

A brief introduction to Ayurvedic system of medicine and some of its problems

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The paper gives a brief introduction to the Ayurvedic system and some of the problems faced by it especially with respect to identification of drugs.

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Today the medical world is posed with complex challenges. Thus time demands an integrated and pluralistic approach towards healthcare to cope effectively with this situation. There has been a growing interest in Ayurveda in the past few years. To initiate fruitful dialogues between Ayurveda and modern science, an in-depth understanding of both the systems becomes an essential prerequisite. Such an exercise should emerge from a standpoint accepting that there are different worldviews existing in the world, Ayurveda being one among them. This may sound quite contrary to the common belief that the science is only one as expressed in modern scientific

paradigm. Both modern science and Ayurveda have universal attributes and share the common objective of well being of mankind. But they are quite different in their philosophical and epistemological foundations, conceptual framework and practical outlook. So, let us examine what are the fundamental differences between *Sastra* (Ayurveda) and the modern science.

Ayurveda is based on the *Sankhya*, *Nyaya* and *Vaisesika* philosophical schools whereas Modern science is based on Logical positivism, Cartesian philosophy and later schools. Ayurveda uses concepts like *Panca mahabhuta siddhanta*, *Tridosha siddhanta*, where as modern science uses atomic theory, phyto-chemistry, pharmacology, etc. At

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the practical level the Ayurvedic outlook is holistic and individualized and modern science's approach is fragmented and specific. So far, the modern studies on Ayurveda have been restricted to exploration of drug sources, sociological, anthropological studies, etc., and no rigorous foundational correlation has been attempted. This predisposes the need of a strong foundational dialogue. From this perspective let us go into some of the basic concepts of Ayurveda.

1.1 What is Ayurveda

Ayurveda is the knowledge of life and longevity. The term Veda denotes knowledge and Ayus can be defined with the following verse.

“Tatrayusceti cetananuvrtih jivitam anubandho dhari cha”.

Ayus is the continuance of consciousness (*Cetananuvrtti*), animation (*Jivita*), continuous flow (*Anubandha*), sustaining the body (*Dhari*). Thus Ayurveda encompasses the knowledge of different facets of life. With such a broad definition Ayurveda advocates various means to protect health and to alleviate disorders. Ayurveda is the knowledge that indicates the appropriate (*Hita*) and inappropriate (*Ahita*), happy (*Sukha*) and sorrowful conditions (*Dukha*) of living, what is appropriate and inappropriate for longevity as well as the measure of these. The core objective of Ayurveda is to have happy life (*Sukhayu*), sustainable happiness in life (*Hitayu*), longevity of life (*Dirghayu*).

This knowledge exists in two major schools. They are the medical and surgical schools. *Caraka Samhita*, a classical text of 1500BC-200AD represents the medical school and *Susruta Samhita* of 1500BC-300AD represents the surgical school. The Ayurvedic classical texts mention eight different specializations. They are *Kaya cikitsa* (Internal medicine), *Bala* (Paediatrics), *Graha* (Mental disorders & afflictions), *Urdhvanga* (Diseases of ear, nose, throat and eye), *Salya* (Surgery), *Damstra* (Toxicology), *Jara* (Geriatrics/Rejuvenation), *Vrsa* (Reproductive health).

1.2 What is health according to Ayurveda

To be established in oneself or one's own natural state is defined as *Svasthya* (perfect health in Ayurveda). For this, a person should have a “Structural” and “Physiological” equilibrium (*Samadosa*), equilibrium of metabolic processes (*Samagni*), equilibrium of body tissues (*Samadhatu*), equilibrium of eliminative system (*Samamalakriya*), equilibrium of senses (*Prasannendriya*), equilibrium of mind (*Prasannamana*), state of pure awareness or a contented self (*Prasanna atma*).

