

Project Report

Plant Biology of *Yajurveda**

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The project aims to make a comprehensive and systematic assessment on the descriptions of plant biological material described in the *Yajurveda* texts. This study would provide the easy identification of plants, their importance in various vedic rituals, magical, medicinal and secular significances and their utilization for mankind. This will also provide a rich source material for understanding the ancient Indian plant biology. The project report is presented under the following chapter titles:

- I. Veda Introduction
- II. Significance of Trees in Vedas
- III. Vedic Rituals and Plant Biological Product
- IV. Plant Biology Knowledge in the Veda *Samhitās*, *Brāhmaṇās*, *Aranyakās* and *Upaniṣads*
- V. Ritualistic Significance of Plants
- VI. Agriculture Crops, Plants and Trees in the Śrī Rudram
- VII. Magical Significance of Plants
- VIII. Medicinal Significance of Plants
- IX. *Yajñāyudha*– Implements for Sacrifices
- X. Botanical Descriptions of Plant species in the *Yajurveda*
- XI. Summary of the utilization and importance of plant species

In the *Yajurveda* (*YV*) texts different types of plants and trees are mentioned. The flora of *Yajurveda* consisting of seventy one (71) plant species is described. Among the 71 plants, 47 species belong to the class Dicotyledonous, 23 species belong to the class Monocotyledonous and one (01) species belongs to the Gymnosperm category, as per the Bentham and Hooker (1862) taxonomic system of plant classification. A total number of 71 plant species, belonging to 32 families, includes 28 tree species, five (05) species of shrubs and 38 species of herbs (see Appendix 1) are described.

The final report (henceforth referred to as ‘the Report’ in this article) that is submitted to the Indian National Science Academy (INSA) contains XLI+639 pages that include 84 photographs of plants and *yajñāyudha*, glossary, bibliography, web bibliography, eight (08) tables and plant names index. *Mantra* references are provided at the end of each chapter designated in Arabic numerals. More than 1400 *mantras* related to plants/trees are provided as references from the *Yajurveda* and other vedic texts in Devanāgarī and Roman diacritic scripts. The complete list of plants and tree species, their class and family are provided in the Report. This article provides the essence of the above-mentioned chapters.

1. VEDA INTRODUCTION

Vedic texts were codified and classified into

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writing by the great sage, Veda Vyasa, as the following: (1) *R̥gveda*—wisdom of the verses, (2) *Yajurveda*—wisdom of sacrificial formula, (3) *Sāmaveda*—wisdom of the chants and (4) *Atharvaveda*—wisdom of *Atharvan ṛ̥ṣis*.

The *Yajurveda* (a *tatpuruṣa* compound of *yajus*—‘sacrificial formula’ and *veda*—‘knowledge’, i.e. ‘the knowledge of sacrifice’) is the next of the four canonical texts of the vedas. It contains the knowledge of principles and methods of performing *yajñas* and *yagas* as spiritual and scientific approaches for global welfare (Sastry, 1940, 1989). *Yajurveda* is quite different from the *RV* and other *saṃhitās*. It is principally in prose form. The word ‘*yajus*’ in the *Yajurveda* is explained as, ‘*gadyatmakam yajus*’. In another definition, ‘*yajur yajates*’, it talks about the relation with the sacrifice (*yajña*), because both the terms are derived from the root ‘*yaja*’ (Sastry, 1940; Raghunathachari, 1982). The *YV* is more pronouncedly a ritual Veda, for it is essentially a guide-book for the *Adhvaryu* (priest), who performs the *yajñas* and *yagas* (Sarma, 1989). The *YV* is divided into two forms, the ‘*Śukla YV*’ (‘pure’

or white, because the *Brāhmaṇa* portions are not mixed up with the *mantra* portion) and the ‘*Kṛṣṇa YV*’ (‘dark’ or black, in the sense of *mantra* being mixed up with the *Brāhmaṇa* sections). A schematic representation on the classification of *Yajurveda* is provided in the Fig. 1.

2. SIGNIFICANCE OF TREES IN VEDAS

Vṛkṣam (tree) is the symbol of life and growth. It stands for eternity and selfless well-being. In the four vedas, many herbs, vines, shrubs and tree species are described. Our *ṛ̥ṣis* in the Vedas have offered hundred-fold respects and prostrations to the trees. *Ṛ̥ṣis* say that it is not possible to imagine life without trees. *Vājasaneyā Saṃhitā (VS)*, show immense respect towards the trees and say one should have reverence and devotion towards all eatables, grains, medicinal herbs, trees, forests and vegetation. Trees are considered as *devatās* (deities) meaning one who keeps giving incessantly. Trees have always been beneficial to us and they possess the divine qualities that qualify them to be addressed as *devatās*. Trees in Indian mythology and folklore are widely considered as

