Indian Journal of History of Science (2024) 59:225–232
https://doi.org/10.1007/s43539-024-00128-1

PROJECT REPORT

Plants of *Atharvaveda*: Their descriptions and medicinal uses

Raghava S. Boddupalli[1]

Received: 6 July 2023 / Accepted: 6 April 2024 / Published online: 12 June 2024
© Indian National Science Academy 2024

Abstract
Atharvaveda is the fourth veda in the usual order of enumeration after *Ṛgveda*, *Yajurveda,* and *Samaveda*. However, the historical analysis of *Atharvaveda* shows that it is as old as *Ṛgveda*. The *Atharvaveda saṃhitā* contains around 5987 verses, which varies slightly based on the two recessions. These *saṃhitās* are curious compendiums of medicine in its various stages of evolution and include the most primitive as well as some of the most highly developed stages of therapy. Most of the vedic healing verses/liturgies occur in the *Atharvaveda*. These liturgies, termed *Bhaiṣajya suktās* (hymns on medicine), which deal with human diseases, their causes, and cures, show a remarkable insight into the subject of health sciences with several medicinal plants' descriptions. The descriptions of the structure of the human body and its organs, which reveal anatomical knowledge, are shown predominantly in the Atharvavedic scriptures. The Atharvan medical terminology is still being used in the traditional Ayurveda practice. The project aims to make a comprehensive and systematic assessment of the descriptions of plants revealed in the *Atharvaveda saṃhitā* texts.

Keywords *Atharvaveda* · Human diseases · Medicinal plants · Flora of *Atharvaveda* · Botanical descriptions accomplished

1 Introduction

Atharva refers to a *ṛtvik*, *purohit,* or *puṇḍit*. The veda is said to have been brought to light by sage Atharvan and is called '*Atharvaveda*'. This is also called *Brahmaved*a because it is assigned to the Brahma priest who supervises the conduct of the *yajña*. The *mantras* in this veda appear both in prose and verse form. It is often said that this was not given the status of a veda, but it was elevated to this position later. This veda has some special features and stands out from the others. It deals more with things here and now than the hereafter, and the sacrifices therein are used to achieve these results. The main themes of the *Atharvaveda* are cures for diseases, rites for prolonging life, fulfillment of one's desires, statecraft, penances, magic, charms, spells, and sorcery. While the gods of *Ṛgveda* are approached with love, the Gods of *Atharvaveda* are approached with fear, and favour is sought to ward off their wrath. Homage is paid to them to abstain from harming. Sophisticated literary style and highly metaphysical ideas mark this veda. The *Atharvaveda* (*AV)* had nine branches or recensions. Out of these, only two are available today. They are: (i) *Atharvaveda Śaunakīya saṃhitā* (*AVSS*; Bloomfield, 1897; Whitney, 1905; Vishva Bandhu, 1960) and (ii) *Atharvaveda Pippalāda saṃhitā* (*AVPS*; Griffiths, 2004, 2007; Bhattacharya, 2017). The *Śaunakīya Saṃhita* has 5977 *mantras* arranged in 20 books, called '*kāṇḍas*'. The *Pippalāda saṃhitā* has about 7950 *mantras* arranged in as many *kāṇḍas*. This veda offers a better insight into the culture and life of the vedic society. It has hymns connected with weddings, agriculture, battles, medicine, domestic ceremonies, etc. Significantly, dozens of hymns are devoted to Hindu spirituality and are often at par with the *upaniṣads*. The following chart in Fig. 1 shows the spread of literature coming under the *Atharvaveda* (*AV*).

1.1 Magic

Atharvaveda contains *mantras*/liturgies for white magic (defensive magic) and black magic (offensive magic). It deals with rivalries between women in a relationship with

The project was accomplished under the sponsorship of Indian National Commission for History of Science during the period October 2022 to March 2023.

✉ Raghava S. Boddupalli
raghava7boddupalli@gmail.com

[1] Institute of Sanskrit and Vedic Studies (ISVS), Sri Siddhivinayaka Temple, Sanjayanagar, Bangalore 560094, India

