Traditional Knowledge of Vedic Grasses : Significance and Medicinal Uses

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Abstract

Grasses have originated and evolved even before human origin. The grass species are revealed in the Vedic texts with specific purpose. These grasses are used in various rituals and also as medicinal herbs that are detailed in the Veda *Saṁhita*s, *Brāhmaṇā*s, *Āraṇyaka*s, *Upaniṣad*s, Epics, *Purāṇa*s and also in later Sanskrit texts. These grasses are used as precise medicinal purposes from the Vedic period. They occupy a significant position in many traditional medicines including Āyurveda, but their importance is poorly documented. These belong to Gramineae or Poaceae family containing 11,000 species including important cereal crops such as paddy, wheat, wild rice and millets. These grasses can be classified into cereal crops, millets and wild grasses. The cereal crops and millets revealed in the Vedic texts are still being cultivated even today for food and fodder. The present article elucidates the descriptions of these grasses, their ritualistic and medicinal significances revealed in the Vedic texts are discussed.

Full Paper

Based on genetic evidence, the earliest human ancestors, are thought to have split off from chimpanzees some 6 million to 7 million years ago. The study shows that the trend continued through all known human evolution, leading to a dominance of grasses by a few million years ago. It strongly suggests that between 24 million and 10 million years ago – long before any direct human ancestors appeared – there were few grasses, and woodlands thus presumably dominated. Then, with an apparent shift in climate, grasses began to appear (Uno *et al*., 2016).

Grass species (Poaceae) play a major role in the life and development of mankind. Human beings' staple food derives from the grass family. Cereals, such as wheat, rice, and corn, provide half of all human calories, and 70% of all plant crops are grasses. They occupy a significant position in many traditional medicines including Ayurveda, but their importance is poorly documented. There are several potential grasses that produce grass oil which are used in medical systems like Ayurveda, Allopathy, Homeopathy, Naturopathy, etc. Poaceae is the largest angiosperm family in India, and is represented by over 1300 species under 270 genera. There are eighteen species of grasses are revealed in the Vedic texts for ritualistic and medicinal purposes for their curative effect in different diseases. The medicinal values of these species are less known and have remained as traditional knowledge. The grasses like *Arundo donax* L., *Cynodon dactylon* Pers., *Desmostachya bipinnata* (L.) Stapf, *Saccharum spontaneum* L., etc. are widely used as traditional medicinal care. There are grasses from which aromatic grass oils, Vetiver oil are extracted and used. Other than this, for industry and lawns also grasses are used. The grass sugarcane is used to produce sugar and ethanol production. Bamboo is commonly used for construction in Asia, while other grasses are turned into pulp for the production of paper.

Vedic literature in general refers to a number of things which directly or indirectly constitute ancient medical tradition. Vedic rituals are not only sacred but also practically useful for the mankind. There are some rituals which, if performed well, cause general strength to the body and organs, luster to the face, and stability to the mind. By performing some others, the appetite of the performer improves and can get rid of several diseases like white leprosy.

Since the Vedic period, *Kuśā, Darbhā* and other types of grass have been upheld to be most sacred of grasses, employed for various purposes during the Vedic sacrifice/yajña. *Kuśā* grass was used to construct an altar (*Vedi*), to cover the Vedic altar upon which objects of sacrifice are placed, to make mats

to be seated upon, and tied as a ring on the finger of the performer of the Vedic rites as a *pāvitri* or purifier of yajña implements and the place. *Kuśā* grass is spread out as mats for the persons offering the ritual sacrifice to sit upon. It is further imagined that the gods (or ancestors in case of *pitṛ śrāddha*) to whom the sacrifice is being offered are present during the sacrifice and take their seats on the sacred grass. *Barhis*, meaning 'that which is plucked' is a bed or a layer of sacrificial grass, that is usually strewed over the sacrificial ground and especially over the altar (*Yajña Vedi*), to serve as a sacred surface on which to present the oblations, and as a seat for the gods and for the sacrificers. Such is the role played Kuśā, and it was imperative to make it sacred.

Botanical Descriptions of Vedic Grasses

Vedic grasses are classified into three categories, namely (1) Wild grasses, (2) Millet crops and (3) Cereal crops.

Wild Grasses

Desmostachya bipinnata (L.) Stapf in Dyer, Fl. Cap. 7: 632. 1900.
Habitat: The sacrificial grass grows throughout the plains of India in dry and hot areas and in sandy deserts.
Common Names: Sacrificial grass (English); Tharbai (Siddha/Tamil)
Āyurvedic Names: Kuśā, Sūchyagra, Yagyabhūṣaṇa, Kshurapatra
Ritualistic Utility: *Darbhā* grass is also known as *Piṃjūla* in the Vedic texts. It is used in sacred ceremonies, as seating mats for priests and gods and also as a bundle of grass, kūrca, used for cleaning the *yajña vēdi*. It is the most sacred article used in a ritual. Special care is taken in its utilization right from sharpening the knife used to cut it and Mantras are chanted at every step. In *Mahāgnicayana*, it is dipped into the mixture of curd and honey and the Agni is consecrated by sprinkling.
Medicinal Properties: The *Darbhā* plant root is cooling, diuretic, galactagogue, astringent. Used for urinary calculi, and other diseases of the bladder. The culms are used in menorrhagia, dysentery, diarrhoea and in skin diseases. The Ayurvedic Pharmacopoeia of India (API) recommended the use of the rootstock (50-100 grams for decoction) in dysuria, vaginal discharges and erysipelas.