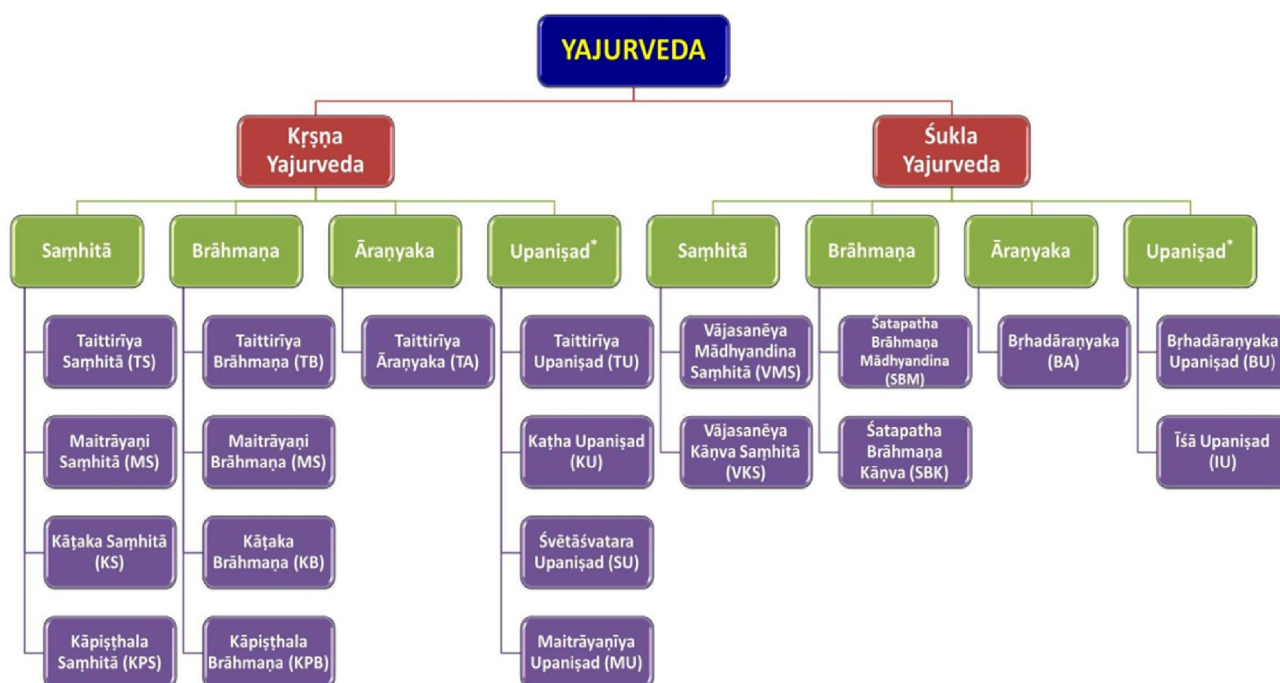


Fig. 1. Classification of *Yajurveda*.

sacred and worshipped across the country for their benevolence. Indians believed that certain trees are the abode of gods and goddesses. The worship of trees in India can be traced to the Indus Valley Civilization, as clearly indicated in the Indus Valley seals. The hymns of the vedas also contain references to such sacred trees and plants on account of their being associated with certain deities and also because of their potent medicinal properties (Dymock *et al.*, 1893). *Sthala vrkṣās* (derived from Sanskrit, i.e. *sthalā* – place; *vrkṣa* – tree) or sacred trees are found all over in India. Hence, killing trees or cutting a live tree is doing a crime against *devatās*.

3. VEDIC RITUALS AND PLANT BIOLOGICAL PRODUCTS

Through the centuries, rituals have been a socio-cultural force in India. It is also pointed out that it is due to these rituals the tradition has been protected. The fact that the vedic sacrifices have continued to be celebrated not only centuries after the vedic period but even up to the present day is an unquestionable proof of the persistence of the old religion, bearing in mind that the ‘*yajña*’ constitutes its more important element (Aguilar, 1976). The execution of rituals maintains the balance of the five major elements (sky, wind, fire, water and earth) affording sun-shine and rain in reasonable measures, resulting in proper growth of crops and plenty of food. Rituals are performed to get relief from excess or scarcity of rain, diseases like small-pox and tuberculosis, dangers from poisonous creatures, wild animals and thieves and other sorts of disturbances (Sarma, 1989).

The full-moon and new-moon (*darśapūrṇamāsa rituals*) sacrifices are of great importance for the study of the vedic ritual because they form the model of all sacrifices called ‘*iṣṭis*’. The rituals are generally classified into three viz., obligatory (*nitya*) such as *agnihotra*; incidental (*naimittika*) such as *jāteṣṭi* and optional (*kāmya*) such as

citrāyaga. A more detailed classification of the group of seven *pākayajñas*, *haviryajñas* and *somayajñas* are provided in the *Śrauta Sūtrās* (Kashikar and Dandekar, 1958).

The main object of the ritual/sacrifice is to yield the required desire of the sacrificer. The plants and their products have got a wide range of use in various forms. A close and critical study of the plants and their products used in rituals reveals that they have got a four-fold significance and as far as the *YV* is concerned, they mark a distinct stage in the evolution of human thought.