There are three different treatment methods adopted in Ayurveda to achieve the above state. They are: *Daivavyapasraya* — Treatment by doing rituals, wearing auspicious gems, chanting *mantras*, etc.; *Satvavajaya* — Control of mind through practices of yoga, meditation, etc.; *Yuktivyapasraya* — Treatment with drug materials such as plants, animals, minerals and metals.

Thus, in the *Yuktivyapasarava* method of treatment, Ayurveda uses different drug materials. Now let us see how these drug sources are understood in Ayurvedic pharmacopoeia.

1.3. The three levels of understanding of a drug material

The *Dravyagunavijnana* is the section of Ayurveda dealing with drug sources. This is divided into *Padarthavijnana* and *Dravyavijnana*. The entire edifice of the Ayurvedic knowledge stems from the view of similarity of man and nature, or in other terms microcosm and macrocosm, both having been constituted

by the fundamental principles. This is understood at six levels known as *Padarthas*. *Padarthavijnana* is the science, which deals with the study of these basic existential principles, i.e. *Dravya* (substratum), *guna* (qualities), *karma* (actions), *samana* (generic), *visesa* (specific), *samavaya* (inherence).

Dravyavijnana is the detailed pharmacology. This is divided into three sub-topics named *Nama*, *Rupa* and *Yuktijñana*, which constitutes the three-tier understanding of *ausadhi* (drug materials). The chart below gives an idea about the structure of Ayurvedic pharmacology.

Ayurvedic pharmacology (*Dravyaguna vijnana*)

<i>Nama jñana</i> (Nomenclature)	<i>Rupa jñana</i> (Identification)	<i>Yukti jñana</i> (Application)	
Polynomials Basionyms Synonyms	Textual descriptions Etymological studies Field data	<i>Kalpna jñana</i> (Pharmaceutical methods)	<i>Yukti jñana</i> (Clinical application)
<i>Gunakarma jñana</i> (Qualities and actions)	<i>Yoga jñana</i> (Classifications)	<i>Sambharana</i> (Collection and Storage)	<i>Roga</i> (Disease) <i>Vikalpa</i> (Disease types) <i>Avastha</i> (Disease stage)
<i>Rasa</i> (Taste) <i>Guna</i> (Qualities) <i>Virya</i> (Potency) <i>Vipaka</i> (Post digestive Effect) <i>Prabhava</i> (Specific action)	<i>Varga</i> (Non-therapeutic) <i>Gana</i> (therapeutic)	<i>Mana</i> (Measures) <i>Sodhana</i> (Purification) <i>Samskarana</i> (Method of preparation)	<i>Prakrtyadi</i> (Constitution etc.) <i>Matra</i> (Dose)
<i>Karma</i> (General action)	<i>Yoga</i> (Formulations) Methods of combining drugs	<i>Upayogakrama</i> (Shelf life, Storage and Dispensing)	<i>Anupana</i> (Vehicle) <i>Kala</i> (Time of administration)
<i>Dosakarma</i> (Action on dosa) <i>Dhatukarma</i> (Action on body tissues) <i>Malakarma</i> (Action on excretory mechanism)			<i>Viruddha</i> (Contra-indications) <i>Pathya-Ahara</i> (Food) <i>Vihara</i> (Habits) Special precautions etc.

1.3.1. *Nama jnana and Rupa jnana* (Understanding of Nomenclature and Identification) :

The nomenclature of Ayurveda is not a binomial system as adopted by modern botany. In Ayurveda, there are many names for a single entity and a single name is used to denote many plants. So it is essential to understand the way Ayurvedic nomenclature works. The total number of names pertaining to medicinal sources may be approximately 20,000 to 25,000. A particular plant will have a group of synonyms which may range from one to approximately fifty. Each name focuses on a very specific aspect of the plant. So these names give a good picture of the various aspects of the plant including morphology, habit, habitat, qualities, biological actions, therapeutic uses and so on.

