troubles, to treat neurastenia, in reconvalescence, it promotes appetite, helps to reduce the level of blood sugar and blood pressure,

externaly it is used to treat unhealed wounds, arthosis, ulcers, bruises). Seed extract used as a hai cleanser (Kapoor, 2005).

Status: Fenugreek has spread as a cultivated crop across the Asian and the African continents. In India it is cultivated throughout, naturalized in Jammu & Kashmir, Punjab & Upper Gangetic plains; Pakistan, Orient, Arabia, S. Europe & Ethiopia.

Photograph 20: *Trigonella foenum-gracecum*

21. *Vaccaria hispanica* (P.Mill.) Rauschert

Family: Caryophyllaceae

Synonym: *Saponaria vaccaria* L.

Vernacular name: Sabuni (Beng.); Musna (Hind.); Soap-wort, Cow-Herb (Eng.)

Description: Plants glabrous, glaucous. Stems 20-100 cm. Leaf blades 2-10 cm, base cuneate to cordate. Cymes open, 16-50 (-100) -flowered. Pedicels (5-) 10-30 (-55) mm. **Flowers:** calyx 9-17 mm, with 5 prominent, usually green, winged angles or ridges, each ridge with strong, cordlike marginal vein; petals with claw 8-14 mm, blade 3-8 mm. Capsules included in calyx tube. Seeds 2-2.5 mm wide.

Medicinal and cleansing uses: It is a weed of disturbed areas and crops. The seeds of this plant are important in traditional Chinese medicine, and clinical tests have shown a variety of beneficial biological activities, including anti-cancer activity. Plant sap used by Indian natives for washing garments, hais, etc. and as remedy for itch (Majumdar, 1972; Agarwal, 1986).

Status: Distributed in N. Africa, Asia, temperate, Europe; sometimes cultivated in gardens of India & Tibet as an ornamental.

Photograph 21: *Vaccaria hispanica*

22. *Yucca filamentosa* L.

Family: Agavaceae

Synonyms: Yucca concava, Yucca filamentosa var. concava

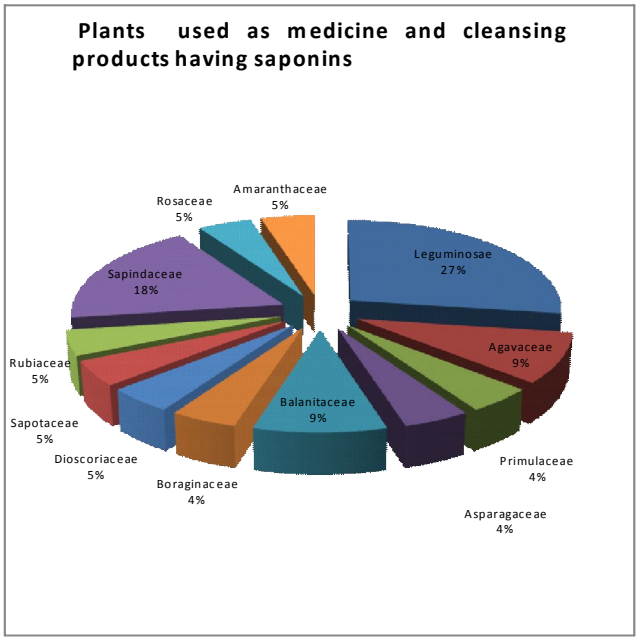
Vernacular name: Adam's needle, Needle o palm (Eng.)

Description: The leaves are growing only at the base of the plant (basal) .The leaf blade is lanceolate (lance-shaped; widest below the middle and tapering at both ends). Leaf blade length-500–750 mm .Flower petal color white to yellow. Flower petal length -50–70 mm. Petal fusion-the perianth parts are separate. Inflorescence type-the inflorescence is a panicle (branched with the individual flowers on stalks). Ovary position-the ovary is above the point of petal and/or sepal attachment. Fruit type (specific)-the fruit is a capsule (splits along two or more seams, apical teeth or pores when dry, to release two or more seeds). Fruit length-38–50 mm.