4. PLANT BIOLOGY KNOWLEDGE IN THE VEDA SAMHITĀS, BRĀHMANĀS, ARANYAKĀS AND UPANIṢADS

Proper identification of higher plants is based upon the external structure of plant organs. The classification (Taxonomy) of various plant parts, their structures and growth is explained in detail in the *Taittirīya Samhitā (TS)*, *Vājasaneyya Samhitā (VS)* and related *Brāhmaṇās*. Plants are in the first place and are broadly classified into three groups— (i) *vrkṣa* (trees), (ii) *auśadhi* (herbs or small plants) and (iii) *vīrūdh* (creepers or herbs with spreading stems). Various types of root and leaf forms have been described in the vedic texts which correspond to the modern botanical terms. The *Taittirīya Samhitā* classifies the plant kingdom into several classes based on its form and growth. Hence, the *ṛṣis*, the ancient scientists, realized the importance of classifying the plants according to their vegetative and reproductive properties, similar to that of modern classifications of the plant kingdom. ‘*Apsuja*’ means water-born is mentioned in the *TS* and in the *TB*. The manufacture and storage of food can be obtained from the references in the *Maitrāyaṇī Samhitā*, the *Kāṭaka Samhitā* and the *Bṛhadāraṇyakopaniṣad*, where waters are regarded as the essence of the earth (*prthivyāś āpah*), herbs as the essence of water (*apāmauśadhyāḥ*), flowers as the essence of herbs (*auśadhīnam puṣpāṇi*) and fruits

as the essence of flowers (*puṣpānām phalāni*), ‘*śaṣpa*’ denotes ‘young’ or a ‘sprouting grass’ (Macdonell and Keith, 1982), mentioned in the *YV Samhitās* and in *RV Brāhmaṇa*, *YV Brāhmaṇa*. Sāyaṇācārya in his commentary on *Taittirīya Samhita (TS)* mentioned that *śaṣpa* means a just born *darbha* grass (*Desmostachya bipinnata*) on the banks of the Ganga River. Many botanical and agriculture associated terms mentioned in the vedas, which are currently in use in the modern botany are comprehensively discussed in the Report. Also, agricultural tools, seasons, crops, favorable crop/s for each season, cycle/s of crops possible for each season and so on, which are revealed in the *YV* and other vedas are discussed. Several botanical and agriculture associated terms are extensively discussed in the Report.

5. RITUALISTIC SIGNIFICANCE OF PLANTS

In the chapter dealing with the ritualistic significance of the plants, it has been noticed that the important feature of the ritual is *homa*. The *homa* involves two things– the material to be sacrificed and the implement used during the sacrifice. Most of the sacrificial materials are the products of the plants. Of them, the ‘*samidhas*’ are very commonly used and its’ usage is of great importance in *yajñas*, *yagas* and *homas*. *Samidhas* of several trees and plants are offered to the fire, of which those of *aśvattha*, *udumbara*, *palāśa*, *śami*, *vaikaṅkata*, *aśanihata*, *puṣkara parṇa* are very much dear to Agni (Fig. 2).

The faggots of *nyagrodha*, *māndhuka* and *plākṣa* and the grasses like *darbha*, *balbaja* and *muñja* are also offered to the fire. Among the *vianda* (an item of food) sacrificed, the *caru*, *purōḍāśa*, *anna*, *saktu*, *lāja*, *dhāna* and *karambha* are noteworthy. *Caru* is prepared of the grains of *āmba*, *garmut*, *gavīdhuka*, *nīvāra*, *priyaṅgu*, *yava*, *vrīhi* and *śyāmāka*. *Purōḍāśa* is prepared of *vrīhi* and *yava*. The grains of *aṇu*, *gavīdhuka*, *garmut*, *godhūma*, *jartila*, *tila*, *nīvāra*, *priyaṅgu*, *māśa*, *yava*, *veṇu*, *vrīhi* and *śyāmāka* are cooked into



Fig. 2. The seven *Samidhās* cherished by Agni.

anna and offered to the deities. In *Vājapeya*, fourteen kinds of *annas* are given in oblation. Several *iṣṭis* are deeply discussed in this chapter. The specific plant products used for some of the important, well-known and desire-motivated *iṣṭis* are listed in the Report. The *saktus* of *karīra* and *kharjūra* are sacrificed in the *karīreṣṭi*. The parched grains of *karīra* are offered to the Agni in *karīreṣṭi* induces rains and those of *vrīhi* in *aśvamedha*. *Lājas* and other sorts of *vianda* are offered to the fire during the *anna homas* in *Aśvamedha*. The porridge is prepared with the grains of *gavīdhukā* and *jartila*. The sacrificial brewage, *māsara* and *sura* are prepared with the mixture of germinated rice, wheat and barley, the flours of rice, wheat and barley and the fruits of *karkaṃdhu*, *kvala* and *badara*. The best of the oblations, the *soma* juice is the product of a plant. The oblation of the juices prepared from the plants of *pūtika*, *ādāra*, and *phālguna* are equivalent to that of Soma plant. Thus, the manifold value of trees and plants having immense ritualistic utility and significance is portrayed in this chapter.

6. AGRICULTURE CROPS, PLANTS AND TREES REVEALED IN THE ŚRĪ RUDRAM

Rudra is a deity of the vedic period. He finds mention in the *Ṛgveda* and there is a detailed section in praise of Lord Rudra in the *Kṛṣṇa*

Yajurveda (KYV) and *Śukla Yajurveda (SYV) Samhitās*. The name 'Rudra' is mentioned in all seven *kāṇḍas* of the *Kṛṣṇa Yajurveda Taittirīya Samhita (KYV-TS)*. The 16th chapter in the *Śukla Yajurveda Samhita (SYV)* and the 5th and 7th *prapāthakas* of the 4th *kāṇḍa* of the *KYV-TS* are dedicated to the 'Rudra' in its entirety. The earliest hymns paying homage to Lord Rudra is the *Śrī Rudram* found in the *Yajurveda*. The *Rudrādhyāya* (colloquially *Rudram* or *Śrī Rudram*) occurs in all four *Yajurveda Samhita* texts with minor variations.