Cynodon dactylon (L.) Pers., Syn. Pl. 1: 85. 1805.
Habitat: The grass species is present throughout India up to 3,000 m.
Common Names: Bermuda grass, Bahama grass, Couch grass (English); Dūb (Unani); Arugampallu (Siddha/Tamil)
Āyurvedic Names: Dūrvā, Bhārgavi, Shatvalli, Shatparvā, Tiktaparvā, Shatviryā, Sahastravirya, Shitā, Anantā, Golomi.
Ritualistic Utility: In *Mahāgnicayana*, an altar is constructed to place the fire and perform *Hōma*s. Mainly bricks are used in the construction. It is ordained that Dūrvā should be arranged between the bricks i.e., *Iṣṭakas* and it is called *Dūrveṣṭakā*. The *Mantra* recited during the arrangement of *Dūrveṣṭakā* exposes the qualities of Dūrvā. It has hundreds of joints (*Parvan*s). Fresh shoots emerge out of each joint and have their own roots.
Medicinal Properties: The grass is a reputed as a remedy in epitaxis, haematuria, inflammed tumours, whitlows fleshy excrescences, cuts, wounds, bleeding piles, cystitis, nephritis and in scabies and other skin diseases. It is credited with astringent, diuretic, anti-diarrhoeal, anticatarrhal, styptic and antiseptic properties. API recommended the dried fibrous root in menorrhagia, metrorrhagia and burning micturation. The Phenolic phytotoxins present in this grass are ferulic, syringic, *p*-coumaric, vanillic, *p*-hydroxybenzoic and O-hydroxyphenyl acetic acids, are reported from the plant. The leaves contain tricin, flavone Cglycosides and a flavonoid sulphate (Khare, 2007).

Coix lacryma-jobi Linnaeus, Sp. Pl. 972, 1753.
Habitat: Warm and damp areas up to about 2,000 m, both wild and also cultivated as an annual grass.
Common Names: Gavedhukah (Sanskrit); Job's Tears (English); Gurlu, Samkru (Hindi); Gurgur (Bengali); Adavi Guriginja (Telugu); Ashru bija, Manjutti (Kannada); Ran jamdhlo (Konkani); Kattu kundumani (Tamil); Kattugotampu (Malayalam); Ran jondhala, Ran maka, Kasai (Marathi); Chaning (Manipuri); Kasi, Kasai (Gujarati); Kaatu Kunthumani (Siddha/Tamil); Garaheduaa, Gargari (Folk).
Āyurvedic Names: Gavedhukā
Ritualistic Utility: The *Caru* and *Anna* of Gavīdhukā are used in the rituals. In *Rājasūya*, a coherent rite called '*Dēvasuvām Havīmṣi*' is performed to please the deity Rudra. In this rite, the *Caru* of Gavīdhuka is offered to Rudra who is the presiding deity of *Paśu*s. Pleased by the oblation of Gavīdhukā *Caru*, Rudra grants cattle (*Paśu*s) to the sacrifice. In *Mahāgnicayana*, an altar is built with bricks for the worship of fire. After the sub-ritual *Śatarudrīya* is completed, the *Caru* of Gavīdhukā is placed on the last brick of the altar. The *Hōma* would be incomplete if the Gavīdhukā *Caru* is not offered. In *Vājapēya yajña*, fourteen kinds of Annas are offered to the Agni and that of Gavīdhukā is one of them.
Medicinal Properties: The decoction of the fruits is used for catarrhal affections of the air passage and inflammation of the urinary tract. Seeds are diuretic. The grass root is used in menstrual disorders. Leaves are used as a drink for inducing fertility in women. The seeds contain *trans*-ferulyl stigmastanol and *trans*-ferulyl campestanol, which form part of an ovulation inducing drug. The extract of the seed is used as an immuno-enhancer, used for the prevention of cancer and infections. Seeds exhibit anti-tumour and anti- complimentary activities. Seeds contain coixenolides, a mixed ester of palmitoleic and vaccenic acids, which is an anticancer agent (Khare, 2007).

Arundo donax Linnaeus, Sp. Pl. 81. 1753.
Habitat: Native to Mediterranean region; found in Kashmir, Assam and the Nilgiris, also grown in hedges.
Common Names: Great Reed, Spanish-Bamboo-Reed, Giant-Bamboo-Reed (English); Korukkai (Siddha/Tamil)
Āyurvedic Names: Na<u>l</u>a, Potgala, Shūnyamadhya, Dhamana
Ritualistic Utility: It is used in obsequies. In *Pitṛmēdha*, the ritual in favour of the manes, a *hōma* is performed. According to *Kalpa*, a bunch of Na<u>l</u>a is kept between the two Palāśa *Paridhis* and a *Mantra* is changed in which the deceased is addressed to make a Na<u>l</u>a a bot, to cross the ocean on his way to the world of *Pitṛ*s. The use of Na<u>l</u>a in rituals is seen only in this context.
Medicinal Properties: The rhizome of the grass is sudorific, emollient, diuretic, anti-lactant, anti-dropsical; uterine stimulant (stimulates menstrual discharge) and hypotensive. The rhizome yields indole-3-alkylamine bases, including bufotenidine and dehydro-bufontenine. The leaves yield sterols and triterpenoids. Bufotenidine possesses antiacetylcholine properties, histamine release activity and is a uterine stimulant. Alkaloids from the flowers produced curarimetic effect of the non-polarizing type.

