

CONTRAVERSIES IN DRUG AND INDUSTRY- ITS MEASURES: A VIEW POINT

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ABSTRACT

Man has been fascinated by nature since he evolved from his primitive ancestors, the apes. No doubt to start with, he hunted for food mainly by killing the wild animals, but if there was anything on which he could depend upon with any confidence towards its availability, it was the plant. Not only the fact that a large number of plants provided him with food but also the fact that they provided him with curative medicine and shelter, were perhaps the reasons why he worshiped them more than the animals which also gave him food. There are a large number of plants, which are used by the people all over India for curse against witchcraft or to remove the effect of the evil eye and sickness. The use of the flora in India to relieve mankind from their sufferings was known from the ancient days. This includes all food, fuel, shelter, drugs, cosmetics etc. The standards have been maintained for several centuries since the disciples were trained in the forest close to the natural flora. In the present paper certain useful methodologies are evaluated for preparing standard Herbal formulations and focus mainly on two things namely *Drug (Dravya)* and *Industry (Pharmaceutical industry)*.

Introduction

History reveals that *Ayurvedic* Materia Medica is one of the earliest Pharmacopoeias available in the world. During *Vedic* period (3000-2000 B.C.) single drug therapy dominated the arena. The number of medicinal plants delineated in *Rigveda*, *Yajurveda* and *Atharvaveda* are 67,81 and 289 respectively. It is also recorded that *Caraka* (500 B.C.), *Suśruta* (2 A.D.), *Vāgbhaṭa* (6 A.D) have delineated 1100, 1270 and 1150 names herbs respectively. With the changing times and methods of teaching, identification of herbs has become more difficult. Therefore, several lexicographers

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attempted for "Compendia of Medicinal Plants" were called *Nighantus* from 7th-17th century A.D. India is a very vast country; it is just a continent with various languages, various dialects, various types of climatic conditions and culture. So, naturally one plant was known by various names in various parts of the country, it has resulted and contributed to many controversies in identification medicinal plants in *Ayurveda*.

The herbal medicine manufacturer's malpractices like substitutes to actual ingredients, adulteration, lack of quality control and standardization are leading to industrial controversies.

The term *Dravya* is a substance defined by *Nyaya Vaisesikas* as a substrate at *Guna* and *Karma*. The word drug is derived from DROGUE, which is a Greek term means a substance used in medicine or a preparation. The definition given in India under Drugs and Cosmetic Act of 1940 is all medicines for internal and external use of human being or animal and all substances intended to use for or in diagnosis, treatment mitigation or prevention of disease in human beings or animals. Industry means pharmaceutical Industry comprises several pharmacies. Pharmacy is a place where *Ayurvedic Kalpana* (Formula) is prepared.

The term *Kalpana* is defined as the process of preparation either for single drug and multi drugs, and used for the suffering according to *Prakrti* (individual body constitution). The main object is to modify with *Samskara* (special process) for utilization or to enhance its action. Even in this 20th Century of advanced scientific era no serious consideration has been given in the field of controversies in drug and industry on adulteration and standardization. Jenkin in his book Quantitative Pharmaceutical Chemistry has established standards for crude drugs, which were earlier used.

Reasons For Contraversies

The reasons are obvious in nature, which are follows.

1. Drug Contraversies

Perplexing synonyms

Prominent characters of vegetable drugs were mentioned, by the use of synonyms basically formed according to *Rudi*, *Swabhava*, *Desokta*, *Laksna*, *Upamana*, *Veerya*. Their homonyms for different plants, kept the later scientists in confusion.