In this chapter, the *mantras* that are connected to the botany and plant vegetation are provided. The botanical and agricultural terminology mentioned in the *Śrī Rudram* is explained in detail. The plants and trees mentioned in the *camaka praśna* are more in number when compared with the *namaka praśna*. Cereal and legume crops, trees and their derivatives that are required to perform *yajñas* and *yagas* are revealed in the *camaka praśna* of the *Śrī Rudram*. In *Śrī Rudram*, a total of 12 agriculture crops consisting of seven (07) cereal crops, four (04) legume crops and one (01) oil seed crop are revealed. Even today, these crops are being cultivated by our farmers for the utilization by mankind and cattle on day to day basis as food and fodder, respectively. The different qualities of cereal grains are detailed in the *camaka praśna*. The plant species that are mentioned in the *Śrī Rudram* are tabulated in the Report.

7. MAGICAL SIGNIFICANCE OF PLANTS

The ritual has given birth to the magic; as such in the order magic comes next to ritual. All the trees and plants which possess ritualistic significance do not have magical significance. In *Rājasūyā*, the use of grains of *apāmārga* in the *homa*, misleads and destroys the enemy of the sacrificer. The *śaṅkus* and *idhma* of *aśvat'ha*, help the sacrificer to defeat his foe and win back his kingdom. The plant *arjuna* wards off the meddling

of evil elements. A *maṇi* (bead) of *udumbara* helps the wearer in getting wealth. The offering of ghee with the *yajña* implement *graha* which is made of *udumbara*, helps the sacrificer to avert untimely death. By offering the parched grains of *karīra* or *kharjūra* to the fire, rain can be created artificially. The plant *varṣāhu* is also used for the same purpose. *Kārṣmarya* is famous for its capacities of quelling the *rākṣasas*. It is used as *paridhi* to hedge the hearth. Even the deities used the *paridhis* of *kārṣmarya* to avoid the meddling of *asuras*. The *sruc* of *kārṣmarya* filled with ghee is as powerful as the *vajra*, famous for its capability of killing the *asuras*. The *samidhas* of *khādira* are used in several rituals of witchcraft. A sword, made of the wood of *khādira* is held by *agnīdhra* in the *darśapūrṇamāsa* and other rituals, to prevent *rakṣasa*. *Garmut* possesses subjugate properties. It subjugates the human beings and the cattle too. The *Bdellium (gulgulu)* is used for subjugating not only the human beings but also the deities and other super human beings. *Darbha* has a wide range of use in witchcraft. The *vidhrtis* (two *darbha* blades kept on the *vedi*) smash all demonic forces and the enemies among the human beings. *Dūrva* averts the nightmares caused by ghosts. The herb *nīlī* dismantles the witchcraft launched with the intention to cause white leprosy (*svētakuṣṭa*). The *juhū* of *parṇa* used in the *apāmārga homa*, expels the ogres and other evil elements. *Parṇa* is an embodiment of Brahman. The faggot of *madhūka* can kill the soldiers of the enemy, by creating either fire accidents, the reasons of which cannot be discovered, or by causing fever. By wearing the rope of *muñja* around the waist, the *Brahmacārin* protects himself from all the evil spirits. *Yava* is a well-known demon-expeller. In the *iṣṭi* of *Traidhātaviya*, a *purōḍāśa* of *yava* is given in oblation to deteriorate the sorcery made by others, quell the demons causing defeat and grant the sacrificer abundant wealth. The use of the branch and *sruc* of *varaṇa* wards off the evil spirits and untimely death. In an *Abhicārakarman*, using the *sphya* (as sword made of *khādira* wood)

as *yūpa*, the faggot of *vibhīdaka* is offered to the fire. This enables the sacrificer to kill his enemies. A dethroned king can regain his kingdom, by performing a *kāmyayāga*, in which the *puroḍāśa* of *vrīhi* is offered to the deities. The offer of the *puroḍāśa* also grants the sacrificer immense wealth. The *sambhāra* of *samī* causes peace (*śānti*). A list of plants classified under magical significance in the *Yajurveda* is provided in the Final Report.

8. MEDICINAL SIGNIFICANCE OF PLANTS

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 he gets rid several diseases like white leprosy.

The *apāmārga homa* in *Rājasūyā* improves the bodily health of the sacrificer. The use of the leaf of *arka* in the *satarudrīya homa* (as an implement of *homa*) gives relief to the sacrificer from many diseases. *Arjuna*, which is used to cover the *caru* in obsequies, is the essence of all *auśadhis* and its use makes the food (*caru*) more nutritious. The use of *aśvat̥tha* as *samidhas* and as *sambhāras* in various rituals tones up the male potentiality in men and fertility in women. It strengthens the semen and helps the man to get a male child. The offering of the faggot of *aśvat̥tha* averts madness and other mental disturbances. The *samidhas* of *āragvadha* are used in the ritual *sarpabali*, which repels snakes and other poisonous creatures. It works as anti-venom. *Udumbara* is the essence of food. In whatever form, its use in rituals causes strength and vitality. It also causes commendable power of speech. In *sarpabali*, the *samidhas* of *kimśuka* are offered to the fire, to get rid of snakes and other venomous creatures. *Kimśuka* forms