Saccharum spontaneum Linnaeus, Mant. Alt. 2: 183, 1771.
Habitat: Throughout India
Common Names: Kāśa (Sanskrit); Wild sugarcane, Kans grass (English); Kaas, Kush (Hindi); Kansh (Bengali); Kahuwa, Khagori (Assamese); Kaki ceruku (Telugu); Hucchu kabbu, Kadu kabbu (Kannada); Pekkarimpu (Tamil); Nannana (Malayalam); Kamis (Marati); Kāśataṇḍi (Orya); Kansado (Gujarati); Ee (Manipuri); Nānal, Pai Karumbu (Siddha/Tamil)
Āyurvedic Names: Kāśa, Kandekṣu, Śvetachāmara.
Ritualistic Utility: It is used in obsequies. In *Pitṛmēdha*, the performer throws away a bunch of Kāśa in western direction of the corpse reciting a *Mantra* thus, 'O deceased, please take this bunch of Kāśa. It will protect you from your enemies and *Rākṣasa*s coming from the west'.
Medicinal Properties: Entire plant is cooling, astringent, diuretic, galactagogue. It is used in the treatment of burning sensation, dysuria, dyscrasia, kidney and bladder stones, dysentery, bleeding piles. The root of

the grass is diuretic, galactagogue. API recommends the root in calculus, dysuria and haemorrhagic diseases.

Eleusine indica (L.) Gaertner, Fruct. Sem. Pl. 1: 8, 1788.
Habitat: Throughout the warmer parts of the world. In India, in wet plains and low hills and pasture grounds.
Common Names: Crowfoot Grass, Crab Grass (English);
Folk Names: Nandiā (Orissa), Mahār Nāchni (Maharashtra), Thippa Ragi (Tamil Nadu).
Āyurvedic Names: Nandimukha
Ritualistic Utility: It is used as sacrificial fuel (*Idhma*) in a *Kāmyayāga*. In order to restore the warlike ability and loyalty of his own army, a king should perform this *yāga* in favour of the deity Indrāṇi. In this ritual, the *idhma* of Balbaja is offered to the fire.
Medicinal Properties: The plant is used for biliary disorders. In Vietnamese traditional medicine, a decoction of the whole plant is used as stomachic, diuretic, febrifuge, and in sprains.

Vetiveria zizanioides (L.) Nash in Small, Fl. Southeast U.S. 67. 1903.
Habitat: A perennial grass, cultivated chiefly in Rajasthan, Uttar Pradesh., Punjab and the West Coast.
Common Names: Sugandhimula, Reshira, Usheera, (Sanskrit); Vetiver, Khas (English); Khas, Khas khas (Hindi); Khaskhas, Venaghas (Bengali); Vattiveru, Vattivellu (Telugu); Lavancha beru, Mudivala beru (Kannada); Vettiver, Vetivera (Tamil); Ramacham (Malayalam); Vala (Marathi); Valo (Gujarati); Panni (Panjabi); Vettiver, Vilamichaver (Siddha); Cuscus, Khas (Unani).
Ayurvedic Names: Ushira, Bahu-muulaka, Sugandhimuula, Jatāmedā, Indragupta, Nalada, Lāmajjaka, Sevya, Samagandhaka, Jalavāsa, Virana, Aadhya.
Medicinal Properties: The root of the grass is infusion used as refrigerant, febrifuge, diaphoretic; stimulant, stomachic, antispasmodic, emmenagogue, astringent, blood purifier. Used in fevers, colic, flatulence, vomiting, spermatorrhoea and strangury. Root oil is used in obstinate vomiting, colic and flatulence. API recommends the root in dysuria. The North India Khas oil contains large amounts of khusilal, other sesquiterpenes include khusol, khusimol, khusitone, cadinene and laevojuneol. The South Indian Khas oil constituents are largely nootkatone, vestipiranes and substances of tricyclic zizaane structure. Khusilal is absent in typical dextrorotatory Khas oils (Khare, 2007).
Economic Importance: The grass species cultivated for scent-making and woven into mats, fans etc.