This naming system was primarily designed to help a physician to select a plant for medicinal purposes. It was not designed to establish the taxonomical identity of a plant. The nomenclature of Ayurveda is therefore a therapeutic nomenclature based on a polynomial system of naming. In the literature the names are categorised as *Svarupa bodhaka* (revealing the form) or *Guna bodhaka nama* (revealing the quality). *Guna bodhaka namas* are names pertaining to qualities, actions, specific action in relation with therapeutic conditions, etc. The different types of names highlight all the three aspects of the drug sources.

Let us consider a detailed example of the various meanings of the plant *Tinospora cordifolia* which is known in

Sanskrit as *Guduci* along with several other synonyms. This will provide an idea of the Ayurvedic nomenclature.

Names describing external characters (*Svarupa bodhaka*) are *Amrtavalli* – weak-stemmed plant, *Cakralaksana* – wheel like appearance on cross section, *Mandali* – circular shape, *Kundali* – stem gets entangled with twiner, *Nagakumari* – twining nature comparable to a snake, *Tantrika* – spreading nature, *Madhuparni* – honey-like leaf juice, *Chadmika* – thick foliage, *Syama* – smoky hue of the stem, *Vatsadani* – eaten by calves, *Dhara* – longitudinal grooves on the stem, *Visalya* – no thorns, appendages, *Chinnaruha* – capacity of cut stems to regenerate fast, *Abdikahvaya* – growing near a reservoir of water.

The terms describing qualities (*Guna bodhaka*) are *Amrita* – an elixir, *Guduci* – that which protects, *Vayastha* – rejuvenative nature, *Jvarari* – anti-pyretic property, *Sounya* – benevolent in action.

There are common terms used as synonyms for different plants. The similarity in reproductive characters, physical characters, qualities, action etc. are the reason for this. Here in the above example the term *Vayastha* is a synonym for *Embllica officinalis* (*Amalaki*), *Amrita* is a synonym for *Terminalia chebula* (*Haritaki*) because of similar characteristics.

1.3.2. *Yukti jnana* (Application):

Guna karma jnana (Qualities and actions)

Yoga jnana (Classifications)

Kalpna jnana (Pharmaceutical methods)

Yukti jnana (Clinical application)

The *Guna karma*: Qualities and actions of a drug source are known through different steps. They are *Rasa* (taste), *Guna* (attributes or qualities), *Virya* (power of action), *Vipaka* (post digestive effect), *Prabhava* (specific action), *Karma* (general action), *Dosa karma* (action on dosa), *Dhatu karma* (action on body tissues) and *Mala karma* (action on eliminative system). Detailed profile of each drug is available in the Ayurvedic pharmacopoeia.

The knowledge of combining individual drugs to make a formulation is known as *Yoga jnana*. This includes non-therapeutic classifications, therapeutic classifications and formulations. While making formulations different factors like drug compatibility, drug interaction, synergism, potentiation, bio-availability, etc. are taken into consideration.

Kalpana jnana mainly deals with *Bhaisajya kalpana*, the pharmaceutical preparation of drugs. There are approximately 70 – 80 varieties of preparations in Ayurveda as drugs and food supplements. A few among them are: *Kasaya* (decoction), *Ghrita* (medicated clarified butter), *Taila* (medicated oil), *Gutika* (tablet), *Curna* (powder), *Leha* (linctus), *Arista* and *Asava* (fermented preparations), *Panaka* (syrup). Thus this topic includes *Kalpana jnana* (pharmaceutical methods) which also includes, *Sambharana* (collection and storage), *Mana* (measures), *Sodhana* (purification), *Samskarana* (method of preparation), *Upayoga krama* (shelf life, storage and dispensing), etc.

Yukti jnana (clinical application) includes understanding of *Roga* (disease), *Vikalpa* (disease types), *Avastha* (disease stage), *Prakrtyadi* (constitution etc.), *Matra* (dose), *Amupana* (vehicle), *Kala* (time of administration), *Viruddha* (contra-indication), *Pathya* (regimens), *Ahara* (food), *Vihara* (habits and routines), special precautions, etc.