remedy to all kinds of poisons. The fruits of *kvala* which are also mixed with *surā* (along with *karkandhu*) strengthen the capacity of the sense-organs. The use of a vessel of *khādira*, in *āyuckāmeṣṭi*, improves the health and causes longevity to the sacrificer. It also gives relief from chronic diseases, the diseases caused by over-heat, stomach disorders and the idea of committing suicide (a relief from depression). The *yūpas* of *khādira* improve luster and longevity. The *sambhāra* of *gulgulu* causes health, strength and luster. The groats of wheat, which are mixed with *surā* and offered to deities, strengthen the virility. In *Vedic* rituals, the use of *darbha* is intended for the purpose of purification. Water is sprinkled with the reeds of *darbha*. It purifies not only the sacrificer and the priests, but also the sacrificial materials. The touch of *darbha* makes the *viand* nutritious. *Dūrvā* is placed on the head before taking bath. It has the capacity to avert nightmares. *Nīlī* is a wonderful discovery of vedic medicine. The *mantras* emphasize that it cures white leprosy and turns the grey hair into black hair. Many kinds of sacrificial materials, prepared of *nīvāra* are offered to deities. Even the gods consider it as the best kind of food. By eating *nīvāra*, the body becomes strong and full of virility. It also improves the power of memory. The faggot of *nyagrōdha* which is offered to the fire alleviates madness and other kinds of mental disturbances. *Parṇa* which has a wide range of use in rituals is full of medicinal properties. Its touch purifies the oblations. By touching the cow and the calf with a green *parṇa* branch, the milk collected from the cow is purified. Besides, it gives protection from the diseases caused by virus. It causes bodily splendor, strength and longevity. The herb, *pāthā* can show wonderful impact upon the human psychomotor system. *Pūtīka* is a substitute of Soma and an agent of coagulation. The offering of the curd, thus prepared, in favour of Indra, improves the health of the sacrificer. With its medicinal properties, *plākṣa* keeps the *paśu* and *havis* free from bacteria. The offer of the faggot

of *plākṣa* to the fire cures madness. *Badara* is mixed with the *surā* offered to deities. It improves virility and causes mild intoxication. The *yūpas* of *bilva* cause health and luster. *Muñja* is an embodiment of the essence of food. By offering it to the *agni* and wearing a rope entwined with it, the sacrificer gets strength and virility. The powder of *yava* is mixed with *surā*. In addition, *puroḍāśa* and *anna* of *yava* are offered to deities. The offerings of the *yava*, helps the sacrificer in obtaining relief from several diseases and health. The *YV* says that the disease *jalodara* is caused by accumulation of unhealthy water in the stomach and it is cured by offering an oblation of *yava* to the deity *varuṇa*. The use of the ladles of *varuṇa* tree is the *homas* causes longevity. By using an offering spoon of *vikaṅkata*, the sacrificer gets bodily splendor. In *Aśvamedha*, the cut parts of the horse are placed on a mat of *vetasa*, prior to the *homa*; for *vetasa* protects the *havis*. Rice is offered to deities, in various forms like *caru*, *puroḍāśa*. The offerings of the same cause strength and health to the sacrificer. The offerings of *śyāmāka*, improves the virility of the sacrificer. Thus, in rituals the herbs have a significant role, which is very important from the medicinal point of view. A list of plants classified under medicinal significance in the *Yajurveda* is tabulated in the Report.

9. YAJÑĀYUDHA— IMPLEMENTS FOR SACRIFICES

9.1 Yajña, Yajña Vidhi and Benefits

Yajña is the subject matter of the entire Veda. *Yajñas* and *yagas* are being performed as spiritual and scientific approaches for the welfare of the people, benefit of the society and for world peace. The *Yajurveda* (*YV*) contains the knowledge of doctrines and methods of performing *yajñas* and *yagas* (Boddupalli and Sastry, 2015 and 2018). The *mantras*/liturgies for performing *yajñas* and *yagas* is incorporated in the *YV Samhitās* and in the *YV Brāhmaṇās*. Many advantages derived

from performing the *yajñas* are described in detail in the *kṛṣṇa* and *śukla Yajurveda Samhitās*. Our *ṛṣis* showed the path and provided the procedures and guidelines whilst themselves performing the *yajñas* and *yagas* (Boddupalli and Sastry, 2018).

9.2 Yajñāgni

The fire (*agni*) that is kindled for the purpose of the *yajña* is called ‘*yajñāgni*’ (sacrificial fire). This is ignited through a mechanism called ‘*agnimanthana*’ and the particular implement used is named as ‘*agnimanthana* device’ (*manthi* and *pramanthi*). This woody instrument, consisting of a pair of *araṇi* used to churn *agni*, is manufactured from an *aśvat̥tha* (*Ficus religiosa*) tree growing out of the womb of a *Śamī* (*Acacia catechu*) tree.