Bambusa arundinacea (Retz.) Roxb., Pl. Cor. t. 79, 1796.
Habitat: Wild throughout India, especially in the hill forests of Western and Southern India.
Common Names: Spiny or Thorny Bamboo (English); Qasab, Tabaashir (Unani); Moongil, Moongiluppu (Siddha/Tamil);
Āyurvedic Names: Vansha, Venu, Kichaka, Trinadhwaj, Shatparvā, Yavphala, Vanshalochana, Vansharochanā, Shubhā, tugā, Tugaakshiri, Tvakkshiri (Bamboo-manna).
Ritualistic Utility: Vēṇu or Bamboo is used in building *yajñaśāla*. *Prācīnavamśa*, the long hut under which rituals like *Sōmayāga* are performed is built with the bamboos heading towards east. In *Mahāgnicayana*, the *yajña* implement, '*Abhri*' made out of Vēṇu is used to dig the earth to prepare *Mahāvīra* pot in which the fire is kindled. This *Abhri* must be hollow. In *Vājapēya*, Anna of Vēṇu grains is offered to the fire in favour of Prajāpati.
Medicinal Properties: Leaf bud and young shoots is used in dysmenorrhoea; externally in ulcerations. The leaf is used in emmenagogue, antileprotic, febrifuge, bechic; used in haemoptysis. Stem and leaf are used as blood purifier (used in leucoderma and inflammatory conditions). Root is poisonous. Burnt root is applied to ringworm, bleeding gums, painful joints.
Bark is used for eruptions. Leaf and Bamboo-manna is used in emmenagogue. Bamboo-manna is pectoral, expectorant, carminative, cooling, aphrodisiac, tonic (used in debilitating diseases, urinary infections, chest diseases, cough, asthma).

Saccharum benghalense Retz. Observ. Bot. 5: 16 1789.
Habitat: Throughout the plains and low hills of India.
Common Names: Muñja, Munjanaka, Munjata (Sanskrit); Munja, Sarpat, Muunj, Kanda (Hindi); Shar (Bengali); Munjagaddi (Telugu); Ramasapu (Kanada); Munjipul, Munjappullu (Siddha/Tamil); Kana (Punjabi); Tirkande (Marathi).
Ayurvedic Names: Munja, Bhadramuja, Vāna, Shara, Sara, Rāmshara.
Folk Names: Sarpata.
Ritualistic Utility: In *Mahāgnicayana*, fire is produced in a pot called *Ukhā* or *Mahāvīra* and Muñja is used to kindle the fire. Burning Muñjas are dropped on the *Rukma*. A rope woven of Muñja is used to tie the horse in *Aśvamēdha* ritual. The rope should be as long as 288 inches or 123 inches. The *Brāhmaṇa* says that by using the rope of Muñja, the horse gets strength (*Ūrk*) and activity.
Medicinal Properties: The grass is used as a refrigerant. It is useful in burning sensation, thirst, dyscrasia, erysipelas and urinary complaints. API recommends the use of the root in dysuria, giddiness and vertigo. The stem is a good source of furfural (yield 5.67%, dry basis). It yields 19.5% (on dry weight) of reducing sugars when digested with sulphuric acid; glucose, xylose, galactose and rhamnose have been identified in the hydrolysate which contains 34.5% fermentable sugars. (It can be used as a potential source of alcohol). In Kerala, *Saccharum arundinaceum* Retz. is used as *Shara* for dysuria, diseases due to vitiated blood, erysipelas, leucorrhoea and piles. The grass is known as *Rāmshara* in North India.

Economic Importance: *Saccharum benghalense* is used as a raw material for thatching roofs. It is used for making baskets. Its fiber is used for making ropes. This perennial wild grass, is one of the ecologically successful native colonizer of the various abandoned mines. It forms pure patches on rocky habitats with skeletal soils. It forms extensive root network that binds the soil/pebbles and forms tall thick clumps with high biomass tufts. It is used by low-income locals for making ropes, hand fans, baskets, brooms, mat, hut and shields for crop protection. *Saccharum benghalense* is a choice species for vegetation and stabilization of erosion prone rugged slopes and their conversion into biologically productive sites of high socio-economic values.

Millet Crops
Panicum miliaceum Linnaeus, Sp. Pl. 1: 58. 1753.
Habitat: The crop is cultivated mainly in Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamil Nadu.
Common Names: Aṇu (Sanskrit); White millet, Common Millet, Proso Millet, Hog Millet (English); Vari (Hindi); Chiruvadlu (Telugu); Vari (Marathi); Vari (Gujarati); White French millet, Red French millet (Australia); Panivaragu (Siddha/Tamil); Chinā Ghās, Fāluudā (Unani)
Āyurvedic Names: Chināka, Chēnā
Folk Names: Chenaa, Chi-Tibet
Ritualistic Utility: Aṇu is used in Annahōmas of Vājapēya, Mahāgnicayana and other rituals.
Medicinal Properties: Seeds (grains) are used as demulcent; it is also used in diarrhoea. Plant itself is anti-gonorrhoeal. The seedlings contain an alkaloid hordenine (beta-*p*-hydroxyphenethyl dimethylamine). Saponins afforded diosgenin and yamogenin isolated from the leaves. The grains contain 10-18% of proteins which include prolamin, glutelin and smaller amounts of albumin and globulin. The protein has a biological value of 56% and a digestibility coefficient of 91% at 10% level of protein intake. It is a highly nutritious cereal grain used for human consumption, bird seed, and/or ethanol production. Unique characteristics, such as drought and heat tolerance, make Proso millet a promising alternative cash crop.

Setaria italica (L.) P. Beauvois, Ess. Agrost. 51. 170. 178. 1812.
Habitat: The crop is cultivated in Andhra Pradesh, Tamil Nadu, Gujarat, Maharashtra and Karnataka.
Common Names: Italian Millet, Fox-tail Millet (English); Tenai (Siddha/Tamil);
Ayurvedic Names: Kangu, Kanguni, Kangunikā, Priyangu Dhānya.