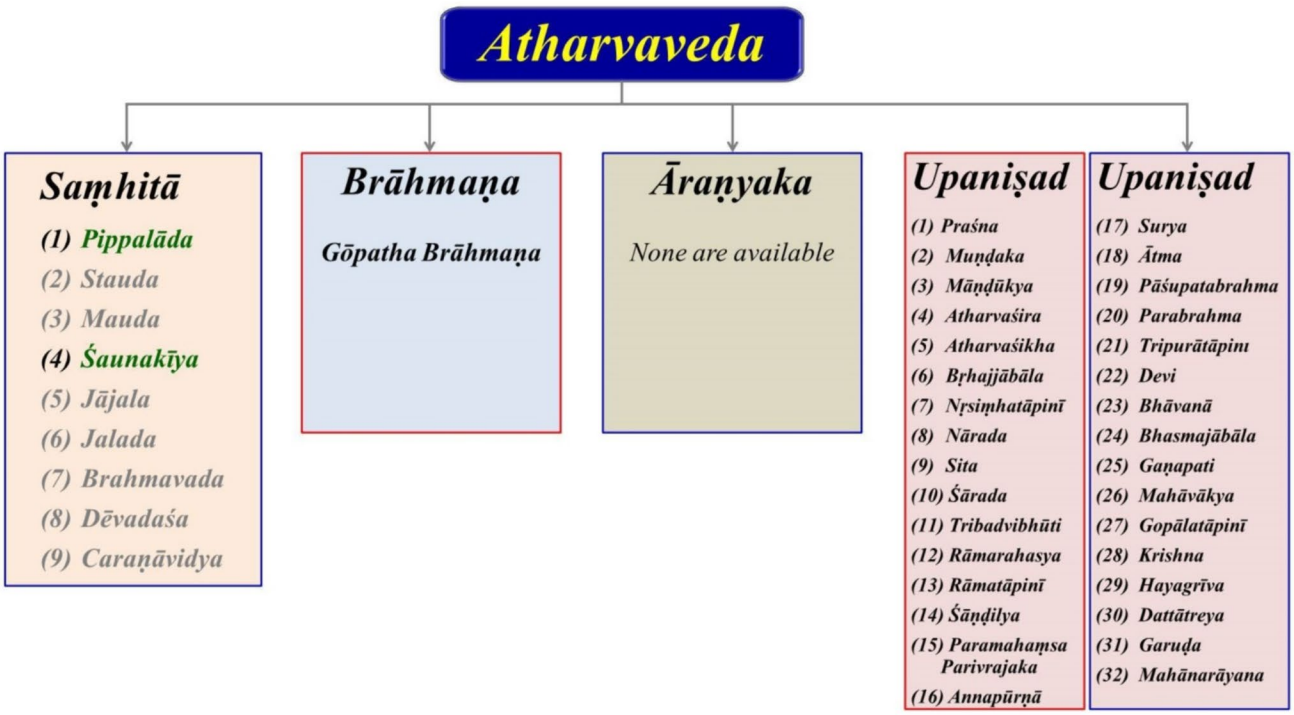

Fig. 1 Classification of *Atharvaveda* (*AV*) texts

the same man, rivalries between two men, attracting/seducing a man by a woman or a woman by a man, and suggests incantations that can be used in such situations.

1.2 Medicine

Atharvaveda describes several diseases, disease-causing agents, and the cures for these diseases. Cure includes herbal medicines/drugs used along with the specific *mantras* or incantations. The medicine system described in *Atharvaveda* is older than that found in Ayurveda. Atharvavedic system of medicine is based on the theory of external disease-causing agents and discusses little about the internal body mechanisms that work against diseases. In Ayurveda, on the other hand, we find the emergence of a tri-humoral theory, which describes the imbalance of three humors in the body leading to diseases and seeks to restore this balance. However, Ayurveda acknowledges that one of the several causes of humoral imbalances is the external agents described extensively in *Atharvaveda*. Thus, there is no doubt that Ayurveda has developed on top of the Atharvavedic system of medicine.

1.3 Warfare

It seems some of the practitioners of Atharvavedic medicine also became experts in making poisons that were used in warfare. It was a practice to apply snake poisons and poisons derived from some plants on arrows, which were then used in battles. Such arrows were often called '*nāgāstras*' (snake arrows) or poisonous arrows. Such arrows occupied the collection of different types of arrows in the quiver of an accomplished archer.

1.4 *Sūktas*/hymns

There are 736 *sūktas* present in the *AV samhita*. They are *bhaiṣajya*, *āyuṣya*, *pauṣṭika*, *ābhicārika*, *prāyaścitta*, *strīkarma*, *rājakarma*, *brāhmaṇya* and other miscellaneous *sūktas*. A brief summary of the *bhaiṣajya* and *āyuṣya sūkta* contents are provided in this report.

Bhaiṣajya sūktas, which deal with diseases, their causes, and cures, show a remarkable insight into the subject of health sciences. That is why this veda is considered to be the precursor of Ayurveda, or the science of health and longevity. Hence, the Ayurveda is listed as an *upaveda* or subsidiary of the *Atharvaveda*. These *sūktas* contain many prayers for health and longevity. The various names of the body parts given here bespeak an intimate knowledge of human anatomy. Several diseases, like fever, leucoderma, leprosy, jaundice, diabetes, dropsy, skin disorders, troubles of the ear, nose, and throat, fracture of bones, heart diseases, and tuberculosis, are mentioned, and cures are indicated. These diseases are caused by germs, violation of the laws of nature, the anger of deities, and evil spirits and sins committed

previously. Chants and charms were also in plenty besides medicines and physical remedies. A deep knowledge of the herbs and their various medicinal properties can be inferred from many of the *mantras*.

Āyuṣya sūktas contain supplications for longevity and are to be uttered on auspicious occasions like *caula* (tonsure), *upanayana* (investiture with the sacred thread), *godāna* (gifting of cows) and so on. The desire to live the full life span viz., 100 years, is often expressed. One of the *sūktas* (*kāṇḍa* 17) prescribes the wearing of the '*rakṣāsūtra*' (thread of protection) on the body to attain longevity.

