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Ancient Science of India 11: Sage Paraasara: The Father of *Ud-vriddha Vigyaana* (Botany)- A Conglomerated Review

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ABSTRACT A symposium was held in the Himalayas during 700 BC, to discuss the theme of Aayurveda (Life Science) and medicinal quality of plants. Sage Paraasara, an eminent plant scientist of Bharatvarsa, projected the concept on Origin of Life, Plant Cell Structure and vast knowledge of *Ud-vriddha Vigyana* (Botany) in that conference.

INTRODUCTION

The use of plants and animals as source of medicine and food is as old as humanity. Human beings everywhere, at all times and places had to deal with the threat of diseases and illness. With the question of health and survival and within the framework of his knowledge, with solutions to problems of illness-the science of 'Aayurveda' developed.

The vedic literature indicates that man might have learnt the medicinal use of plants from the animals, those who posses the inherent capacity to recognize the medicinal plants from nature (Box-1) (Atharva Veda: *Kanda*-8, *Sukta*-7, verson-23-25). Aayurvedic epic 'Susruta Samhita' mentions that, medicinal herbs and plants should be recognized and identified with the help of cowherds, hermits, huntsmen, forest dwellers and those who cull the fruits and edible roots of the forest. Similarly 'Charaka Samhita' mentions that the goat herds, shepherds, cowherds and other foresters are well acquainted with the names and forms of plants; should be counseled during the search of medicinal herb. The science of Aayurveda has grown up from such point of origin with vast knowledge of medicines (Raghunathan 1984).

In India about 16,000 flowering plants known to occur, out of which 3,000 are recognized and used in Ethnomedicine or folk medicine based on oral information from generation to generation. Out of the above 1500 plants are used in organized systems of medicine like Aayurveda, Unani and Siddha. About 700 plants of the above have been investigated pharmacologically and chemically and their active principles are used in modern medicine system. This shows that, folk medicine system are the original source that slowly entered into Aayurveda and finally investigated and recognized among the modern medicines (Ved Prakash 1998).

BOX-1
Animals are aware of medicinal value of plants: Views of Atharvaveda (A.V.)

- The medicines which are known to Boars, Mongooses, Snakes and distinct heavenly beings; we greet those medicines to cure and sustain the human beings (A.V: 8.7.23)
- The animals, birds specially the Swan gooses are aware of bright herbaceous medicines; which were previously used by Saint Angira; we welcome them for the conservation of our deceased person (A.V.: 8.7.24)
- The medicines which are eaten by non-violent cows as well sheep and goats, let these medicines do our wellbeing (A.V: 8.7.25)

Aim

The aim of the present work is to explore the proceedings of a symposium on medicinal plants held in the Himalayas; 700 BC. Special emphasis is given to focus over Saint Paraasara, who had

formulated the epic Vriksaayurved and projected the structure of the plant cell in the symposium.

METHODOLOGY

The present work is carried out following the 'Literary Research Techniques' of Ethnobiological Research (Padhy et al. 2015). The observations and discussion portion is divided into part-1 and part-2; the former dealing with the Himalayan Symposium and later about the work of Saint Paraasara.

OBSERVATIONS AND DISCUSSION

(Part-1)

Proceedings of the Aayurveda Symposium

Aayurveda means: *Aayur*-Life and -*Veda*-Science or knowledge; significantly focus on the thematic process of life. This is traditional Hindu system of medicines which is based on the idea of balance in bodily systems with control of diet, use of herbal treatment and yogic breathing.

The world's first symposium on the medicinal plants in relation to diseases was held in the regions of Himalayas during the 7th Century B.C. Sage Bharadwaja had presided over the meeting and there were 51 active participants (Table 1) along with a good number of forest dwelling hermits and other sage scientists. Six eminent sages named Agnivesa, Bhela, Jatuukarna, Paraasara, Haarita and Ksaarapaani recorded the discussions of the symposium under the guidance of the most benevolent sage Aatreya Punarvasu. The seminar started with a fundamental question:

"Health is the supreme foundation of virtue, wealth, enjoyment and salvation. Now diseases are the destroyers of health, of a good life and even of life itself. Thus has arisen the great impediment to the progress of humanity; what shall be the means of remedying it? (Charaka Samhita (CS), Chapter 1/ Verse 15, 16) (Sarasvati 1995)".

The name of some of the sages reflected in the Table 1 is also mentioned in different Vedic age literatures in various contests. It should not be confused that the same person had attended the symposium. For example, Bharadvaaja was the president and also the name of one participant.

