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.

Keywords: Ayurveda, Drugs of confused identity, Indigenous healthcare.

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 Pana ca mahabhuta siddhanta, Tridosha siddhanta, where as modern science uses atomic theory, phyto-chemistry, pharmacology, etc. At
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 cetananuvritthi jivitam anubandho dhari cha".

Ayus is the continuance of consciousness (Cetananuvritti), 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 (Hitaw) and inappropriate (Ahitaw), 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), Salva (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 (Samadhahata), equilibrium of eliminative system (Samamalakriya), equilibrium of senses (Prasannendriya), equilibrium of mind (Prasannamana), state of pure awareness or a contended self (Prasannatma).

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.; Yuktiyapasraya — Treatment with drug materials such as plants, animals, minerals and metals.
Thus, in the Yuktiyupasraya 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 Dravyaguna vijnana 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), samanvya (generic), vishesa (specific), samavaya (inheritance).

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

<table>
<thead>
<tr>
<th>Ayurvedic pharmacology (Dravyaguna vijnana)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nama jnana (Nomenclature)</td>
</tr>
<tr>
<td>Polynomials</td>
</tr>
<tr>
<td>Basionyms</td>
</tr>
<tr>
<td>Synonyms</td>
</tr>
<tr>
<td>Gunakarma jnana (Qualities and actions)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Rasa (Taste)</td>
</tr>
<tr>
<td>Guna (Qualities)</td>
</tr>
<tr>
<td>Virya (Potency)</td>
</tr>
<tr>
<td>Vipaka (Post digestive Effect)</td>
</tr>
<tr>
<td>Prabhava (Specific action)</td>
</tr>
<tr>
<td>Karma (General action)</td>
</tr>
<tr>
<td>Dosakarma (Action on dosa)</td>
</tr>
<tr>
<td>Dhutakarma (Action on body tissues)</td>
</tr>
<tr>
<td>Malakarma (Action on excretory mechanism)</td>
</tr>
</tbody>
</table>
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 Guduchi along with several other synonyms. This will provide an idea of the Ayurvedic nomenclature.


The terms describing qualities (Gula bodhaka) are Amrita – an elixir, Guduchi – that which protects, Vayastha – rejuvenative nature, Jvarari – anti-pyretic property, Soumya – 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 Emblica 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)
Kalpana 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), *Guтика* (tablet), *Curma* (powder), *Leha* (liquefied), *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), *Samkarana* (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), *Prakryadi* (constitution etc.), *Matri* (dose), *Ampana* (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 compounded 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 Sankhapospi 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 Sankhapospi. Similarly Canescoc decussata Schult, Canescor diffusa R. Br. Evolvulus alsinodes Linn., Lavandula bipinnata Kuntze, Woodfordia fruticosa Kurz, Cannabis sativa Linn. have been correlated to Sankhapospi but do not match with the original descriptions of Bṛhattarṣayi (3 major earliest classical works of Ayurveda i.e. Caraka, Susruta and Vagbhatta).

Non-availability also results in looking for similar morpho-variants and thus result in alternatives. For example Sarpegauntha is correlated to Rauwolfia serentina. Since this plant is not commonly available, Rauwolfia 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 bodhivriksha 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 suvareca, a plant described in Caraka Samhita and Susruta Samhita in the Divyapurushadhi 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 suvareca 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 Indula racemosos 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 Asavari, Somavari, Urjavanti, Udojas which find their mention in the Vedas have become obscure. A group of plants called Divyapurushadhi 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 Azhukanam 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 Sankhopsis 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 medic. 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, kamuda, kalhara, 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 Amrita [correlated to Tinospora cordifolia (Willd.) Miers ex Hook. & Thoms.] and Amruta is also a synonym for Haritaki (Terminalia chebulica 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 “Mental” 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 Rasnapatti. 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 pappillosa* 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) *Ephemeranthus macraei* (Lindl.) Hunt & Summerhayes (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 *Coscium fenestratum* (Gaertn.) Colebr.
Some traders resort to adulteration when the genuine or substituted drug source is in short supply. For example, *Crocus sativus* Linn. (safron), 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 hypercholesteremia, 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 *namajivana, roopajivana, vaktijivana*, 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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