Medicinal and cleansing uses: Leaves & roots contain steroidal saponins and used to make soap & shampoos; also medicinal (http://garden.lovetoknow.com/wiki/Adam's Needle).

Status: Native of arid areas of southern N. America; planted in gardens of India.

Photograph 22: *Yucca filamentosa*



References

Agarwal, V.S. (1986). Economic Plants of India, (Kailash Prakashan, Calcutta), 1-419.

Ambasta, S..P., K. Ramachandran, K. Kashyapa and R. Chand R (ed.) (1986). useful Plants of India, (*CSIR, New Delhi*), 918.

Anonymous (1952). *The Wealth of India,* (Publications & Information Directorate, CSIR, New Delhi), **3:** 72- 227.

Anonymous (1969). *The Wealth of India,* (Publications & Information Directorate, CSIR, New Delhi), 8- 15.

Anonymous (1972). *The Wealth of India,* (Publications & Information Directorate, CSIR, New Delhi), 9- 327.

Anonymous (1985). *The Wealth of India*, (Publications & Information Directorate, CSIR, New Delhi), **1A:** 97.

Anonymous (2004). The fine line.*Soap, Perfumery & Cosmetics,* **July:**57.

Banerjee, D.K. and D.C. Pal (1996). Plants used by Tribals of North Indian Plains for hai & scalp preparation. *In: Ethnobilogy in Human Welfare, ed. S K Jain, (Deep Publication, New Delhi),* 187-188.

Bhandari, M.M. and A.K. Bhansali (2000). Rhamnaceae*, in: Fl. India,* ed. N.P. Singh, J.N. Vohra, P.K. Hajra and D.K. Singh, *(Botanical Survey of India, Calcutta),* **5:** 163-245.

Bio-Botanica Inc. (2005). Bio-saponinsTM The natural surface active agent. (http://www.bio-botanica.com/articles/articles.asp#, accessed 11/10/2013.)

D'Amelio, F.S. (1999). Sr, Botanicals: A phytocosmetic Desk Reference, (Buca Ratan, London, New York, Wahington), 1-361.

Dini, I., G.C. Tenore, O. Schettino and A. Dini (2001). New Oleanane saponins in Chenopodium quinoa. *J. Agricultural & Food Chemistry,* **49:**3976-3981.

Dirk, D.D., and S.R. Webb (2005). The next 15 years: Taking plant vaccines beyond proof of concept.Immunol. *Cell Biol.,* **83**:248–256.

Duthie, J.F. (1960). *Flora of Upper Gangetic plain* (Botanical Survey of India).

Estrada, A., G.S. Katselis, B. Laarveld, and B. Barl (2000). Isolation and evaluation of immunological adjuvant activities of saponins from *Polygala senega* L. Comparative Immunology. *Microbiology and Infectious Diseases,* **23**: 27–43.

Estrada, A., B. Li, and B. Laarveld (1998). Adjuvant action of *Chenopodium quinoa* saponins on the induction of antibody responses to intragastric and intranasal administered antigens in mice. *Comp. Immunol. Microb.,* **21**: 225–236.

George, A. J. (1965). Legal status and toxicity of saponins. *Food Cosmet. Toxicol.,* **3**: 85–91.

Hostettmann, K. and A. Marston (2005). Saponins. Chemistry and pharmacology of natural products. *Cambridge University Press,* Cambridge, isbn-10: 0521020174.

http://altnature.com/gallery/soapwort.htm

http://darwin.bio.uci.edu:80/sustain/protected/chap7slides.ppt

http://garden.lovetoknow.com/wiki/adam'sneedle

http://icmr.icfai.org/casestudies/catalogue/Marketing1/MKTA008.htm

http://the.Honoluluadvertiser.com/article/2005/Jun/24/il/ill0a.htm

http://www.arcbc.org.ph/arcbcweb/medicinal_plants_page5.htm-accessed on16.9.2013

http://www.lyraesherbpages.homestead.com/medicinalherbsQ-Z.html.

http://www.solsticesoap.com/herbal-soap.html.

http:/www.infobanc.com/sellinq/2005/2005_q1/5033112.htm

Jain, S. K. (1991). Dictionary of Indian Folk Medicine & Ethnobotany, (Deep Publications, New Delhi).