1.5 *Atharvaveda* and Ayurveda

The *Atharvaveda* (*AV*) is a curious compendium of medicine in its various stages of evolution. It contains the most primitive as well as some of the most highly developed stages of therapy. In the *AV*, the word '*brahma*' is used in the sense of physician, whereas the word '*bhiṣak*' is used in *Yajurveda,* and '*rudra*' is used in the sense of primordial physician. Among the four vedas, the *Atharvaveda* deals more with various diseases prevalent during the vedic period. Most of the vedic healing verses/liturgies occur in the *Atharvaveda*. The *bhaiṣajya sūktas* (hymns on medicine), which deal with diseases, their causes, and cures, show a remarkable insight into the subject of health sciences. That is why the *Atharvaveda* is considered the precursor of Ayurveda, or the science of health and longevity. Hence, the Ayurveda is listed as an *upaveda* or subsidiary of the *Atharvaveda* (Karambelkar, 1959, 1961; Modak, 1993; Wise, 1986; Dominik, 2003; Khare and Katiyar, 2012). These *sūktas* contain many prayers for health and longevity. Several diseases like fever, leucoderma, leprosy, jaundice, diabetes, dropsy, skin disorders, troubles of the ear, nose, and throat, fracture of bones, diseases of the heart, and tuberculosis are mentioned, and treatments indicated in the *Atharvaveda* and the later Ayurvedic texts (Karambelkar, 1961). These diseases are caused by germs, violation of the laws of nature, the anger of deities and malevolent spirits, and sins committed previously. Apart from medicines and physical remedies, the use of chants and charms was also in plenty (Griffith, 1895; Bloomfield, 1897). The project report is presented under the following chapters:

(1) Introduction
(2) Skin disorders (*twak rogas*)
(3) Human internal diseases
(4) Human anatomical knowledge
(5) *Atharvaveda* special hymns on medicinal plants
(6) Botanical descriptions of medicinal herbs
(7) Summary of the utilization and importance of plant species
(8) Flora of *Atharvaveda*

2 Skin disorders mentioned in the *Atharvaveda*

Skin diseases are numerous and a frequently occurring health problem affecting all ages, from neonates to the elderly, and cause harm in a number of ways. Maintaining healthy skin is important for a healthy body. Many people may develop skin diseases that affect the skin, including cancer, herpes, cellulitis, and others. Medicinal herbs and their parts are frequently used to treat these diseases (Mukhopadhyay, 2013). In the Indian context, the development of skin diseases can be divided into four broad time frames: (i) the prehistoric to Vedic period, (ii) the post-Vedic period, (iii) the medieval period, and (iv) the modern period (Mukhopadhyay, 2016).

The *AV* describes the skin diseases (*twak roga*) in the name of *kilasa*, *palita*, with the clinical picture of grey and white spots, generally from deeper skin layers, and refers to herbal remedies. Almost all the *Ayurveda saṃhitās* uniformly classified *kuṣṭa* as *mahākuṣṭa* and *kṣudrakuṣṭa*, but there is a difference of opinion about the number in each group. The historical perspectives of the *twak rogas* (*kuṣṭa*) were presented according to *Ṛgveda*, *Atharvaveda*, Caraka, Suśruta, Vāgbhaṭa, Madāhavakara Toḍaramala. In the doctrines of Ayurveda, the *twak rogas* are known by the general term *kuṣṭa* (Narayana, 1997). The term '*kilasa*' occurs in the *Atharvaveda* and the *Vājasanēyī saṃhitā* and means white leprosy, in which the skin becomes spotted without ulcers, probably a type of tuberculoid leprosy.

The vedic term *takman* (fever and related body aches) is particular to the *Atharvaveda*. It is designated a demonic disease whose characteristics point to fever. *Takman* is the main disease in the *Atharvaveda*. *Atharvaveda* has an enormous discussion, and five *sūktas* (1-12, 1-25, 5-22, 6-20, 7-116) are titled for the *takman* disease. There are different names for the fevers of different durations—*ubhayeṣu* for 2-day's fever, *tritīyaka* for 3-day's fever, *sadandi* for a long-duration fever, and *hāyana* for a year's fever (AV 19-39-10).

Yakṣma (Consumption/Tuberculosis, Syphilis) in the *Ṛgveda* (1-122-9, 10-85-31) and the *Atharvaveda* (2-10-5, 6; 3-31-1, 5-4-9, 7-7-2, 10-8-3, 7, 10; 12-2-1, 2; 19-36-1; 19-38-1) frequently denote 'illness', in general, perhaps as rendering the body emaciated. *Yakṣma* is the regular Atharvan term for the disease. *AV* mentions that it is a general internal disease found in humans and cattle (*AV* 8-7-15, 12-2-1). It is characterized by entering and possessing every body part (*AV* 6-85-1, 9-8-7 and 9). It causes disintegration of the limbs, fever in the limbs, and pain in the heart and all body parts (*AV* 5-30-8&9, 9-8-5, 13-19, 21 and 22). Most writers of vedic literature believe that *yakṣma* referred to a class of diseases whose principal characteristics were consumption/tuberculosis (Prasad, 2002). The treatment for *yakṣma* (*rogacikitsa*) is explained in the *AV* (3-11:3-5). This

is said to lead to death and is found to be common among people of *durācara* (bad habits) [Narayana, 1995]. A charm to cure scrofulous pustules and scrofula is mentioned in the *AV* 7-76-3. The word '*jāyānya*' mentioned in *AV* also resembles consumption/tuberculosis, and it breaks ribs, settles in the lungs, harbours in the back, and springs from excessive sexual intercourse (*AV* 7-76-3). In the *AV* 8th *kāṇḍa*, 7th *sūkta*, there are 28 verses/hymns. These liturgies explain the characteristics of twenty-one (21) medicinal herbs and trees that are revealed for treating *yakṣma* and related diseases.