Synonym	Drug	Latin Name	Synonym in practice
Agni	Citraka	<i>Plumbago zeylanica</i>	Plumbago zeyianica
	Bhallataka	<i>Semicarpus anacardium</i>	
Ananta	Sariba	<i>Hemidismus indicus</i>	Hemidismus indicus
	Agnimanda	<i>Premna integrifolia</i>	
	Durva	<i>Cynadon dactylon</i>	
	Bahula	<i>Anthem sowa</i>	
Aparajitha	Aparajitha	<i>Clitoria ternaetia</i>	Clitoria ternaetia
	Visnukranta	<i>Evolvulus alsinoides</i>	
	Sankapuspi	<i>Convolvulus pluricaulis</i>	
	Sami	<i>Prosopis spicigera</i>	
	Hapusa	<i>Juniperus communis</i>	
Amruta	Guduchi	<i>Tinospora cardifolia</i>	Tinospora cardifolia
	Bahula	<i>Anthem sowa</i>	
	Amlaki	<i>Phyllanthus emblica</i>	
Arista	Arista	<i>Sapindus emerginatus</i>	Sapindus emerginatus
	Kiratatikta	<i>Swetia chirata</i>	
	Nimba	<i>Azadirachta indica</i>	
	Rasona	<i>Allium sativum</i>	
	Rita Karanja	<i>Acasia canunna</i>	
Amoga	Patala	<i>Stereospermum suaveolons</i>	
	Vidanga	<i>Emblia ribes</i>	
Uraganda	Vaca	<i>Acorus calamus</i>	Acorus calamus
	Kalphala	<i>Myrica nagi</i>	
	Rasona	<i>Allium sativum</i>	
	Ajaganda	<i>Gynandropis gynandra</i>	
	Yavani	<i>Apium graveolens</i>	

Katukam	Katukarohini	<i>Picrorrhiza kurrora</i>	Picrorrhiza kurrora
	Kankola	<i>Piper cubeba</i>	
	Trapusa	<i>Cucumis sativus</i>	
	Marica	<i>Piper nigrum</i>	

Lack of correlated opinion

During 35 hundred B C to end of 8th Century and 9th to 15th Century a number of *Samhitas*, *Nighantus* were written in which opinions and commentaries on characters and properties were given in Sanskrit, which is also kept the scientists as well as regionalists in confusion due to opinion correlation or extinction of plants.

Lack of Morphology

Drug prominent morphological characters were given in Sanskrit synonyms its lack of analysis has kept the scientists in confusion due to homonym names.

2. Industrial Contraversies

Rise up substitutes

If official drug is not available, substitutes may serve the purpose in its place, even though they are less effective and resembles to greater extent with authentic drug.

Rise up adulterations

These are similar to genuine/authentic drug in respect of morphological appearances and similarity in color, shape, size etc., but do not bear identical or similar physiological action. At present these drugs are adulteries in the market.

Sl. No.	Sanskrit name of Drug	Latin name	Adulterant/ Substitute
1	<i>Krisnajeeraka</i>	<i>Carum carvi</i>	Nigella sativa
2	<i>Katuki</i>	<i>Picrorrhiza kurrora</i>	Getiana kuroo
3	<i>Kiratatikta</i>	<i>Swetia chirata</i>	Andrgraphis paniculata Rubial cardifolia

4	<i>Rasna</i>	<i>Pluchea lanceolata</i>	Dodonaea viscosa Inula racemosa Vanda roxburghii Tylophora asthamatica Alpinia galanga Rauwolfia serpentina Aristolochia indica
5	<i>Pasanabheda</i>	<i>Saxifraga lingulata</i>	Aerva lanata Kalanchoe pinnata Coleus aromaticus Rotula aquatica
6	<i>Priyangu</i>	<i>Callicarpa macrophylla</i>	Prunus mahaleb Aglaia roxburghiana
7	<i>Talisapatra</i>	<i>Taxus baccata</i>	Abies webbiana Rhododendron anthopogon
8	<i>Nagabala</i>	<i>Sida humilis</i>	Sida spinosa Grewia hirsute
9	<i>Parpata</i>	<i>Fumaria parviflora</i>	Oldenlandea corymbosa Justicia procumbens Perestrophe vicaliculata Molluga stricta
10	<i>Laxmana</i>	<i>Ipomoea sepiaria</i>	Biophytum sensitivum
11	<i>Trayamana</i>	<i>Delphinium zalil</i>	Thalicturum foliolosum Ficus heterophyllum
12	<i>Moorva</i>	<i>Marsdenia tenacissima</i>	Senseviera roxburghiana Bauhinia vahlii Clematis triloba Helicteres isora