2. Current status of Ayurveda

Around 70 percent of the healthcare needs of India is still being catered by traditional systems of Medicine including Ayurveda, which highly depend on the natural resources. It is estimated that the world has about 250,000 plants to which India's contribution is about 50,000 plants of all groups including about 20,000 flowering plants and conifers. It is estimated that out of these, 7,000 plants are used in the Traditional Systems of Medicine and according to a recent survey it is reported that 1,700 plants are used in the Ayurvedic system of medicine. However, the number of vegetable drugs actually used by various Ayurvedic practitioners in India and available in different markets is around 700.

The drugs sold in the Indian market bear vernacular or regional or trade names which vary from region to region, thanks to its multilingual character. There are around twenty one official languages and innumerable dialects in India. Though the original names of the Ayurvedic drugs as given in the classical literature are in Sanskrit, in the trade they are known in the regional or vernacular names like Hindi, Bengali, etc. in the northern, eastern and western India while

in South India, they are known by Tamil, Kannada, Telugu and Malayalam names. The plethora of languages prevailing in India has contributed to considerable confusion in the botanical identity of the drug.

3. Sources of medicine in Ayurveda and controversy in their identity

Several floras, like the *Flora of British India* and regional floras of different States and regions of India, carry description of the plants, described under valid botanical names. Subsequent to the publication of these floras, efforts were undertaken to link the description of Ayurvedic drugs given in classical Sanskrit literature like *Caraka Samhita*, *Susruta Samhita*, *Astanga Hridaya* and *Astanga Samgraha*, to the scientific botanical names. Though the Sanskrit literature have provided accurate description, confusion in the identification of botanical sources of these drugs was probably brought about by poor understanding of the Sanskrit literature and misinterpretation by various commentators. This confusion has become confounded by the existence of several names for one drug and several drugs having one common name.

Non-availability of a species, poor or distorted understanding and parallelly evolving knowledge systems are the three major reasons for looking for alternatives and wrong and multiple identities added to them, result in controversy. Thus a high percentage of plants used in the present day Ayurvedic practice have some controversy attributed to them.

3.1. Non-availability: Due to non-availability or high cost in the market, there are chances of substitution or adulteration of drugs. If this practice continues for long time the original identity of a plant may become obscure and the substitute will be considered as the original. For example, the plant referred to *Sankhapuspi* in the earlier texts of Ayurveda is no more available. There are many legitimate substitutions to this plant. In Kerala tradition, *Clitoria ternatea* Linn. and in Northern India, *Convolvulus microphyllus* Sieb. ex Spreng are being used as *Sankhapuspi*. Similarly *Canscora decussata* Schult., *Canscora diffusa* R. Br., *Evolvulus alsinoides* Linn., *Lavandula bipinnata* Kuntze, *Woodfordia fruticosa* Kurz, *Cannabis sativa* Linn. have been correlated to *Sankhapuspi* but do not match with the original descriptions of Brhatrayi (3 major earliest classical works of Ayurveda i.e. Caraka, Susruta and Vaghbhatta).

Non-availability also results in looking for similar morpho-variants and thus result in alternatives. For example *Sarpagandha* is correlated to *Rauvolfia serpentina*. Since this plant is not commonly available, *Rauvolfia tetraphylla* has been used as a candidate. Thus alternatives are made and controversy is generated in due course.

3.2. Poor understanding is another major reason resulting in wrong identities. A drug can also become controversial when the information available on the species is limited. Poor

understanding of the nomenclature intricacies, misinterpretations, poor deciphering of the classical texts, poor field identification skills, wide chronological gaps between the different classical texts, all lead to wrong identity.

Nomenclature issues and peculiarity of Sanskrit language, if not understood properly, may mislead the reader. For example, in some cases the gender of the words plays a very important role. For example, the word *Pippala* denotes *bodhi* tree when used in male gender and the same in female gender denotes long pepper (*Pippali*). Therefore, etymological intricacies and grammar have to be clearly understood to avoid misidentifications.