The terms *kuṣṭa, kilasa, palita*, and vitiligo (leprosy and allied skin disorders) are mentioned in the *Atharvaveda saṃhitā*. The term *kuṣṭa* is described in the *kāṇḍa* 1, *sūktas* 23 and 24, with 1-4 hymns in each *sūkta*. Like other ancient medical texts in other parts of the world, the term *kuṣṭa* was probably used to represent a number of skin ailments along with leprosy (*Mycobacterium leprae*) in the modern sense. Three words '*śvitra*', '*kilasa*,' and '*kuṣṭa*' were used. *Kilasa* is the name of 'white leprosy' in the *Atharvaveda* (1-23-1). It resulted in the appearance of grey (*palita*) and white (*śukla*, *śvēta*) spots all over the body. The etiology of *kuṣṭa* is stated in the *AV* 1-23-4. It affects the bone tissue (*asthi*), muscle tissue (*māmsa*), adipose tissue (*mēda*) etc., and the essential elements that constitute the human body (*dhātus*). In the *AV* 1-23-1 *mantra*/liturgy, the medicinal herbs namely, *rāma* (*vākucī—Psoralea corylifolia*), *kṛṣṇa* (*bhṛṅgarāja—Eclipta prostrata*), *asikni* (*Nīli—Indigofera tinctoria*) and *rajani* (*haridra—Curcuma longa*) are mentioned for the treatment of *kilasa* and *palita* skin disorders (Boddupalli, 2022). The plant *nīli* (*Indigofera tinctoria*) is described in two hymns of the *Atharvaveda* as a dark-coloured plant (*AV* 1-23 and 1-24). This plant is used against white leprosy or *svētakuṣṭa*. It is believed that in the *Atharvaveda* the darkness of the plant *nīli* removes the white spot of the body. In these hymns, white leprosy is called *kilasa*, and gray spots are called *palita*. For warding away this disease, the medicinal herbs *haridra*, *rāma*, *kṛṣṇa* are used along with plant *nīli* or *asikni*. A paste prepared from these plants or their leaves would give black colour to the skin (*AV* 1-23.1-3). *Kauśika saṃhitā* describes in detail the use of the *nīli* plant in 26.22-24. Another plant, *Nakthajata* (*AV* 1-23-1), *asuri* or *shyama*, and *brahma* (AV 1-24-4) are also mentioned as the medicine of leprosy (*kuṣṭaroga*).

The herb, *Dolomiaea costus* (Falc.) Kasana & Pandey, (commonly called *kuṣṭa*), is described in the *kāṇḍa* 5, *sūkta* 4, with 1–10 hymns; and in the *kāṇḍa* 19, *sūkta* 39 with 1–10 hymns. It is used in Ayurveda to treat several skin disorders and other ailments of the body. Sharma (1969) has compiled its uses as mentioned in *Atharvaveda*. It has been used in *takman* (fever of all kind); *śiraḥ śool ukta-jvara* (headache with fever); *tṛtyāya-jvara* (fever after every third day); *santata-jvara* (long fever); *ekahik-jvaar* (single fever); *kafa-roga* (cough); *kṛmi-roga* (worm remover); *śiroroga* (headache); *śirovedanā* (head pain); *dṛṣṭi-roga* (eyesight disease); *tvakroga* (skin diseases); *prāna-vāyu triguṇata* (breathing disease); *vyān-vāyu viguṇata* (a kind of breathing trouble). Apart from the above, it was also used as *balbardhaka* (tonic); *vīryavardhaka* (increaser of semen), and in jaundice. And it was also used as incense and in *havana sāmigri* with other aromatic ingredients. The geographical distribution, botanical history, chemical constituents, and therapeutic uses of the medicinal herb *kuṣṭa*, which is an ancient and important medicinal plant native to Kashmir revealed in the *Atharvaveda* (*AV*) were extensively discussed (Akbar, 2020; Prasad & Subhaktha, 2002; Rathore et al., 2021; Shah, 2019; Singh & Singh, 2019).

Śvitra is a disease where white patches appear on the body. The disease is of special importance as it causes ugliness on the body. Probably keeping this in mind, the *Ayurveda* described the disease along with *kuṣṭa*. Four important medicinal plants have been mentioned for the treatment of *śvitra* (*kilasa*) in the two hymns of *AV* by their descriptive epithets in the *AV saṃhitās*. They are: *Rāma* (*Bakuchi—P. corylifolia*), *Kṛṣṇa* (*Bhṛngarāja—E. prostrata*), *Asikni* (*Indravaruṇi—Citrullus colocynthis*) and *Rajani* (*Haridra–C. longa*). The botanical descriptions with photos of these medicinal plants are detailed by Boddupalli (2022).

3 Human internal diseases mentioned in *Atharvaveda*

Humans have been battling microorganisms since before our species evolved into its modern form. The causative factors of human diseases are due to the microorganisms present in the environment. These germs enter the human body through skin, nostrils, ears, mouth, and others (*AV* 5-23-3). Two distinct words are mentioned in the Atharvaveda (AV): the *krimi* and *kṛmi*. The word *kṛmi* means insect (*kīṭakamu*/insect), whereas *krimi* means worm/germ (*AV* 5-23-3 and 6), which multiply, enter human bodies, and are visible or invisible. In other words, germs like bacteria, viruses, worms, and others are referred to as *krimi,* and various insects like *kīṭa*, *pataṃga* are referred to as *kṛmi*. The word *krimi* occurs in the *Atharvaveda* for different macroscopic (worms) and microscopic (bacteria, viruses, fungal pathogens) organisms. Based on the above, there are two types of *krimi* viz., *dṛṣta* (visible/macroscopic) and *adṛṣta* (invisible/microscopic), described in the *Atharvaveda* as a designated hymn (5-23: 1-13) to kill the parasitic germs (Boddupalli, 2022). A schematic representation of the human diseases mentioned in the *Atharvaveda* is represented in the Fig. 2.