Ritualistic Utility: In a *Kāmyēṣṭi* performed in favour of Maruts by *Grāmakāma*, one who wishes to rule the villages. Both Priyaṅgu and Maruts were born from *pṛśni*, the white cow. In *Nakṣatrēṣṭi* too Priyaṅgu is used as *Caru*. In *Aśvamēdha*, *Annahōma* is performed as a subordinate sacrifice throughout the night as read in *Kalpa*. One of the materials used in the *Annahōma* is Priyaṅgu.
Medicinal Properties: Plant is used as a sedative to the gravid uterus. Grains are used for alleviating pain after parturition. It is applied externally in rheumatism. Analysis of a dehusked sample (79% of whole grain) gave following values: protein 12.3, fat 4.3, minerals 3.3, crude fibre 8.0, and other carbohydrates 60.9%. The principal protein of the millet is prolamin (48%), albumin and globulin together form 13-14% of the total protein, and glutelin 37%. The oxidation of unsaturated fatty acids, present in the grain, during the cold winter months is reported to yield toxic substances.

Echinochloa frumentacea Link, Hort. Berol. 1: 204, 1827.
Habitat: The crop is cultivated mainly in Karnataka, Tamil Nadu, Uttar Pradesh and Madhya Pradesh.
Common Names: Japanese Barnyard Millet (English); Kudrraivali pillu (Siddha/Tamil).
Āyurvedic Names: Śyāmāka
Folk Names: Shamā, Sānvā
Medicinal Properties: Plant is cooling and digestible, considered useful in biliousness and constipation. The millet has a well-balanced amino acid composition, but is deficient in lysine. Glutelin is the major constituent of protein.

Cereal Crops
Triticum aestivum Linnaeus, Sp. Pl. 1: 85. 1753.
Habitat: Cultivated as a food crop mainly in Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Maharashtra, Bihar and Rajasthan.
Common Names: Wheat (English);
Āyurvedic Names: Godhuma
Folk Names: Gehun
Ritualistic Utility: In *Vājapēya* ritual, the *caṣāla* is ordained to be made of the wheat flour superseding the usual wooden one. In the same ritual, a *hōma* of *anna*s of fourteen kinds of grains is ordained and Gōdhūma is one of them. In the *Vasōrdhārā* hōma, the sacrificer prays Agni and Viṣṇu to grant him heaps of wheat. In *Sautrāmaṇi* parched grains of wheat are mixed with *surā* and offered to Indra, Sarasvatī and Aśvins.
Medicinal Properties: Wheat germ oil is rich in tocopherol (vitamin E) content, total tocopherols 1897 mcg/g, alpha tocopherol 67%. The presence of ergosterol (provitamin D) has also been reported. Wheat germ is also used for its minerals, proteins and lipid contents. Germ proteins are rich in lysine (5.28–5.55 g/100 g protein), possess high biological value (94%) and protein efficiency ratio (2.9). Wheat germ contains haemagglutinating andantipyretic factors, but these are destroyed by toasting. It also contains haemoproteins, possessing peroxidase activity. Bran oil contains tocopherols, but major part of them (68%) is in epsilon form; alpha-tocopherol forms only 11% of the total. Gluten lipids, associated with gluten, contain a high percentage of linoleic acid; lowering of serum cholesterol level has been observed in experiments.

Oryza sativa Linnaeus, Sp. Pl. 333. 1753.
Habitat: Cultivated all over India as a food crop.
Common Names: Rice (English); Nell (Siddha/Tamil); Biranj Sāthi (Unani);
Āyurvedic Names: Shāli, Vrihidhānya, Tandula, Vrīhi.
Ritualistic Utility: Vrīhi (rice) is used in rituals in the form of *Caru*, *Purōḍāśa* and *Anna*. In *Rājasūya*, an *Aṅga* called *Dēvasuvām Havīmṣi* is performed in which the *Purōḍāśa* of black rice is offered to Agni. In the same *Aṅga* ritual, a *Purōḍāśa* of *Āśuvrīhi* to Savitṛ and another of *Mahā Vrīhi* to Indra are offered. In *Pavamānēṣṭi*, a *Purōḍāśa* of rice is offered to Agni reciting a *Mantra*. The offering of this *Purōḍāśa*

cause *Brahmavarca*s and other results to the sacrificer. In a *Kāmyēṣṭi* performed in favour of Āditya to obtain immense wealth, the *Caru* of rice is offered to the deity Āditya.
Medicinal Properties: Rice water (a water decoction of rice) is used as a demulcent, refrigerant in febrile & inflammatory diseases and in dysuria. Also used as a vehicle for compound preparations used for gynecological disorders. It is regarded as cooling in haematemesis and epistaxis, and as diuretic. The green culm or stalks are recommended in biliousness. Ash of the straw is used in the treatment of wounds and discharges. Lixiviated ash of straw is used as anthelmintic and in nausea. API recommends the dried root in dysuria and lactic disorders.