Table 1: Precise list of participants in the symposium presented alphabetically

Aasvalayana	Kaikaseya
Aasvarathya	Kasyapa
Aatreya	Kaundinya
Aatreya (the Mendicant Sanyasi)	Kusika
Abhijit	Lokaaksa
Agastya	Maarica
Angiras	Maarkandeya
Asit	Maimataayani
Baadarayana	Maitreya
Badisa	Naarada
Bhaargava	Paariksi
Bharadvaaja	Paingi
Bhrgu	Pulastya
Cyavana	Saandilya
Devala	Saankhya
Dhaumya	Saankrtya
Gaalava	Sakuneya
Gaargya	Saralomaa
Gautama	Sarkaraaksa
Hiranyaaksa	Saunaka
Jamadagni	Vaamadeva
Kaankayana	Vaarksi
Kaasyapa	Vaijavaapi
Kaatyayana	Vasistha
Kaapya	Visvaamitra

There are two Aatreyas along with Aatreya Punarvasu. Vasistha and Visvaamitra names of Ramayana age also observed. Naarada was a saint and regarded as a *Devataa* in mythology; a different participant in the symposium.

The discussions of the symposium were recorded by the group of six sages- Agnivesa et al. At first Agnivesa compiled the whole work which was reviewed by Sage Aatreya Punarvasu and the assembly of the sages. In course of time the other five scholars also completed their work and all the work obtained currency in the world for the well-being of the multitudes of living beings. The above facts are reflected in Charaka Samhita; *Suutrasthaana* (Chapter 1) and further elaborated in 30 chapters. The basic theme of the science of life as the gist of the seminar is reflected as follows (Sarasvati 1995).

What is the Science of Life ?

What is named the Science of Life, wherein are laid down the good and the bad of life, the happy and the unhappy life, and what is wholesome and what is un-wholesome in relation to life, as also the measure of life (CS 1/41).

The Synonyms for Life

Life is spoken of by such synonyms as the union of the body, senses, mind and spirit the support animation, the flux, and the link between the past life and the future one (CS 1/42).

The Superior Excellence of the Science

The Science relating to Life is regarded by the philosophers as the most meritorious of all the sciences because it teaches mankind what constitutes their good in both the worlds (CS 1/43).

The proceedings of the conference are very scientifically elaborated and projected, so that after several hundred years it is in the best use of human society. It is beyond imagination, the amount of research on medicinal plants was done at that time and the technologies and patience involved. Svami Satya Prakash Sarasvati (Former Professor and Head of the Department of Chemistry, University of Allahabad, retired on 1967) has rightly commented in his book (Sarasvati 1995)-'Founders of Science in Ancient India' that:

"We are familiar with the modern day seminars and symposia, but perhaps the human society does not record the minutes of a seminar held for such specific purpose on an applied scientific subject earlier than this one which was presided over by Sage Bharadvaja".

Charaka Samhita, which has recorded the activities of the seminar is authored by Saint Charaka during the period 200 B.C. to 200 A.D. Charaka was a great researcher on medicinal plants and regarded as 'The father of Aayurveda'. His Samhita is a compilation of his research work along with the findings of other sages. This treatise has eight sections include 120 chapters with exhaustive descriptions on 620 plants; written in Sanskrit.

(Part-II)

Vriksaayurveda

The science of plant life is called Vriksaayurveda, an alternative word for *Ud-vriddha Vigyaana*. There is clear reference of Vriksaayurveda in the ancient epics Arthasaastra, Brhatsamhitaa and Agnipuraana dealing with the Agricultural practices; rules for planting trees-their proper seasons, specific location for their aesthetic and hygienic effect; as well plant diseases and their treatment.

Another treatise of Vriksaayurveda is attributed to Saint Surapaala (10th Cent. AD) which bears an elaborate account on the treatment of plant diseases. This Sanskrit Epic "Surapaala's Vrikshaayurveda is translated by Dr. Nalini Sadhala and published by Asian Agri-History Foundation, Secunderabad (present Telangana) in the year 1996 (Sadhala 1996).

In the encyclopedic work compiled by Saarngdhaara named 'Saarangdhaara Paddhati', 13th Cent. A.D; there is a branch of Vriksaayurveda with a chapter Upavana-Vinoda deals with construction and maintenance of gardens.

The most important epic; the point of discussion in this manuscript is 'Paraasara's Vriksaayurveda; which is a full-fledged treatise (700 BC) covering many basic aspects of plant science.

The treatise Vrikshaayurveda of Paraasara is a master work dealing with the plant life in scientific manner.