Japanese Ministry of Health and Welfare. 2005. List of Existing Food Ad-ditives.*http://www.ffcr.or.jp/zaidan/FFCRHOME.nsf/pages/list-exst.add, accessed* 01/11/2013.

Jain, P. and D.K. Kulshreshtha (1993). Bacoside A1, a minor saponinfrom *Bacopa monniera*. *Phytochemistry,* **33**: 449–451.

Kanjilal, U. N., P.C. Kanjilal and A. Das (1934). *Fl. Assam, (Govt. of Assam),* **3**: 444.

Kapoor, L.D., A. Singh, S.L. Kapoor and S.N. Srivastava (1969). Survey of Indian Plants for Saponins, Alkaloids and Flavonoids-Part I. *Lloydia,* **32(3)**: 297-304.

Kapoor, L.D., A. Singh, S.L. Kapoor, S.N. Srivastava and N.C. Shah (1975). Survey of Indian Plants for Saponins, Alkaloids and Flavonoids – Part IV. *Lloydia,* **38 (3)**: 221-224.

Kapoor, L.D., S.L. Kapoor, S.N. Srivastava, A. Singh and P.C. Sharma (1971). Survey of Indian Plants for Saponins, Alkaloids and Flavonoids-Part II. *Lloydia,* **34(1)**: 94-102.

Kapoor, L.D., A. Singh, S.L. Kapoor, S.N. Srivastava and N.C. Shah (1972). Survey of Indian Plants for Saponins, Alkaloids and Flavonoids-Part III. *Lloydia,* **35(3)**: 288-295.

Kapoor,V.P. (2005). Herbal cosmetics for skin and hai care. *Natural Product Radiance,* **4(4)**: 306-314.

Khanna, K.K. (2002). Ethnobotany of five districts of Terai region, Uttar Pradesh, In: Trivedi, P.C. *(ed.) Ethnobotany, (Adavishakar Publishers Distributors, Jaipur*), 128-145.

Lasztity, R., M. Hidvegi and A. Bata (1998). Saponins in food. *Food Rev. Int.,* 14: 371–390.

Lata, S. (1996). *Grewia optiva* Drumm. 'Bhimal' a boon for rural people in Kumaon hills, India. *In: Ethnobiology in Human welfare, ed. S. K. Jain, (Deep Publication, New Delhi),* 471-472.

Mahato, S.B. (1991b). Triterpenoid saponins from Medicago hispida. *Phytochemistry,* **30**: 3389–3393.

Mahato, S.B., S. Garai and A.K. Chakravarty (2000). Bacopasaponins E. and F. : two jujubogenin bisdesmosides from *Bacopa monniera*. *Phytochemistry,* **53**: 711–714.

Mahato, S.B. and A.K. Nandy (1991a). Review article number 60. Triterpenoid saponins discovered between 1987 and 1989. *Phytochemistry,* **30**: 1357–1390.

Mahato, S.B., A.K. Nandy and G. Roy (1992a). Review article number 67. Triterpenoids. *Phytochemistry,* **31**: 2199–2249.

Mahato, S.B., Pal, B.C., Nandy, A.K., 1992b. Structure elucidation of twoacylated triterpenoid bisglycosides from *Acacia auriculiformis* cunn. *Tetrahedron,* **48**: 6717–6728.

Mahato, S.B., S.K. Sarkar and G. Poddar (1988). Review article number 38. *Triterpenoid saponins. Phytochemistry,* **27**: 3037–3067.

Mahato, S.B. and S. Sen (1997). Review article number 118. Advances in triterpenoid research, 1990–1994. *Phytochemistry,* **44**: 1185–1236.