9.3 Sacrificially Important Trees

It is almost impossible to perform *yajñas* and *yagas* without using plants or trees and their related products. Therefore, the plants, herbs, shrubs and the trees revealed in the *YV* are the vital elements in performing *yajñas*, *yagas*, *homas* and *iṣṭis* (Boddupalli and Sastry, 2018). The sacrificer (*yajamāni*) should prepare for the *yajña* with the collection of *yajñāyudha* or *yajña* implements. In order to perform any *yajña* flawlessly, only the specified *yajñāyudha* should be used. These are made from the wood of distinctive trees (Boddupalli and Sastry, 2015). The names of these important trees and their qualities are clearly revealed and described in the *KYV-TS*. There are more than fifty (50) types of *yajñāyudha* that are well-known in the *YV* and *Śrauta sūtrās* are described and detailed in the Report. These implements such as *sruca*, *sruva*, *juhu*, *vasordhārā*, *upabhṛt* and others are the offering spoons with different measurements and shapes depending on the type of ritual. These are made of *aśvat̥tha*, *udumbara*, *khādira*, *parṇa*, *kārṣmarya*, *varaṇa* and *vikaṅkata*. The cups, known as *grahās* and *camasas* are used to preserve the juice of *soma* and *surā*. The wood of

nyagrodha is used for preparing *camasas*. The *grahās* are made up of *udumbara*, *asvat'ha*, *khādīra* and *vikāṅkata* trees. The woody trees that are used in the manufacture of the *yajñāyudha* are listed in the Report.

10. BOTANICAL DESCRIPTIONS OF PLANT SPECIES REVEALED IN THE *YAJURVEDA*

Each plant / tree revealed in the *Yajurveda* is described botanically under the following heads: (i) Name of the plant species in vedic Sanskrit language as described in the *YV*, (ii) Family name of the species in parentheses, (iii) Complete plant botanical citation with synonyms as per the International Code of Botanical Nomenclature (ICBN), (iv) Common / vernacular names of the plant in multiple languages of Indian origin, (v) Documented species distribution with nativity and exotic cultivation, (vi) Botanical description of the plant, (vii) General notes, and (viii) Medicinal / Economic importance of the plant species are highlighted. A total of 71 plants and tree species' photographs are depicted in the Report. In case of plants, photographs of the plant/crop, flowers, fruits, roots and seeds are portrayed. While in case of tree species, photographs of entire tree, wood, bark, flowers, fruits and seeds are represented. Among the plants (considering all forms) revealed in the *Yajurveda* texts, there are three Red Listed species by the International Union for Conservation of Nature (IUCN). They are: *Oryza rufipogon* (Poaceae), *Blyxa octandra* (Hydrocharitaceae), and *Pterocarpus santalinus* (Fabaceae). There is no plant species either extinct or endangered in the list provided. Majority of the plants/trees are still growing wild, with some being grown in India and in the Indian sub-continent that are been used by mankind.

11. SUMMARY OF THE UTILIZATION AND IMPORTANCE OF PLANT SPECIES

The *Yajurveda* (*YV*) thus describes different types of plant species and their significant usages

in various rituals, as magical and medicinal importance and in manufacturing the *yajña* implements. Most of the sacrificial materials are the products of the plants. Of them, the 'samidhās' are very commonly used and its' usage is of great importance in *yajñas*, *yagas* and *homās*. Among food-oblations used in various rituals, the *caru*, *puroḍāśa*, *anna*, *saktu*, *lāja*, *dhāna*, *karambha* and *yavāgū* are noteworthy. Cereal grains and legume seeds are cooked into *anna* and offered to deities (Fig. 3)



Fig. 3. Cereal grains and Legume seeds are cooked into 'anna' and offer to the deities through Agni

<i>Aṇu</i>	: <i>Panicum miliaceum</i>	} 09 Cereal crops
<i>Gavīdhuka</i>	: <i>Coix lacryma-jobi</i>	
<i>Godhūma</i>	: <i>Triticum aestivum</i>	
<i>Nīvāra</i>	: <i>Oryza rufipogon</i>	
<i>Vrīhi</i>	: <i>Oryza sativa</i>	
<i>Priyaṅgu</i>	: <i>Setaria italica</i>	
<i>Yava</i>	: <i>Hordeum vulgare</i>	
<i>Śyāmāka</i>	: <i>Echinochloa frumentacea</i>	
<i>Veṇu</i>	: <i>Bambusa arundinacea</i>	
<i>Garmut</i>	: <i>Vigna adenantha</i>	} 02 Legume crops
<i>Māṣa</i>	: <i>Vigna mungo</i>	
<i>Tīla</i>	: <i>Sesamum indicum</i>	} 01 Oil seed crop

The sacrificial brewage, 'māsara' and 'surā' are prepared with the mixture of germinated seeds of rice, wheat and barley, the flours of rice, wheat

and barley and the fruits of *karkaṃdhu*, *kvala* and *badara*. This intoxicating drink, 'surā', is a wonderful creation of Vedic medicine. The best of the oblations, the *soma* juice is the product of a plant. Some of the important, well-known and desire-motivated *iṣṭis* are listed in a tabular form in the report along with their end result and the plant products used for the purpose. Most of the *yajña* implements used in various *yajñas*, *yagas* and *homas* are manufactured from wood. Among these implements, *sruc*, *sruva*, *juhu*, *upabhṛt*, *dhruvā*, *camasa* and *graha* are the important ones. Except *camasa* and *graha*, which are shallow cups, all the other implements mentioned above are offering spoons with various dimensions. The magical significance of plants, whose products are used in rituals/sacrifices, is also seen to be equally important. The curative effects of the plants are often mentioned amidst their ritualistic and magical potentialities. Most of the curative aspects of the plants used in the rituals of the *YV*, though not explicit, can be clearly traced in the *AV*.