The text is divided into six parts (*Kaanda*). Out of these the 5th *Kaanda* is partially available and the 6th *Kaanda* is completely missing in the original manuscript (Sircar and Sarkar 1996). The first *Kaanda* is again subdivided into eight chapters (CH) with the following contents:

CH 1: Introduction to the subject matter and brief account of the origin of life (Padhy 2023b)

CH2: Classification of lands according to soil structure and the climate with an outline of the flora characteristics to each type of land.

CH3: Distribution of forests in ancient India (Padhy 2023a).

CH4: The leaf and its various parts, and other leaf like appendages. It also includes the description of the internal structure of the leaf with presentation of plant cell structure.

CH5: Description of the different parts of a flower; various types of flowers according to their shape and form; and also provides a system of classification of plants based upon their floral characteristics.

CH6: Description of fruits and its various parts; kinds of fruits and other morphological peculiarities.

CH7: Deals with the eight different plant parts: Root, Stem, Heart-Wood, Sap, Exudate, Oleaginous substances and spines / prickles. The details of each plant part with morphology and functional roles have been furnished.

CH 8: Describes an account of the seed and the seedling. Process of germination and various methods of propagation of plants.

Kaanda-2 deals with plant division *Vanaspati* (Cryptogans) with invisible flowers and *Kaanda*-3 about plants which has visible flowers *Vaanaspatya* (Phanerogams). *Kaanda*-4 deals mostly about the monocotyledonous plants. In the text a broad system of classification of plants based upon the habit and morphological peculiarities is projected along with histology of leaf and rudimentary concept of plant physiology.

Paraasara has another treatise in Sanskrit named 'Krishi Paraasara' deals with ancient Indian Agriculture. The plant cell structure described by Paraasara is presented as follows.

Plant Cell Structure in Vriksaayurveda

The cell structure is described in the *Kaanda* 1, Chapter 4, Verse 27, 28 in Sanskrit is as follows:

Patre rasakosastu rasasyasraya aadhaarashya II (27)

Khalu vruksaya-patree rasakoosasastu-parisankhyaha santi I

Tee Kalaabeestitena panchabhautikaguna samanweetasya rasasyasayascha I

Atee ranjakayukta-manabascha I

Kalaa tu sukhma-patrakaa,

Ya bhuutosmaa paachita

Kalalaadupajaayate I

Aasaya aadhara-scheetee II (28)

Meaning

The leaf cells are the reservoirs of the fluid (*Rasa*). The cells are also called *Aasraya* which means a receptacle of *Rasa*. A leaf is made up of innumerable cells named as *Rasaasrya* (Fig.1). Each cell has a cell wall called *Kalaavestana*. Cells are microscopic *Anavassca* and contain a coloured substance *Rannjaka* (pigment). Inner to *Kalaavestana* there is a fine and transparent membrane called *Sukshma Patraka* (plasma membrane), which is derived out of the jelly like substance *Kalalam* (protoplasm) as a result of the metabolic changes under the influence of the heat energy (*Bhuutosmaa*). Accordingly, a pigment containing leaf cell can be called as *Ranjakayuta Rasaasrya*. The above descriptions indicate that Paraasara must have had a device such as a microscope of some kind (Naik 1984).

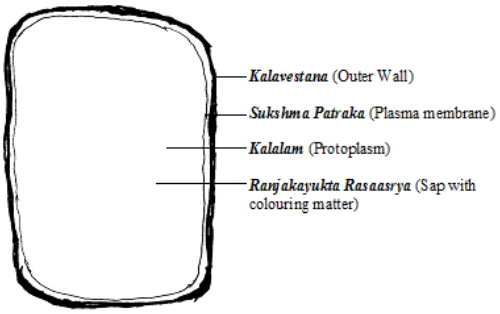

Fig. 1. Paraasara's cell system *(Rasaasrya)* -*Anvasva* (Not visible to the naked eye)
Source: Author

Much prior to Paraasara, in Atharva Veda, three chapters are presented where the description of the microbiological world is available. Those are 'Krumijamvana' (*Mandala 2, Suukta 31*), 'Kurminaasana' (2.32) and 'Kurmighanna' (5.23). *Kurmi* points to the microbes and *Jamvana, Naasana, Ghanna* means their death, spoilage and end. The sage scientist Kannva had authored these hymns and the micro-organisms are named later as *Kaanva*, as a token of remembrance and recognition. The way *Kannva* has described the microbiological world, it can not be ignored that the sage scientist have had a microscope like device. Comparatively Anatomy Van Leeuwenhoek has observed the microscopic world with the help of the instrument developed by himself in the year 1674. The discovery of *Kannva* remained locked within the Sanskrit versus of Vedic texts (Padhy 2016).

Leeuwenhoek is honoured as 'Father of Microbiology'.