There are also chances of misdirections in the commentaries or subsequent literature. *Brahma suvarcala*, a plant described in *Caraka Samhita* and *Susruta Samhita* in the *Divyaousadhi* group of drugs has been later correlated to *Mandukaparni* by Indu, a commentator on *Astanga Samgraha*, a classical text of 6th cent AD. According to the descriptions available in *Caraka Samhita*, *Brahma suvarcala* is a herb with golden latex and lotus like leaves. This does not at all match with the present day available *Mandukaparni* [correlated to *Centella asiatica* (L.) Urban]. So either the *Mandukaparni*'s present day identity is controversial or the description by *Indu* is not valid.

Poor deciphering of the texts is another reason resulting in wrong identities. Poor identification skills at the level of collector, trader or end-user also result in wrong identities. This is primarily

because of the alienation from the field/natural habitat. *Puskaramula* is a plant which finds mention in the earliest available classical text. This is correlated to *Inula racemosa* Hook.f. by many authors. In the markets of Kerala, *Puskaramula* (a type of jasmin) is being used as the above mentioned plant for the last 30 years.

Wide chronological gaps between the texts in the evolutionary history of Ayurveda or lack of enough materials for filling these gaps have also led to wrong identification. This has also created a vast gap between practice and the classical theoretical Ayurveda. Plants like *Asvavati*, *Somavati*, *Urjavanti*, *Udojas* which find their mention in the Vedas have become obscure. A group of plants called *Divyousadhi* having powers like that of *soma* were included during the period of *Caraka Samhita* and *Susruta Samhita*. But later they were dropped by *Vagbhata*. This may be because of the difficulty in ascertaining their identities.

Due to similarity in the morphological characters or specific features two different species may be known by the same name in the vernacular languages thus resulting in wrong identity. For example, in Tamil, both *Cressa cretica* Linn. and *Drosera indica* Linn. are known by the same name *Azhukanni* because of the similar feature of presence of dew like substance on the leaves.

3.3. Parallely evolving knowledge systems have generated multiple identities to a large extent. Availability of morpho-variants, identifying species with partly similar or fully similar properties,

inherent qualities of accent and dialects, diverse non medical literature describing flora and etymological intricacies are few among them.

Similarity in the morphological characters, clinical applications or textual descriptions may generate new candidates. For example, *Brahmi* is a plant correlated by most of the Ayurvedists to *Bacopa monnieri*. (L.) Pennel. But in the North Indian tradition, *Centella asiatica* (L.) Urban is used as *Brahmi*. This is because of the similarity in their therapeutic effects. Similarly *Woodfordia fruticosa* Kurz has been correlated to *Sankhapuspi*, may be because its flower has the shape of a conch.

Inherent qualities in vernacular languages, diverse dialects and accent also lead to multiple identities. For example *Matala* in Tamil refers to *Punica granatum* Linn., whereas in Kannada it pertains to *Citrus medica*. Likewise *Aralimara* is the Kannada name for *Ficus religiosa* Linn. but in few specific locations of Karnataka (a Southern state of India), *Ficus* is known as *Ragi mara*. *Ragi* is the popular name for the cereal *Eleusine coracana* Gaertn. *Pasanabheda* is the term which means breaking the stone. *Pasanabheda* of Northern, Eastern, Southern India are different according to Bapalal Vaidya, a pioneer in the research on the controversy of medicinal plants.

Non-medical literature also contributes to multiple identities or wrong identities. For example, *kamala*, *utpala*, *kumuda*, *kalthara*, all are, at times, referred to the same species in poetical interpretations.

The polynomial nomenclature is one of the major issues which makes a lot of confusion to many of the authors and readers, the same plant having many names or the same name applied to different plants. As mentioned earlier in this paper, there are around 60 synonyms of *Amrta* [correlated to *Tinospora cordifolia* (Willd.) Miers ex Hook. & Thoms.] and *Amrta* is also a synonym for *Haritaki* (*Terminalia chebula* Retz.). If this is not properly understood it may cause confusion. This is primarily because of lack of understanding of nomenclature dynamics of Ayurveda.