Hordeum vulgare Linnaeus, Sp. Pl. 1: 84. 1753.
Habitat: Cultivated as food crop in Uttar Pradesh, West Bengal, Bihar, Madhya Pradesh, Rajasthan, Haryana, Punjab, Himachal Pradesh and Jammu and Kashmir.
Common Names: Barley (English); Yavam, Saambaluppu (Siddha/Tamil); Barley, Jao Shaeer
Ritualistic Utility: The barley and its products have a wide spread range of use in rituals. In *Rājasūya*, an *Aṅga* ritual called *Daśapēya* in which the juice Sōma is offered to the fire is performed. At the end of this ritual, as directed by the *Brāhmaṇa*, a big cart, filled with *Yava*s is given to the priest, *Acchāvāka*. This *Dāna* pleases the deity Varuṇa. In another Aṅga of Rājasūya called '*Dēvasuvām Havīmṣi*' is performed, wherein the *Caru* of *Yava* is offered to Varuṇa. In a *Kāmyēṣṭi* called *Traidhātavīyēṣṭi* which grants several materials wishes to the sacrificer. In this *iṣṭi*, three *Purodāśa*s are offered to the fire and the second one is of *Yava*.
Medicinal Properties: Barley is nutritive and demulcent during convalescence and in cases of bowel inflammation and diarrhoea. It protects immune system. API recommends barley in urinary disorders, muscular rigidity, chronic sinusitis, cough, asthma, lipid disorder and obesity. Juice of young barley leaves is seven times richer in vitamin C than oranges, five times richer in iron than spinach, 25 times richer in potassium than wheat; high in SOD (superoxide dismutase), an enzyme that slows ageing of cells. The nutritional quality of the barley depends on beta-glucan fraction of the grain. Beta-glucan-enriched fraction produced cholesterol-lowering effect in hamsters. Naked barley extracts have been found to selectively inhibit cyclohexanase activity and may be useful as a therapeutic drug for treating thrombosis and atherosclerosis. Ethanol extract of young green leaves exhibits antioxidant activity attributed to a flavonoid, 2"-O-glucosylisovitexin. It also exhibits anti-inflammatory and antiallergic activities. The leaves contain an indole alkaloid, gramine, which exhibits antibacterial properties.

Oryza rufipogon Griff. Notul. Pl. Asiat. 3: 5. 1851.
Habitat: Wild rice is a native species of Asia and is widely distributed in the tropics and subtropics except Africa. It occurs at altitudes from 0 to 1000 m. It is perennial, tufted wild rice. It grows in shallow water, irrigated fields, pools, ditches and sites with stagnant or slow, running water.
Common Names: Nīvāra (Sanskrit); Common wild rice, Brown beard rice, Perennial wild red rice, Red rice, Red-bearded rice, Wild red rice (English); Birhni, Karga, Reesa (Hindi); Arroz Colorado, Arroz rojo (Spanish); Riz rouge sauvage (French); Arrozrana, Jingirra, Wild rice (Australia); Arroz-preto, Arroz-vermelho (Brazil); Reis, Wilder roter (German); Padi burung, Padi hantu (Indonesia); Khao nok, Khao pa (Laos); Padi hantu, Padi yang (Malaysia); Khao phee (Thailand).
Ayurvedic Names: Nīvāra

Saccharum officinarum Linnaeus, Sp. Pl. 1: 54. 1753.
Habitat**:** Uttar Pradesh, Bihar, Punjab, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and all other states of India.
Common Names: Ikṣu, Pundakah (Sanskrit); Sugarcane, Noble cane (English); Eekh, Pundiya, Ganna (Hindi); Kunhiar, Kushyar, Akh (Assamese); Cheruku, Cheruku gada (Telugu); Kabbu, Iksu, Petta patti kabbu (Kannada); Karumbu, Pundaram (Tamil); Karibpu (Malayalam); Sherdi (Marathi); Chu (Manipuri); Karumbu, Nanal (Siddha/Tamil); Gannā, Naishakar (Unani).

Āyurvedic Names: Ikṣu, Dirgha-chhada, Bhuurirasa, Morata, Asipatra, Madhutrna, Gudamuula, Trnarasa.
Ritualistic Utility: The leaves of sugar cane (Ikṣu) are used in the *Ātithyēṣṭi*, connected with the Soma ritual. This *iṣṭi* is performed in the honour of Soma, the king of *Oṣadhi*s.
Economic Importance: Ethanol is generally available as a by-product of sugar production. It can be used as a biofuel alternative to gasoline, and is widely used in cars in Brazil. It is an alternative to gasoline, and may become the primary product of sugarcane processing, rather than sugar.
Medicinal Properties: Cane Juice is used for restorative, cooling, laxative, demulcent, diuretic, anti-septic. It is also used in general debility, haemophilic conditions, jaundice and urinary diseases. API recommends the juice of the stem in haemorrhagic diseases and anuria; and the root in dysuria. Sugarcane juice contains sucrose (70-80% of soluble solids in the juice), glucose and fructose. Non-sugar constituents present in the cane juice are carbohydrates other than sugars. Asparagine and glutamine are prominent amino acids in the juice. Other amino acids include alanine, gammaamino butyric acid, aspartic and glutamic acids, glycine, leucine, lysine, serine and tyrosine. The presence of phenylalanine, histidine, valine, proline, threonine and arginine, pipecolic acid, methionine and tryptophan has also been reported. Aconitic acid constitutes about three-fourths of the total carboxylic acid present in the juice. Vitamins present in the juice are: thiamine, riboflavin, niacin, pantothenic acid, biotin, and vitamin D; enzymes include diastase, invertase, lactase, peroxidase, tyrosinase. Phenols in the cane juice are mainly polyphenols from tannin and anthocyanin from the rind. Cane juice contains glycolic acid which improves skin complexion as it has anti-wrinkle effect, prevents scaly growth and increases natural collagen and elastin in the skin. Enzymes present in the seeds include large quantities of diastase and invertase. An ester, vanilloyl-1-O-beta-D-glucoside, has been isolated from the bagasse. The leaves contain alpha-amylase and glutathione-S-transferase.