In Charaka Samhita (Chapter VII, 10), it is reflected that *Krmies* (worms) are found in blood vessels (*Sthaanam Raktavaahinyo Dhamanyah*), which are microscopic (*Anu*), Circular (*Vrtta*), without feet (*Apaada*), invisible on account of extreme fineness (*Suukhmatwaaccaika Bhavantyadsyah*), of coppery colour (*Varnastaamrah*).

From the above observations it is clear that in those days there must have been some instrumental devices to carry out such microscopic work. Comparatively in 1665, Robert Hooke, an Englishman, first studied the internal structure of a thin slice of bottle cork with the help of a microscope improved by himself. He discovered

for the first time a honey-comb like structure in it, and to each individual cavity of a structure he applied the term *cell*. The readers are free to choose the priority of the discovery of cell structure-Paraasara and Robert Hooke.

Time Period of Paraasara's Treatise

'Vrksaayurveda of Paraasara' (A Treatise on plant science) authored by Sircar and Sarkar 1996, projects that this work was compiled probably between 1st Cent. B.C. or 1st Cent. AD and this view was confirmed earlier by Majumdar (1951). However, the reviewer of the book Dr. D.K. Kanjilal has fixed the time period 3rd-4th Cent. A.D, based upon the linguistic and other internal evidences.

It was mentioned earlier (Part-1) that Agnivesa compiled the whole discussion of the Himalayan medicinal seminar being reviewed by Aatreya Punarvasu. In course of time this work was projected as an encyclopedic medicinal compendium by Agnivesa. But this work received little attention. Later Agnivesa Samhita was revised by Charaka (2BC-2AD) with additional elaborated informations and named as 'Charaka Samhita', which has projected the Himalayan conference discussed earlier where Paraasara was an active participant. This gives clear evidence that Paraasara was not of the period 1st BC-1st AD as mentioned by Sircar and Sarcar (1996).

The contents of Vriksaayurveda presented earlier clearly indicate that Paraasara was a researcher on plant science. The Himalayan conference was on medicinal value of Aayurveda. Presence of Paraasara among the six eminent sages to record the proceedings and presentation of Vriksaayurveda in the conference seems ambiguous. But a verse of Charaka Samhita clears this doubt as follows:-

"It is only a person who is well acquainted with the names and external features of plants, as well as able to use them properly according to their properties, should be called an expert physician" (Charaka Samhita, *Sutrasthana*, Chapter 1, 56)

Most probably, Paraasara was in-charge of teaching plant science in the symposium; which was later compiled as a treatise Vriksaayurveda.

Paraasara Presented the Vriksaayurveda in the Himalayan Symposim

In conformation to the time period view of Paraasara's treatase, there are evidences in the book vide 1st *Kaanda* / 1st Chapter / Verse 2-5 as follows:-

Brahmaa swayambhu bhagawan sisrukhyu berbedha prajaha I (1)

Agre sasarja sthabaraatamano brukshya-beerudha II (2)

Atee khitiruhaa sarvei Jagatoo hitakaarakaaha I

Bane Chaitrarathai ramye sametahaa punya-karmaynaha II

Bhradwajaadayaha sarva yechanyai munist-tamaaha I

Gyaantu-meechanttha praprachhu Paraasa-ran maharsayah II (3)

Prustena munivehi sarvaha Paraasaro-abrabrittha I

Atharbaanga prabakhyami brahmoaktam Vrukshya-veidyakam II (4)

Uttpatting prakruti-bhedamaakrutin bhumi-bhedataha I

Vrukshyaanaam cha chikeechitam yathaaha chaturananaha II

Vrukshyaa balayastatha gulma beebedha-trunayatayaha I

Rutupuspa-phalantaa bai ausodhyaa yajnyaree twiha II (5)

Meaning

Thus said Paraasara (Verse (V)-1)

Brahmaa (the creation power), the God omniscient in his desire to bring diverse kinds of animates created first the immobile forms-trees, shrubs (V-2).

(The above statement gives idea that the plant world evolved first (Mohapatro et al. 2001) as per Manusmriti)

In order to acquire knowledge about the plants beneficial to the world, performers of holy rites like Bharadwaaja and other foremost of the sages assembled in the beautiful 'Caitraratha' forest (in the Himalayas) and questioned Paraasara (to enlighten them) (V-3)

When requested thus by the sages, Paraasara spoke (to the congregation): I shall narrate to you the 'Vrksaayurveda' embodied in the Atharvaveda, and as revealed by Brahmaa, the creator (V-4)

The genesis of the plants, their nature and form as influenced by variation of land characteristics along with their care and treatment, and delineation of the essential features of the trees, shrubs, creepers, grasses, seasonal flowers (*Rutu puspa*) and annual plants (*Osadhi*) on the surface of the earth-what all the Lord Brahmaa told me I shall narrate the same (V-5).