The *Atharvaveda* (*AV*) mentions a large number of diseases, both minor and major, known and unknown in clear terms and vaguely (Prasad, 2000). *AV* at 9-8: 1-21 refers to many diseases, for example, *śīrṣamaya* (diseases of head), diseases of heart,

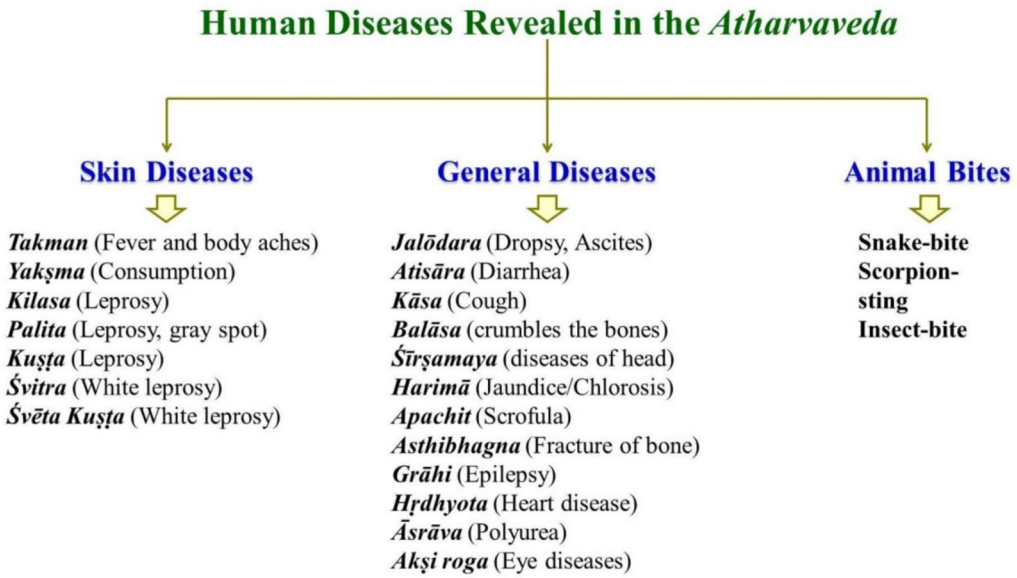

Fig. 2 Human diseases mentioned in the *Atharvaveda*

rectum, back, other parts of the body, blood, bones etc. Regarding the number of diseases, *AV* also mentions one hundred deaths/diseases (*AV* 1-30-3; 3-11-1 and 8-2-27). The treatment of diseases by means of spells and medicinal herbs in the *Atharvaveda* formed the basis of the Indian system of medicine, the *Āyurveda*. The descriptions revealed in the *AV saṃhitā* hymns and the medicinal cures are highlighted in this chapter. The human internal diseases described in the *AV saṃhitā* are: (i) *Jalodara*–Dropsy, *balāsanāsanam*, *AV* 1-10 hymn, 1-4 *mantras*—*Palāśa* wood (*Butea monosperma*) decoction is used, (ii) *Atisāra*–diarrhoea/dysentery, 1-2 hymn, 1-4 *mantras*—a string made of *muñja* grass (*Saccharum benghalense*) is to be tied, and a *pūtikā* plant (*Caesalpinia bonduc*) is used, (iii) *Viṣūci*–cholera—*AV* 2-25 hymn, 1-5 mantras—*Pṛśniparṇī* (*Uraria picta*) plant is used (iv) *Balāsa*—crumbles the bones, *AV* 6-14 hymn, 1-3 mantras—*Cīpudru* tree (*Cedrus deodara*) bark is used, (v) *Kāsa*–cough, 6-105 hymn, 1-3 mantras—*Ajaśṛṅgī* (*Rhus succedanea*) is used, (vi) *Harima*—jaundice, *AV* 6-20 and 6-23—seeds of *Śuka* tree (*Pinus sylvestris*) are used, (vii) *Apachit*—scrofula, *AV* 7-78 hymn and 6-83 hymn, 1-4 *mantras*, (viii) *Snake-bite* and *Scorpion-bite—sarpa viṣadūrīkaraṇam*—10-4 hymn, 1-26 *mantras—Soma* (*Sarcostemma acidum*), *Ghṛtācī* (*Amomum subulatum*), *Darbha* grass (*Desmostachya bipinnata*) and *Durva* (*Cynodon dactylon*).

4 Human anatomical knowledge mentioned in the *Atharvaveda*

The descriptions of the structure of the human body and its organs, which reveal anatomical knowledge, are mentioned predominantly in the *Atharvaveda*. It conveys a clear understanding of how anatomical knowledge was acquired through the sacrifice of animals, principally the horse (*Aśvamedhayajña*, *Taittiriya Brāhmaṇa* 3-8 and 3-9), and of men [*Puruṣamedhayajña*, *Satapatha Brāhmaṇa* 6-2-1 (18), 7-5-2 (13-14)]. Also, it is by chance observations of improperly buried bodies and examinations of patients by physicians. As a result of these sacrificial rites, quite accurate lists of bodily structures of the horse and man have been recorded and transmitted through the sacred texts (Zysk, 1985, 1986).