Conclusion

Science in general and plant science in particular is an integral part of the Vedas and the *Upavedas*. Although various terminologies are available now in modern botany, they, in fact, originated from the vast Vedic literature. The authenticity of various botanical descriptions is in the *Veda-mantras*. The fact is that our understanding and analytical capacity is still restricted and fails to match with the very high standard of Vedic literature. Although literature related to botanical descriptions and information in Vedas are available in Ṛgveda (RV), Yajurveda (YV) and Atharvaveda (AV), but they are mostly in discrete form. Attempt has been made to compile it at one place for the benefit of interested scholars and readers.

In this paper, the plant biological and agricultural knowledge are discussed that is revealed in the Veda *Mantra*s/liturgy. It is found that the plants and trees have several-fold importance in the Vedas. It is clearly evident from the discussion that the morphology, taxonomy, classification of plants, anatomy, physiology, the agricultural and botanical terminologies are revealed in the Vedas with a specific purpose. To further conclude, there is an urgent need in protecting the traditional knowledge such as the Vedic botany and agriculture for future generations.

Abbreviations: AV - Atharvaveda; BU - Bṛhadāraṇyakōpaniṣad; CU - Chāndōgyōpaniṣad; KYV - Kṛṣṇa Yajurveda; KS - Kāṭhaka Saṁhitā; RV - Ṛgveda; SB - Śatapatha Brāhmaṇa; SU - Śvētāśvatara Upaniṣad; SV - Sāmaveda; SYV - Śukla Yajurveda; TA - Taittirīya Āraṇyaka; TB - Taittirīya Brāhmaṇa; TS - Taittirīya Saṁhitā; VS - Vājasaneyi Saṁhitā

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Table 1: Grass Species Revealed in the Vedic Texts

S. No.	Vedic Sanskrit Name	Common Name	Botanical Name	Veda References
1.	Balbaja	Indian Goosegrass / Crowfoot grass	*Eleusine indica*	RV 8-55-3; TS 2-2-8(2); KS 10-10; MS 2-2-5; AV 14-2-23
2.	Darbha / Kuśa	Sacrificial grass	*Desmostachya bipinnata*	RV 1-191-3, AV 6-43-2, 8-7-20, 10-4-13, 11-6-15, 19-28-1, 19-28-30, 19-28-32, 19-32-1, 19-32-2; TS 1-5-1(4), TS 5-4-5, TS 5-6-4, TS 6-1-1(7); TS 6-2, TS 7-5-8(5); TB 1-3-7(40), TB 3-8-2(5), TB 1-7-6(4), TB 2-7-9 (5), TB 3-2-5(35), Kalpa on TB 3-10-1; TA 2-11, TA 3-8(11); KS 23-1; MS 4-8-7; SB 11-5-3, SB 13-4-3(1); TB 1-7-6(4), 2-7-9(5); KS 23-1; AB 1-3; KB 18-8
3.	Dūrvā / Pākadūrva	Bermuda grass	*Cynodon dactylon*	RV 10-16-13, 10-134-5, 10-142-8; TS 4-2-9(2), TS 4-2-9(37), TS 5-2-8(3); VS 13-20; SB 7-4-2(11), SB 7-4-2(12); AV 18-3-6
4.	Iṣīkā	Reed grass	*Chionachne gigantea*	AV 12-2-54
5.	Kāśa / Kaśa	Kansgrass	*Saccharum spontaneum*	RV 10-100-10; TA 6-9(21)
6.	Muñja	Baruwa grass	*Saccharum benghalense*	RV 1-191-3; TS 5-1-9(5), TS 5-1-9(49), TS 5-1-10(5); TB 3-8-1(1); TA 4-5; Kalpa on TB 3-8-1; KB 18-7; SB 4-3-3(16), SB 6-6-1(23), SB 6-6-2(15), SB 6-6-2(16), SB 12-8-3(6)
7.	Sugandhitējana	Vetiver	*Vetiveria zizanioides*	TS 6-2-8(4); KS 25-6; AB 1-28-28; SB 3-5-2 (17); PB 24-13-5
8.	Naḻa	Bamboo reed	*Arundo donax*	TA 6-7(18); Kalpa on TA 6-7
9.	Vēṇu	Thorny bamboo	*Bambusa arundinacea*	RV 1-10-1; TS 5-1-1(4), TS 5-2-5(2), TS 6-1-1(1); TB 1-3-8(22); TE 2-9, TA 5-2(11), TA 5-3(22); MS 3-1-2; SB 6-3-1(31)
10.	Aṇu	Proso millet	*Panicum miliaceum*	TS 5-4-8(37), TS 4-7-4(8), Sāyaṇa on TS 4-7-4; TB 1-3-8(48); VS 18-12; Mahīdhara on VS 18-12; BU (Kāṇva) 6-2-13
11.	Gavīdhuka	Job's tears	*Coix lacryma-jobi*	TS 1-8-9(16), TS 1-8-10(18), TS 4-5-11, TS 5-4-3(10), TS 5-5-9(40); Kalpa on TS 4-5-1;