In the verse-6 he narrated the origin of life presented earlier (Padhy 2023b).

The following evidences are clear from the above verses:

1. Paraasara presented the plant science in the symposium. In the beginning of every chapter he has mentioned: I will now give discourse upon so and so aspect.
2. There was assemble of the sages.
3. Bhardwaaja, the President of the conference was present.
4. The name of the meeting place 'Caitrarratha' forest of Himalayas is mentioned. This forest is one of the eleven forests of Bharatvarsa projected by Paraasara (Padhy 2023a) in Chapter 3 of 1st *Kaanda* of his book.

Paraasara compiled the whole presentation as a treatise 'Vrksaayurveda of paraasara' (Sircar and Sarkar 1996). The time 700 B.C. projected by Sarasvati (1995) is more acceptable (for the conference period), who has done extensive research on 13 scientific aspects of Ancient Science of India. Comparatively how the plant science developed in the western world is discussed further.

Ud-vriddha Vigyaana verses Botany

The scientific study of the Morphology, Physiology, Genetics, Ecology, Distribution, Classification and Economic importance of plants is called '*Ud-vriddha Vigyaana*' / Botany. The Sanskrit word for plant is *Ud-vriddha* and the scientific study is known as *Vigyaana*. The word *Ud-vriddha* has the meaning-grown up, come forth, appearing (Williams 1899). Since the plants germinate inside the soil and spout out penetrating the soil they are named *Ud-vriddha*. This is the scientific as well as literary value of Sanskrit nomenclature.

The origin of the word Botany came from the Greek word 'Botane', which means grass, pasture, herbs or fodder and the former word is derived from 'Boskein' means to feed or to graze. Since the original meaning of Botane is focused on the idea of a posture, it is possible that the study of plants (Botany) came about from herdsmen needing to know what plants were safe for their herds to eat (internet).

The Father of Botany

Theophrastus was a Greek philosopher and the successor to Aristotle. He came to Athens at a young age and initially studied in Plato's school. After Plato's death, he got attached to Aristotle. Theophrastus had wide range of interests including biology, physics, ethics and metaphysics. His two important botanical works are 'Enquiry into plants' and 'On the causes of plants'. He developed his own vocabulary to describe plant processes and horticultural and agricultural efforts. Out of his 'Enquiry into plants' set of books, the first book deals with the parts of plants and the second with reproduction of plants and the times and manner of sowing. The third, fourth and fifth books are devoted to trees, their types, locations and practical application. The sixth deals with shrubs and spiny plants; seventh about herbs; eighth about the edible seeds and ninth deals with plants which produce juices, gums and resins.

The second set of books 'On the causes of plants' has eight parts; out of which six survive. It concerns the growth of plants, proper time for cultivation, methods of preparing the soil, manuring, use of tools; and deals with the smells, tastes and economical uses of plants. Poor emphasis is given on medicinal use of plants. Theophrastus detected the process of germination and realized the importance of climate and soil to plants. He had his own botanical garden.

Theophrastus is regarded as 'Father of Botany' in the western countries. But his job of classification of plants was limited with observing a few plants grown in the garden of Lyceum in Athens, and he did not travel beyond the walls of the garden (Naik 1984). Unfortunately, the lack of knowledge of Sanskrit language played a negative role for the poor spreading of Paraasara's wealth of informations throughout the world. However, the author has not receded to demand Paraasara as the father of Botany / *Ud-vriddha Vigyaana* (Padhy and Dash 2000). Period of Theophrastus is 371-287 BC; while Paraasara projected his work in the symposium of Himalayas-700 B.C., with scientific concepts like origin of life and structure of cell.

CONCLUSION

Study of plant science and microbiology has started from the Vedic age as reflected in Atharva Veda. The post Vedic epic Manusmruti focuses over the origin of life and systematically classified the plant world. The nomenclature of plants as *Ud-vriddha* is very scientific and rational. The contributions of Paraasara starting from origin of life, cell structure, morphology and anatomy of the

plant organs, nature and properties of soil, description of 11 forest types in Bharatavarsa and their distribution and study of internal structures of leaves are very systematic. Paraasara had formulated a system of classification of plants based on a study of the comparative morphology; which has significant coordination with modern families of plant classification. Saint Paraasara should by honoured as the Father of *Ud-vriddha Vigyana;* a genuine scientific demand.

RECOMMENDATION

Every society and culture should learn to demand the priority of their past inventions.

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