The way in which the vedic medicine works, is magnificent. It works through the smoke, that rises while performing the *homas* with various *samidhas*, the touch of the wooden implements and the consumption of the remnant of various oblations like *anna*, *caru*, *puroḍāśa*, *yavāgū*,

which are prepared of grains of *aṇu*, *amba*, *priyaṅgu*, *nīvāra*, *veṇu*, *śyāmāka* etc. The vedic medicine is mingled with magic. Mere use of the herbs, without the recitation of *mantrās* is not found in vedic texts. Thus, it is seen that the plants have got four kinds of significances viz., ritualistic, magical, medicinal and secular. The plants, with their four-fold significance, not only become the most essential part of the ritual, but also boost up the practical benefit derived from a ritual. All the plants and trees, revealed in the *YV*, are botanically described and provided with photographs in the Report. Also, a table showing the frequency of occurrence of plant names in the *Yajurveda Taittirīya Saṃhita (TS)*, *kāṇḍa*-wise, is provided.

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APPENDIX

Flora of *Yajurveda*

In the *Yajurveda (YV)* texts different types of herbs, shrubs, climbers, water plants and trees are mentioned. The flora of *YV* consists of seventy one (71) plant species that are used in various rituals, magical, medicinal and in manufacturing *yajña* implements are described. Among the 71 plants, 47 species belong to the class Dicotyledonous, 23 species belong to the class Monocotyledonous and one (01) species belongs to the Gymnosperm category, as per the Bentham and Hooker (1862) taxonomic system of plant classification. A total number of 71 plant species, belonging to 32 families, includes 28 tree species, five (05) species of shrubs and 38 species of herbs. Amongst the 38 herbaceous species, there are 20 species of grasses, six (06) legume grain species, five (05) other herbs of different families, three (03) aquatic plants, two (02) creepers and two (02) oil seed crop species. The 1st highest number of species (20) is from the family Poaceae (grass family), the 2nd highest number of species (13) is from the family Fabaceae (including trees), the 3rd highest number of species (4) belongs to family Moraceae (Fig family) and two species each from Combretaceae, Capparaceae, Arecaceae, Asclepiadaceae and Nymphaeaceae, respectively and the remaining are one species each of different families. The complete list of plants and tree species, their class and family are provided below:

Huge trees	Botanical Name	Class	Family
1. <i>Śragvadha</i>	<i>Cassia fistula</i>	Dicotyledon	Fabaceae
2. <i>Arjuna</i>	<i>Terminalia Arjuna</i>	Dicotyledon	Combretaceae
3. <i>Aśanihatavṛkṣa</i>	(any tree hit by a thunderbolt)		
4. <i>Aśvat̥tha</i>	<i>Ficus religiosa</i>	Dicotyledon	Moraceae
5. <i>Bilva</i>	<i>Aegle marmelos</i>	Dicotyledon	Rutaceae
6. <i>Guggulu</i>	<i>Commiphora wightii</i>	Dicotyledon	Bursaceae
7. <i>Kāṣmārya</i>	<i>Gmelina arborea</i>	Dicotyledon	Verbenaceae
8. <i>Khādira</i>	<i>Acacia catechu</i>	Dicotyledon	Fabaceae
9. <i>Māndhuka</i>	<i>Madhuca longifolia</i>	Dicotyledon	Sapotaceae
10. <i>Nyagrodha</i>	<i>Ficus benghalensis</i>	Dicotyledon	Moraceae
11. <i>Parṇa</i>	<i>Butea monosperma</i>	Dicotyledon	Fabaceae
12. <i>Plākṣa</i>	<i>Ficus virens</i>	Dicotyledon	Moraceae
13. <i>Pūtu-dru</i>	<i>Cedrus deodara</i>	Gymnosperm	Pinaceae
14. <i>Rājjudāla</i>	<i>Cordia dichotoma</i>	Dicotyledon	Boraginaceae
15. <i>Raktachandan</i>	<i>Pterocarpus santalinus</i>	Dicotyledon	Fabaceae
16. <i>Rohitaka</i>	<i>Aphanamixis polystachya</i>	Dicotyledon	Meliaceae
17. <i>Śalmali</i>	<i>Bombax ceiba</i>	Dicotyledon	Bombaceae
18. <i>Śamī</i>	<i>Prosopis cineraria</i>	Dicotyledon	Fabaceae
19. <i>Sphūrjaka</i>	<i>Diospyros malabarica</i>	Dicotyledon	Ebenaceae
20. <i>Śrī Gandha</i>	<i>Santalum album</i>	Dicotyledon	Santalaceae
21. <i>Tilvaka</i>	<i>Symplocos racemosa</i>	Dicotyledon	Symplocaceae
22. <i>Uduṃbara</i>	<i>Ficus racemosa</i>	Dicotyledon	Moraceae
23. <i>Upavāka</i>	<i>Wrightia antidysenterica</i>	Dicotyledon	Apocynaceae
24. <i>Vaikaṅkata</i>	<i>Flacourtia indica</i>	Dicotyledon	Flacourtiaceae
25. <i>Varaṇa</i>	<i>Crateva magna</i>	Dicotyledon	Capparaceae
26. <i>Vibhīdaka</i>	<i>Terminalia bellirica</i>	Dicotyledon	Combretaceae
Edible Fruit trees			
27. <i>Kharjūra</i>	<i>Phoenix dactylifera</i>	Monocotyledon	Arecaceae
28. <i>Kvala</i> or <i>Badara</i>	<i>Ziziphus mauritiana</i>	Dicotyledon	Rhamnaceae
Shrubs			
29. <i>Arka</i>	<i>Calotropis gigantea</i>	Dicotyledon	Asclepiadaceae
Shrubs			
30. <i>Karīra</i>	<i>Capparis decidua</i>	Dicotyledon	Capparaceae
31. <i>Nīlī</i>	<i>Indigofera tinctoria</i>	Dicotyledon	Fabaceae
32. <i>Pūtikā</i>	<i>Caesalpinia bonduc</i>	Dicotyledon	Fabaceae
33. <i>Vetasa</i>	<i>Calamus rotang</i>	Monocotyledon	Arecaceae
Herbs			
34. <i>Apāmārga</i>	<i>Achyranthes aspera</i>	Dicotyledon	Amaranthaceae
35. <i>Aśvagaṃdha</i>	<i>Withania somnifera</i>	Dicotyledon	Solanaceae
36. <i>Punarnava</i>	<i>Boerhavia diffusa</i>	Dicotyledon	Nyctaginaceae
37. <i>Soma</i>	<i>Cannabis sativa</i>	Dicotyledon	Cannabinaceae
38. <i>Soma</i>	<i>Sarcostemma acidum</i>	Dicotyledon	Asclepiadaceae
39. <i>Varṣāhū</i>	<i>Trianthema portulacastrum</i>	Dicotyledon	Aizoaceae