				Sāyaṇa on TS 4-5-11; TB 1-3-8(48), TB 1-7-4(24); SB 9-1-1(8), SB 14-1-2(19)
12.	Nīvāra	Wild red rice	*Oryza rufipogan*	TS 1-8-10(18), TS 4-7-4(3); TB 1-3-6(7), TB 1-3-4(26), TB 1-3-8(48), TB 3-3-4(32); TA 10-11(26); KS 12-4; MS 2-6-6, MS 4-4-3, MS 3-4-10; VS 18-12; SB 5-1-4 (14); SB 3-3-5, SB 5-3-3(5)
13.	Priyaṅgu	Foxtail millet	*Setaria italica*	TS 2-2-11(4), TS 2-2-11(61), TS 4-7-4; KS 10-2, KS 10-11; MS 2-1-8; VS 18-12; TB 1-3-4, TB 3-8-14(55); Kalpa on TB 3-8-14; TA 1-3-4; BU 6-3-22
14.	Śyāmāka	Barnyard grass millet	*Echinochloa frumentacea*	TS 1-8-1(2), TS 2-3-2(6), TS 4-7-4(2); MS 2-2-4; VS 18-12; KS 10-2; AV 20-135-12; SB 10-6-3(2), 12-7-1(9); KB 4-12
15.	Gōdhūma	Wheat	*Triticum aestivum*	TS 4-6-4; MS 1-2-8; VS 18-12, VS 19-22, VS 19-89, VS 21-29; TB 1-3-7(41), TB 1-3-8(48), TB 2-6-11(39); SB 2-7-1(1), SB 2-7-1(2), SB 12-7-1(2), SB 12-2-9, SB 12-9-1(5); BU 4-3-22
16.	Vrīhi	Paddy / Rice	*Oryza sativa*	TS 1-8-10, TS 2-3-1(1), TS 3-4-11, TS 4-7-4, TS 7-2-10(2), TS 7-3-14(35); Sāyaṇa on TS 1-8-10; TB 1-3-8(48), TB 2-4-6(52), TB 3-1-6; KS 10-6, KS 11-5; MS 3-10-2, MS 4-3-2; VS 18-12; SB 12-7-1(9)
17.	Yava	Barley	*Hordeum vulgare*	RV 1-23-15, RV 1-66-3, RV 1-117-21, RV 1-135-8, RV 1-176-2, RV 2-5-6, RV 2-14-11, RV 5-86, RV 7-3-4, RV 8-2-3, RV 8-22-6; TS 4-7-4, TS 6-2-10(3), TS 6-4-10(5), TS 7-2-10(2); KS 25-10, KS 26-5; MS 4-3-2; VS 5-26, VS 18-12, VS 23-30; TB 1-8-4(1); SB 1-1-4(20), SB 2-5-2(1), SB 3-6-1(9), SB 3-6-1(10), SB 4-2-1(2), SB 12-7-2(9); KB 4-12AV 6-30-1, AV 6-50-1
18.	Ikṣu	Sugarcane	*Saccharum officinarum*	TS 6-2-1(1), TS 7-3-16(1); TB 2-5-7(32); MS 3-7-9; VS 25-1; ApSS 2-9-12, ApSS 9-7-7.

Figure 1 **-** Wild Grasses and Products Revealed in the Vedic Texts

Figure 1 - Wild Grasses and Products Revealed in the Vedic Texts - (a) *Desmostachya bipinnata* (Darbha/Sacrificial grass) plant, **(b)** Mat; **(c)** Sacrificial loops made from Darbha leaves; **(d)** *Cynodon dactylon* (Durva/Bermuda grass) creeping on ground, **(e)** Bunches of leaves; **(f)** *Coix lacryma-jobi* (Gavīdhuka/Job's tears) plant in flowering; **(g)** Beads close-up, **(h)** Necklace from beads **(i)** *Arundo donax* (Na̲la/Bamboo reed) cultivation; **(j)** *Saccharum spontaneum* (Kaśa/Kansgrass) along water beds in flowering; **(k)** *Eleusine indica* (Balbaja/Goosegrass) plant, **(l)** Panicle close-up; **(m)** *Vetiveria zizanioides* (Sugandhitējana/Vetiver) plants in groups; **(n)** Vetiver roots in bundles; **(o)** *Bambusa arundinacea* (Vēṇu/Thorny bamboo) plants, **(p)** Bamboo seeds **(q)** *Saccharum benghalense* Muñja/Baruwa grass plant population, **(r)** Muñja tray, **(s)** Rope rolls

Figure 2 - Millet Crops Described in the Vedic Texts

Figure 2 - Millet Crops Described in the Vedic Texts - (a) *Panicum miliaceum* (Aṇu/Proso millet) crop, **(b)** Panicles; **(c)** Grains; **(d)** *Setaria italica* (Priyaṅgu/Foxtail millet) crop in flowering, **(e)** Panicle close up, **(f)** Immature seed heads, **(g)** Ears and grains, **(h)** Grains; **(i)** *Echinochloa frumentacea* (Śyāmāka/Barnyard grass millet) crop; **(j)** Grains

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