In present day's sources of botanical correlations, many inaccuracies have crept in, since the authors have not been critical and fully oriented to this issue of controversy. Thus identification of drug sources becomes the first step to do any research or further study of any drug source.

3.4. Drugs of confused identity: A few examples—

3.4.1 One classical example is the drug *Brahmi*. This drug is reported to possess properties of improving memory and intellect. The clinical trials have shown significant results in the learning capacity of the mentally retarded children. A few drugs like "Mentat" and "Memory Plus" have been developed from *Brahmi* by the Central Drug Research Institute, Lucknow, in India and are marketed by chemists.

Botanical sources of *Brahmi*:

Two different plants are known by the same name - *Brahmi*

1. *Centella asiatica* (Linn.) Urban (Apiaceae)
2. *Bacopa monnieri* (Linn.) Pennell (Scrophulariaceae)

In many of the Indian markets, *Centella asiatica* is sold in the name of *Brahmi* whereas in some markets, especially in West Bengal and Southern India, *Bacopa monnieri* is sold as *Brahmi*.

Views of classical literature on *Brahmi*:

A study of classical literature on *Brahmi* reveals that the original source of *Brahmi* is *Bacopa monnieri*, whereas *Centella asiatica* constitutes the botanical source of another Ayurvedic drug called *Mandukaparni*. This is included by *Caraka* in his *Vayasthapana gana* – the group of drugs capable of maintaining the youthful vigour and strength. It is also capable of improving the receptive and retentive capacity of mind.

3.4.2 Another drug of confused identity is *Rasnapati*. This drug is aperient and purgative. Six different plants are known by this name.

(a) *Pluchea lanceolata* C.B. Clarke
 (b) *Inula helenium* Linn. (c) *Inula racemosa* Hook.f. (d) *Vanda tessellata* Roxb. (e) *Acampe pappilosa* Lindl. (f) *Alpinia galanga* Willd. Except *Pluchea lanceolata* C.B. Clarke, all the other drugs are root drugs. The well accepted source of the drug *Rasna* is *Pluchea lanceolata*, in accordance with the classical literature.

3.4.3 Jivanti:

The root drug is useful in rejuvenating health and cures all the three humours, i.e., *Vata*, *Pitta* and *Kapha*. Botanical sources are (a) *Leptadenia reticulata* (Retz.) Wt. (Asclepiadaceae). (b) *Ephemerantha macraei* (Lindl.) Hunt & Summerhays (Orchidaceae). (c) *Holostemma ada-kodien* Schults. The accepted source of this drug, botanically and according to the classical literature, is: *Leptadenia reticulata*. However, in Kerala (Southern India), the last named plant is used.

Such examples have brought the focus on research not only on their botanical sources but also on their clinical and pharmaceutical applications.

3.5. Substituted and adulterated drugs —Causes and reasons

Over exploitation of a drug source results in the depletion of the source, affecting the environment and giving way to the substituted and adulterated drugs. Non-availability, in abundance, of a drug source in its natural habitat also forces us to accept substituted drug-source. For example, the original source of the barberry root, useful in curing jaundice, haemorrhoids, urinogenital disorders and skin diseases, known in Ayurveda as *Daaruharidra*, is *Berberis aristata* Hook.f. & Thomson or *B. asiatica* Roxb. For want of enough raw materials of these species, another species of the same genus, *B. lycium* Royle is used as a common adulterant, and in Southern India it is substituted by *Coscinium fenestratum* (Gaertn.) Colebr.

Some traders resort to adulteration when the genuine or substituted drug source is in short supply. For example, *Crocus sativus* Linn. (saffron), is often adulterated with the skins of *Allium cepa* Linn. (onion) and the ray florets of *Carthamus tinctorius* Linn. (safflower).

3.6. Problems and prospects of cultivation of drug sources

A way of obtaining genuine crude drugs is to cultivate them. By cultivation there is an assurance of continuous supply of genuine drug sources. Further, it does not disturb the environment, rather contributes to it. But cultivation also has its own problems which are explained here.