The *AV* hymns on medicine, which deals with diseases, their causes, and cures, show a remarkable insight into the health sciences and also mention ‘the wonderful structure of man’. It refers to the human heart as ‘lotus with nine gates’, which is an astoundingly accurate depiction of the heart today. The heart resembles a lotus bud when placed with the tip pointing upward. There are nine apertures, with three chambers in the right atrium, four in the left atrium, and one in each of the right and left ventricles. Furthermore, it offers information about conception, fetus development, pregnancy problems, and parturition. The bones, tissues, and various organs of the human body's anatomy are mentioned in the *Atharvaveda*. The Atharvan medical terminology is still being used in the traditional Ayurveda practice. This detailed study of various human organs is revealed in the *mantras*/liturgies of the Vedic scriptures, and it can be comprehended that the Atharvans began the process of documenting medical anatomical knowledge with meticulous examination of human organs and bones.

The hymn on *yakṣma* (*AVSS* 9-8:1-22), with the title, *yakṣmanivāranam* (a charm for the cure of various diseases

connected with consumption), is a description of the disease tuberculosis (consumption) that has percolated to and is to be removed from the limbs of the human body, such as eyes, head, arms, lungs, heart, and others. A glimpse of the anatomy can be seen here. It is said in the hymn that "from eyes, nostrils, ears, chin, head, brain, tongue, veins of the throat, hind muscles of the neck, marrow, spine, shoulders, arms, intestine, veins of anus, belly, heart, both the kidneys, liver, thighs, knees, ankles, ribs, fingers of feet waist, buttocks, and other organs, the *Yakshma* disease is being removed". Also, the detailed information about the body's bones testifies to the deep observation of the bodies, not only of humans, but also of animals by the ancient Vedic seers, who obviously knew the knowledge of dissection. A more or less comprehensive list of the different parts of the human body and its development is revealed in the Vedic literature and well documented in also provided in French (Filliozat, 1964) and in English (Wise, 1986) languages.

5 *Atharvaveda* special hymns on medicinal plants

The *AV saṁhitā* has specially designated hymns/charms on only certain medicinal herbs. Some of these medicinal herbs are discussed here:

Apāmārga (*Achyranthes aspera* L.) is mentioned in *AVSS kāṇḍa*-04, *sūktas* 17, 18, and 19 with the name *Apāmārgah*. These charms/hymns describe the use of the medicinal plant *apāmārga* against sorcery, demons, and enemies. Each hymn contains eight *mantras*/liturgies.

Silācī (*Rubia cordifolia* L.) mentioned in *AVSS kāṇḍa*-05, *sūkta* 05 reveals the cure of wounds. This hymn contains nine *mantras*/liturgies.

Kuṣṭa (*Dolomiaea costus* (Falc.) Kasana & Pandey) is mentioned in *AVSS kāṇḍa*-05, *sūkta* 04 and *kāṇḍa*-19, *sūkta* 39 with the name '*Viśvabheṣaja*' because the plant *kuṣṭa* acts against all types of *takman* (fever) and the sorceresses. It is one of the aromatic drugs.

Pippali (*Piper longum* L.) is described in *AVSS kāṇḍa*-06, *sūkta* 109 as a separate hymn titled '*pippali-bhaishajyam*' having three *mantras*. The plant *pippali* is used as a remedy for all wounds and diseases. It cures the injuries caused by missiles and blows. *Sāyaṇacharya* says that it also cures wind diseases means *vātikṛta* or *vātaroga*.

Rohiṇī (4-12-1) is described in *AVSS kāṇḍa*-04, *sūkta* 12 as '*Rohiṇī-vanspatih*'. The hymn describes the cure for fractures.

Viṣāṇaka (*Ammi visnaga* L.) is mentioned in *AVSS kāṇḍa*-06, *sūkta* 44 as '*Roganasanam*', which is used against excessive discharges (*āsrāva*, human internal disorder) from the body.

Pṛśniparṇī (*Uraria picta* (N. Jacquin) Desvaux ex DC.) is mentioned in *AVSS kāṇḍa*-02, *sūkta* 25 as a separate hymn titled '*Pṛśniparṇī-vanspatih*'. This hymn contains five *mantras*. It is employed as a devourer of the embryo in the womb. It is credited with the power to cure the barrenness of women. It is also known as *putrada*, *putrajanani* in the *AV* hymns (2-25:1-5).

Ajaśṛṅgī (*Rhus succedanea* L.) is mentioned in *AVSS kāṇḍa*–04, *sūkta* 37 as a separate hymn '*Oṣadhī-Ajaśṛṅgī*'. The plant is mentioned in *mantras* 1-2 and 6-10 and is used to drive out *rākṣas*, *apsarās*, *and gandharvas* and kills both visible and invisible microbes.

Uduṃbara (*Ficus racemosa* L.) is mentioned in *AVSS kāṇḍa*–19, *sūkta* 31 as a separate hymn titled '*Auduṃbaramaṇih*'. The tree is described in *mantras*/liturgies 1-14. This special hymn/charm ensures general prosperity, accompanying self-investiture with an amulet of *Uduṃbara* (*Ficus racemosa*).

Aśvat'tha (*Ficus religiosa* L.) is mentioned in *AVSS kāṇḍa*-3, *sūkta* 6 as a separate hymn titled '*śatrunāsanam*'. The tree is described in *mantras*/liturgies 1-8. It describes *Aśvat'tha* tree as a destroyer of enemies.

Gulgulu (*Commiphora wightii* (Arn.) Bhandari) is revealed in *AVSS kāṇḍa*-19, *sūkta* 38 as a separate hymn titled '*Gulguluh*'. The tree is described in *mantras*/liturgies 1-3. It is also mentioned in the *AV* 4-37-3. The plant *Guggulu* is used as the medicine of *yakṣma*. One who breathes the odour of *gugglu* plants the *yakṣma* scatter away from him like antelopes from a wild beast. The bark extract kills germs, cures diseases and injuries, and is also used as a curse.