Majumdar, N.C. (1972). A note on the family Carryoophyllaceae with special reference to the Indian species. *Bull. Bot. Surv. India,* **14**: 71-75.

Mal, B. and V. Joshi (1991). Underutilized plant resources, in: Plant Genetic Resources, Conservation and management concepts and approaches. *Ed. R. S. Paroda & R. K. Arora (IBPGR, New Delhi)*, 211-230.

Malik, K.C. (1993). Stereculiaceae, in: Fl. India, (Ed.) B. D. Sharma and M. Sanjappa, (Botanical Survey of India, Calcutta), **3**: 407-476.

Manadhar, N.P. (2013). Traditional use of plants for bathing and washing clothes in Nepal, Honey Bee, (4), 12(1), (2001), 32 &http://www.sristi.org/hb_11_4_21.html, accessed on. **6:** 9.

Menon, P. (2013). Checklist & Approximate Quantity of Non-Wood Forest Produce (NWFP) Collected from Peppara Woldlife Sanctuary, in: http:/www.mtnforum.org/resources /library/ menop02a.htm.

Negi, K.S. and K.C. Pant (1994). Genetic wealth of Agri-Horticulatural crops, their wild relatives, indigenous medicinal and aromatic plants of U.P. Himalayas, *J. Econ. Tax. Bot*., **18(1)**: 17-41.

Negi, K.S., J.K. Tiwari, R.D. Gaur and K.C. Pant(1988). Indian butter tree – *Aesandra butyracea* (Roxb.) Bachni, *Ind. J. For*. **11** : 319-321.

Nielsen I C, Mimosaceae (Leguninosae-Mimosoideae) *in: Flora Malesiana ser. 1*, ed. WJJO de Willde, H P Nooteboom, C Kalkman, **11(1)**, (1992), 1-276.

Nielsen, S.E., Anthoni, U., Christophersen, C., Cornett, C., 1995. Triterpenoid saponins from *Phytolacca rivinoides* and *Phytolacca bogotensis*. *Phytochemistry* **39**, 625–630.

Nigam S K & Misra G, Mahua and Chura to boost Tribal Economy, in: Ethnobilogy in Human welfare, (Deep Publication, New Delhi), (1996), 468-470.

Nigam, S.K., Li, X.-C., Wang, D.-Z., Misra, G., Yang, C.-R., 1992.Triterpenoidal saponins from *Madhuca butyracea*. Phytochemistry **31**, 3169–3172 .

Oakenfull, D. 1981. Saponins in food-a review.Food Chem.,6:19–40.Oakenfull, D. 1986. Aggregation of saponins and bile acids in aqueous solution. Aust. J. Chem., **39**:1671-1683.

Oakenfull, D., and Sidhu, G.S. 1989. Saponins. In: Cheeke, P. R., *Ed*.,Toxicants of Plant Origin, Vol II Glycosides. *CRC Pres, Inc. Boca Raton, Florida,* **pp.**97–141.

Oda, K., Matsuda, H., Murakami, T., Katayama, S., Ohgitani, T.,Yoshikawa, M., 2000. Adjuvant and haemolytic activities of 47 saponins derived from medicinal and food plants. Biological Chemistry **381**, 67–74.

Osbourn, A.E., 1996. Saponins and plant defense – a soap story. *Trends Plant Sci.* **1**, 4–9.

Panagin Pharmaceuticals Inc. 2005. http://www.panagin.com/index.htm, **accessed 23 /8/2017.**

Pande P C & Pokhariya D S, Kumaon Himalaya ki paramparic prodhyogika paddhati: ek vihamgavalokan (in Hindi), in: Ethnobotany of Kumanon Himalayas, ed P C Pande, D S Pokhariya & J S Bahtt (Jodhpur: Scientific Publishers), **(1999)**, 471-493.

Pant P C, Sapindaceae, in: Fl. India, ed N P Singh, J N Vohra, P K Hajra & D K Singh (Botanical Survey of India, Calcutta), **5**, (2000), 343-387.