3.6.1. Problems

- i. It is not possible to cultivate all the drug sources.
- ii. Farmers are not ready to take up cultivation of non-remunerative medicinal plants, in the place of cash crops like rice, sugarcane, pulses and vegetables, unless the Government gives them incentives and protects them from financial loss, which cover issues like Benefit Sharing and the Intellectual Property Rights. One such example is the cultivation of *Trichopus zeylanicus* Gaertn. (Dioscoreaceae), in Kerala, in south India involving tribal people in its cultivation. The plant, locally known as *Arogyapaccha*, meaning, that which provides good health and vigour, is reported to provide a general health tonic which may be equivalent to ginseng.
- iii. Further, sometimes, the cultivated plants are different in their morphology

and efficacy as a drug from its wild relative. A typical example is the source of the Ayurvedic drug—*Asvagandha*—which is *Withania somnifera* Dunal, used as an ingredient of several Ayurvedic formulations as an aphrodisiac and tonic. It is a constituent of BR 16-A, used in the treatment of hypercholestroemia, mental disturbances and convulsions. The cultivated drug, in this case, is quite different in its morphology, odour, etc. from its wild source. Though both the cultivated and wild samples are reported to possess similar chemical constituents, they are however reported to differ in their pharmacological effects, the wild one being more potent.

Conclusion

The need for an integrated research

All the examples in this paper emphasize the need for an objective research on the plants mentioned in the Ayurvedic classical literature to link their description to the correct botanical sources mentioned in the modern floras applying the principles of *namajñana*, *roopajñana*, *yuktijñana*, etc., and study their pharmacognosy, pharmacology and clinical aspects to make them acceptable in modern medical practice. It is not a question of which is the correct botanical source of a drug but which is more potent in curing a disease. This can be achieved by comparative analysis of all the botanical sources of a drug. Such a coordinated research programme will render far reaching benefits in emphasizing the significance of Ayurvedic drugs in terms of modern medicine.

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Some suggested reading

- 1 Wealth of India – Vols. I to XI (1947 to 1977): Vols. I-A, 2-B and 3-Ca-Ci (Revised), 1990-1995 National Institute of Science Communication, Council of Scientific & Industrial Research, New Delhi.
- 2 Varier P S, *Indian Medicinal Plants—A Compendium of 500 species*, Vol.1,1994 (Repr.1996); Vol.2. 1994 (Repr.1997), Vol.3 1995 (Repr.1996), Vol. 4 1995 (Repr.1997), Vol.5.1996 (Repr.1997), (Orient Longman Ltd., Chennai).
- 3 Sarin Y K, *Illustrated Manual of Herbal Drugs Used in Ayurveda*, (Council of Scientific & Industrial Research and Indian Council of Medical Research, New Delhi), 1996.
- 4 Sivarajan V V & Balachandran I, *Ayurvedic Drugs and Their Plant Sources*, (Oxford & IBH Publishing Co, Pvt. Ltd., New Delhi), 1994.
- 5 Abdul Kareem M, *Plants in Ayurveda (A Compendium of Botanical and Sanskrit Names)*, (Foundation for Revitalisation of Local Health Traditions, 50, MSH Lay out, Anandnagar, Bangalore), 1997.
- 6 Hooker J D, *Flora of British India*, Vols I-VII, (Secretary of State for India, London), 1872-1879.
- 7 Darshan Shanker, Ram Manohar, Unnikrishnan, "Epistemology of Traditional Indian Medical System and its Difference from Western Tradition, CD ROM, Proceedings of the Fifth International Conference of the International Society for the Study of European Ideas, in Utrecht, The Netherlands, August 1996.
- 8 Unnikrishnan P M. An insight into Ayurveda's understanding of Medicinal plants, *Amruth*, August 1997.
- 9 Unnikrishnan P M. How does the Medicinal plant controversy occur ? *Amruth*, August 1998.