Darbha (*Desmostachya bipinnata* (L.) Stapf), a grass herb also called a 'sacrificial herb' is mentioned in *AVSS kāṇḍa*–19, *sūkta* 28 as a separate hymn/charm titled '*darbhamaṇih*'. This ritual herb is described in *mantras*/liturgies 1-10. This hymn is used for the destruction of enemies.

Dūrvā (*Cynodon dactylon* (L.) Pers.), a grass species, is described in *AVSS kāṇḍa*-06, *sūkta* 106 as a separate hymn/charm titled '*Dūrvaśālā*'. This ritual herb is described in *mantras*/liturgies 1-3. It is used in a rite for welfare to prevent conflagration of the house.

Jangiḍa (*Oroxylum indicum* (L.) Vent.), a grass species, is described in the *AVSS kāṇḍa*-02, *sūkta* 04 as a separate

hymn/charm (with six *mantras*) titled '*Jangiḍah*' and in the *kāṇḍa*-19, *sūkta* 34 as a separate hymn/charm (with ten *mantras*) titled '*Jangiḍamaṇih*'. These charms with an amulet derived from the *Jangiḍa* tree act against diseases and demons to ensure health and prosperity.

Āsurī (*Brassica juncea* (L.) Czernajew), a medicinal herbaceous species, is described in the *AVSS kāṇḍa*–01, *sūkta* 24 as a separate hymn/charm titled '*Āsurī vanaspatih*'. This is described in the *mantras*/liturgies 1-2. It is also mentioned in the *AVSS kāṇḍa*-07, *sūkta* 38 in the *mantras*/liturgies 1-4.

6 Botanical descriptions of medicinal herbs mentioned in the *Atharvaveda saṃhitās*

Each plant/tree mentioned in the *Atharvaveda saṃhitās* is described botanically under the heads: (i) name of the plant species in the Sanskrit language, (ii) family name of the species, (iii) complete plant botanical citation with synonyms as per the International Code of Botanical Nomenclature (ICBN), (iv) Atharvaveda *mantra*/liturgy references with *mantra* in Devanagari and meaning of the *mantra*, (v) common/vernacular names of the plant in multiple Indian languages, (vi) documented species distribution with nativity and exotic cultivation, (vii) botanical description of the plant, (viii) general notes, (ix) phytochemical constituents, and (x) medicinal/economic importance of the plant species. A total of 110 plants and tree species are described in the report. Photographs of the plant/crop, flowers, fruits, roots, seeds and few commercial products for each medicinal herb are portrayed in the case of plants. In the case of tree species, photographs of the entire tree, including wood, bark, flowers, fruits, and seeds, are represented.

7 Flora of *Atharvaveda*

In the *Atharvaveda Saṃhita* texts (*AVSS* and *APSS*) different types of plants and trees are mentioned. The flora of *AV* consists of more than one hundred and seventy-two (172) plant species used in treating various human diseases. Among the 172 plants, 110 plants are identified. Of these, 83 species belong to the class Dicotyledonous, 27 species belong to the class Monocotyledonous and two (02) species belong to the Gymnosperm category, as per the Bentham and Hooker (1862) taxonomic system of plant classification. A total of 110 plant species belonging to 48 families include, 27 tree species, seven (07) species of shrubs, and 76 species of herbs. Amongst the 76 herbaceous species, there are 22 species of grasses, six (06) legume grain species, five (05) other herbs of different families, five (07) aquatic plants, eleven (11) creepers, and two (02) oil seed crop species. The 1st highest number of species (21) is from the family Poaceae (grass family), the 2nd highest (17) is from the family Fabaceae (including trees), the 3rd highest (4) belongs to family Moraceae (Fig family) and family Nymphaeaceae and three (3) belongs to family Combretaceae, Asteraceae, Gentianaceae, Zingiberaceae and two (2) species each from, Capparaceae, Asclepiadaceae, Menispermaceae, Convolvulaceae, Solanaceae, Apocynaceae, Rutaceae, Hydrocharitaceae, Ranunculaceae and Pinaceae respectively and the remaining are one species each of different families. The complete list of plants and tree species, as well as their class and family, is provided in the report submitted to the Indian National Science Academy (INSA).

Acknowledgements I thank Brahmasri Mudigonda Venkatappayya Sastry, Brahmasri Rama Murthy, and other Veda Gurus at Srisailam, Brahmasri Vedam Venkata Rama Sastry, Bangalore, for their continued guidance in teaching the Atharvaveda texts and also for critically going through the manuscript and for their continued encouragement during the study. I profusely thank the Indian National Commission for History of Science, Indian National Science Academy (INSA), New Delhi, for their financial support. Many thanks are due to Sri Madhvendra Narayan, Assistant Director (History of Science), INSA, for his continuous communication and for editing the present report. I wish to acknowledge Sri K.K. Subramani, Founder Chairman, and Sri K.S. Avinash, Administrator, Cauvery Sannidhi for Indian Culture, Sri Rangapatna, Karnataka, for accepting to be the host institute for this project.

References

Akbar, S. (2020). *Saussurea lappa* (Falc.) Lipsch. (Asteraceae/Compositae). In *Handbook of 200 medicinal plants*. Springer. https://doi.org/10.1007/978-3-030-16807-0_166

Bentham, G., & Hooker, J. D. (1862–1883). *Genera Plantarum* (Vols. I–III). L. Reeve & Co.