Creepers

40. <i>Pāṭhā</i>	<i>Cissampelos pareira</i>	Dicotyledon	Menispermaceae
41. <i>Urvāruka</i>	<i>Cucumis sativus</i>	Dicotyledon	Cucurbitaceae

Water plants

42. <i>Avakā</i>	<i>Blyxa octandra</i>	Dicotyledon	Hydrocharitaceae
43. <i>Kyāmbu</i>	<i>Nymphaea pubescens</i>	Dicotyledon	Nymphaeaceae
44. <i>Puṣkara parṇa</i>	<i>Nymphaea nouchali</i>	Dicotyledon	Nymphaeaceae

Grasses

45. <i>Balbaja</i>	<i>Eleusine indica</i>	Monocotyledon	Poaceae
46. <i>Darbha</i>	<i>Desmostachya bipinnata</i>	Monocotyledon	Poaceae
47. <i>Dūrvā</i>	<i>Cynodon dactylon</i>	Monocotyledon	Poaceae
48. <i>Gavīdhukā</i>	<i>Coix lacryma-jobi</i>	Monocotyledon	Poaceae
49. <i>Iḷṣu</i>	<i>Saccharum officinarum</i>	Monocotyledon	Poaceae
50. <i>Iṣīkā</i>	<i>Chionachne gigantea</i>	Monocotyledon	Poaceae

Grasses

51. <i>Kāśa</i>	<i>Saccharum spontaneum</i>	Monocotyledon	Poaceae
52. <i>Muñja</i>	<i>Saccharum benghalense</i>	Monocotyledon	Poaceae
53. <i>Nala</i>	<i>Arundo donax</i>	Monocotyledon	Poaceae
54. <i>Sugandhitejana</i>	<i>Vetiveria zizanioides</i>	Monocotyledon	Poaceae
55. <i>Veṇu</i>	<i>Bambusa arundinacea</i>	Monocotyledon	Poaceae

Wild cereals

56. <i>Aṇu</i>	<i>Panicum miliaceum</i>	Monocotyledon	Poaceae
57. <i>Gavīdhuka</i>	<i>Coix lacryma-jobi</i>	Monocotyledon	Poaceae
58. <i>Nīvāra</i>	<i>Oryza rufipogon</i>	Monocotyledon	Poaceae
59. <i>Priyaṅgu</i>	<i>Setaria italica</i>	Monocotyledon	Poaceae
60. <i>Śyāmāka</i>	<i>Echinochloa frumentacea</i>	Monocotyledon	Poaceae

Cereal crops

61. <i>Godhūma</i>	<i>Triticum aestivum</i>	Monocotyledon	Poaceae
62. <i>Sasya</i>	<i>Zea mays</i>	Monocotyledon	Poaceae
63. <i>Vrīhi</i>	<i>Oryza sativa</i>	Monocotyledon	Poaceae
64. <i>Yava</i>	<i>Hordeum vulgare</i>	Monocotyledon	Poaceae

Wild Legumes

65. <i>Garmut</i>	<i>Vigna adenantha</i>	Dicotyledon	Fabaceae
66. <i>Masurā</i>	<i>Vicia hirsuta</i>	Dicotyledon	Fabaceae
67. <i>Prśniparṇī</i>	<i>Uraria picta</i>	Dicotyledon	Fabaceae

Pulse crops

68. <i>Khalva</i>	<i>Cicer arietinum</i>	Dicotyledon	Fabaceae
69. <i>Māṣa</i>	<i>Vigna mungo</i>	Dicotyledon	Fabaceae
70. <i>Mudga</i>	<i>Vigna radiata</i>	Dicotyledon	Fabaceae

Oil seed crops

71. <i>Sarcapa</i>	<i>Brassica juncea</i>	Dicotyledon	Brassicaceae
72. <i>Tila or Jartila</i>	<i>Sesamum indicum</i>	Dicotyledon	Pedaliaceae

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