Rajendran S M & Aswal B S, Some flowering plants used as cosmetics among tribals of Nilgiris, Tamil Nadu, India*, in: Ethnobotany and Medicinal Plants of Indian subcontinent,* ed J K Maheshwari, (Scientific Publisher, Jodhpur), **(2003),** 425-430.

Raju, J., Patlolla, J.M.R., Swamy, M. V., and Rao, C. V. 2004. Diosgenin, a steroid saponin of *Trigonella foenum graecum* (Fenugreek), inhibits azoxymethane-induced aberrant crypt foci formation in F344 rats and induces apoptosis in HT-29 human colon cancer cells.Cancer Epidem. Biomar., **13**:1392–1398.

Rana T S, Datt B & Rao R R, Flora of Tons valley Garhwal Himalaya (Uttaranchal, (Bishen Singh Mahendra Pal Singh, Dehra Dun), **(2003).**

Rao,A.V., and Sung, M.-K. 1995. Saponins as anticarcinogens. *J. Nutr.,* **125**:717S–724S.

Rastogi R P, *Compendium of Indian Medicinal Plants*, (CDRI, Lucknow & NISC, NewDelhi), vol. I-VI, (1998-2002).

Rastogi, S., Pal, R., Kulshreshtha, D.K., 1994. Bacoside A3–A triterpenoid saponin from *Bacopa monniera*. *Phytochemistry* **36**, 133–137.

Rastrelli, L., Aquino, R., Abdo, S., Proto, M., De Simone, F., De Tommasi, N., 1998. Studies the constituents of *Amaranthus caudatus* leaves isolation and structure elucidation of new triterpenoid saponins andionol-derived glycosides. Journal of *Agricultural and Food Chemistry* **46**, 1797–1804.

Rawal J. R., MEDHERB GREEN PAGES INAIA – A handbook of Authentic current information on Indian Medicinal Plants Trade Sector, (Rawal Publishers & Distribution, Delhi), (2003), 1-370.

Saklani & Rao R. R., Some wild legumes traditionally used by tribals of North East India with particular reference to non-conventional edible legumes, *in: Advances in Legume Researh in India, ed R R Rao, (Bishen Singh Mahendra Pal Singh, Dehra Dun)*, (2002), 239-250.

Samant S S, Dhar U & L M S Palni, Medicinal Plants of Indian Himalaya, Diversity Distribution Potential Values, (Gyanodaya Prakashan, Nainital), (1998).

Samraj P., Useful alien tree of the Nilgiris, *Bull, Bot. Surv. India, 23*, (1981), 243-249.

Saxena H.O. & Brahman M., *The Flora of Similipahar* (Similipal), Orissa, (Regional Research Laboratory, Bhubaneswar), (1989).

Sharma A., Haridasan K., Barthakur S. K., Notes on Legume flora of Arunahcal Pradesh with special reference to West Kameng Distrit*, in: Advances in Legume Research in India, ed R. R. Rao, Bihen Singh Mahendra Pal Singh, Dehra Dun, (2002),* 171-179.

Shiva M. P., Lehri A. & Shiva A, *Aromatic and medicinal plants,* (International Book Distributor), (2002).

Singh G. & Kachroo P., *Forest Flora of Srinagar*, (Bishen Singh Mahendra Pal Singh, Dehra Dun), (1976).

Singh K., Singh P. K. & Singh S., An ethnobotanical approach to the indigenous soaps and detergents lof Meitei community of Manipu*., J. Econ. Tax. Bot.,* **25 (3)**, (2001), 547-552.

Singh P. & Singh V., Zygophyllaceae, in: *Fl. India ed. P. K. Hajra, V. J. Nair & P. Danel*, **4, (1998)**, 39-59.

Singh, N. 2004. Low isoflavones, high saponins soy protein product and process for producing the same. *US Patent Application **2004*/0013791 A1**.

Sparg, S.G., Light, M.E., van Staden, J., 2004. Biological activities and distribution of plant saponins. *J. Ethnopharmacol.***94**, 219–243.