Bhattacharya, D. (2017). *The Paippalada-samhita of the Atharvaveda*. Critically edited from palm leaf manuscripts in the Oriya script discovered by Durgamohan Bhattacharyya and one Sarada manuscript (Vols. 1–4), The Asiatic Society.

Bloomfield, M. (1897). *Hymns of the Atharvaveda: Sacred books of the East* (Vol. 42). Scanned at https://www.sacred-texts.com/hin/sbe42/index.htm.

Boddupalli, R. S. (2022). Skin disorders (*twak rogas*) revealed in the *Atharvaveda*: Descriptions of medicinal plants and utilization. *Indian Journal of History of Science, 57*(2), 63–77. https://doi.org/10.1007/s43539-022-00040-6

Dominik, W. (2003). *The roots of Ayurveda* (pp. xxviii–xxx). Penguin Classics. ISBN 978-0140448245.

Filliozat, J. (1964). *La Doctrine classique de la medicine indienne. Ses origines et ses parallels Grecs* (pp. 119, 121–128). Paris: Imprimerie Nationale, 1949 (D. R. Chanana, Trans.) *The classical doctrine of Indian medicine: Its origins and its Greek parallels*. Munshiram Manoharlal.

Griffith, R. T. H. (1895–1896). *The hymns of the Atharvaveda*. Library of Alexandria. Scanned at https://www.hinduwebsite.com/sacredscripts/hinduism/athar/index.asp

Griffiths, A. (2004). *Paippalada mantras in the Kausika Sutra*. English translation. HAL Open Science.

Griffiths, A. (2007). Schmiedchen A. *Atharvaveda and its Paippaladasakha*: *Historical and philological papers on a Vedic tradition*, Geisteskultur Indiens: Texte und Studien 11. Shaker Verlag.

Karambelkar, V. W. (1959). *The Atharvavedic Civilization*. Nagpur University.

Karambelkar, V. W. (1961). *The Atharvaveda and Ayurveda*. Majestic Printing Press.

Khare, C. P., & Katiyar, C. K. (2012). *The modern Ayurveda*, *milestones beyond the classical age*. CRC Press, Taylor & Francis Group. ISBN 978-1-4398-9632-7.

Modak, B. R. (1993). *The ancillary literature of the Atharvaveda*: *A study with special reference to the parisistas*. Veda Vidya Pratishthan. ISBN 81-215-0607-7.

Mukhopadhyay, A. K. (2013). Skin in health and diseases in *Ṛgveda saṃhitā*: An overview. *Indian Journal of Dermatology, 58*(6), 413–416.

Mukhopadhyay, A. K. (2016). Dermatology in India and Indian dermatology: A medico-historical perspective. *Indian Dermatology Online Journal, 7*, 235–243.

Narayana, A. (1995). Medical science in ancient Indian culture with special reference to Atharvaveda. *Bulletin of Indian Institute of History of Medicine, 25*(1–2), 100–110.

Narayana, A. (1997). Historical perspectives of the *twak rogas* (*Kushṭha*). *Bulletin of Indian Institute of History of Medicine, 27*(1), 15–24.

Prasad, P. V. V. (2000). Atharvaveda and its Materia Medica. *Bulletin of Indian Institute of History of Medicine, 30*, 83–92.

Prasad, P. V. V. (2002). General medicine in *Atharvaveda* with special reference to *Yakshma* (Consumption/Tuberculosis). *Bulletin of Indian Institute of History of Medicine, 32*, 1–14.

Prasad, P. V. V., & Subhaktha, P. K. J. P. (2002). Medico- historical review of drug *Kustha* (*Saussurea lappa* C. B. Clarke). *Bulletin of Indian Institute of History of Medicine, 32*, 79–92.

Rathore, S., Debnath, P., & Kumar, R. (2021). Kuth *Saussurea costus* (Falc.) Lipsch.: A critically endangered medicinal plant from Himalaya. *Journal of Applied Research on Medicinal and Aromatic Plants, 20*, 100277. https://doi.org/10.1016/j.jarmap.2020.100277

Shah, N. C. (2019). *Kuṣṭa*, *Saussurea costus* (*Saussurea lappa*): Its unexplored history from the Atharvaveda. *Indian Journal of History of Science, 54*(4), 420–434.

Singh, B., & Singh, S. (2019). Chapter 23: Himalayan *Saussurea costus* (Falc.) Lipsch.: Traditional uses, phytochemistry, therapeutic potential and conservation perspective of critically endangered medicinal plant. In B. Singh (Ed.), *Plants for human survival and medicine* (pp. 429–446). New India Publishing Agency.

Vishva Bandhu. (1960). *Atharvaveda Samhita* (*Saunaka*), with Sayanacharya commentary, Devanagari language (Vols. 1–5). Vishveshvaranand Vedic Research Institute (VVRI).

Whitney, W. D. (1905). *Atharvaveda Samhita* (*Saunaka*). English Translation (Vols. 1–2). Harvard University.

Wise, T. A. (1986). *The Hindu system of medicine*. Mittal Publication.

Zysk, K. G. (1985). Religious healing in the Veda. *Transactions of the American Philosophical Society, 75*(7), 1–311. https://doi.org/10.2307/20486646

Zysk, K. G. (1986). The evolution of anatomical knowledge in ancient India, with special reference to cross-cultural influences. *Journal of the American Oriental Society, 106*(4), 687–705. https://doi.org/10.2307/603532

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.