Rise up unknown substitutes

If official drug is not available improper substitutes and unknown materials are mixed in place, which does not resemble with authentic drug either in color, shape, size, smell, actions etc.,

Lack of quality control

The constituents of vegetable drugs present in the formulation have to be estimated for at least genuine purpose or to identify inferior's adulterations for individual and multi drug formulations.

Lack of standardization

So far general methods followed in prescribing standards for single and multi drug formulations for Metallic salts, fixed oils, volatile oils, but does not contain quality control for the vegetable drugs which are very important at least for identification of nature of vegetable drug used in the formulations.

Measures For Contraversies

To over come the controversies in drug and industry, the views of *Caraka* (500 B.C.) with slight addition presently available in pharmaceutical codex is considered generally and in particular preparing individual monographs based on an analytical approach of Sanskrit synonyms for establishing morphological characters of each and every vegetable drug. The monograph of each drug is to be prepared to find the quality control of the material used for formulation based on morphology, action and uses, habitat, ecology, storage, collection, preparation, Posology, therapeutics, maturity, chemical constituents, substitutes and adulteration. The need to lay scientific standards for vegetable drugs has become imminent since the traders evading code self conduct by marketing spurious preparations. To overcome the controversy in identifying the plants the following method can be adopted.

S. No.	As per Ayurveda	Modern Pharmacognocny
1	<i>Prakruti</i> <i>Namarupavignanam</i>	Title Synonyms Etymology Definition Description Macroscopic Microscopic Foreign matter Additional contamination Organoleptic Character – Touch/Odor/Taste Phytochemical: Identity / Purity/ Strength Biological activity Toxicological study
2.	<i>Desa</i>	Habitat (Place of origin)
3.	<i>Rutugrihita</i>	Method of Collection /Time of collection
4.	<i>Nihita</i>	Method of Storage
5.	<i>Upaskrita</i>	Method of administration
6.	<i>Matra</i>	Dose (Posology)
7.	<i>Yukthi</i>	Clinical application
8.	<i>Vyadivedita</i>	Therapeutics
9.	<i>Guna/Rasa/Vipaka/ Virya/ Prabhava/ Karma/Yoga</i>	Pharmacological Properties, Actions and Formulations
10.	Definitions related to <i>Nama, rupa, guna, karma</i>	Linguistic roots on Nomenclature/ morphology/ pharmacology

Herbal Drug Standards In Ayurveda

Identification of quality herbal products is available in *Atharvaveda* (VII, 7) and *Rigveda* (X, 97). A complete picture of morphological identity of plants was mentioned in *Visnu Purana* (VII, 37-39).

Ancient scientists of Indian System of Medicine like *Caraka* (500 B. C.) and *Susruta* (2 A.D.) have clearly identified the necessity of quality products in the clinical application. Therefore, they advised careful examination of the drug as in the nature, its quality, specification, place of growth, season and mode of collection, method of preservation etc.

i. Examination in the Nature

It is advised that the characters of herbs shall be known with the help of forest dwellers and shepherds.

ii. Quality

e.g. it is said that the following characters must be present in the *Haritaki* (Chebulic myrobalon) fruit.

1. Must be new one
2. Must be smooth in texture
3. Must be hard in nature
4. Must be round in shape
5. Must be heavy in weight and should sink in the water

iii. Specifications

e.g. *Guduci* (*Tinospora Cordifolia*)

Kutaja (*Hollorica Antidysentrica*)

Satavari (*Asperogus Recemosus*)

Aswagandha (*Withania Somnifera*) etc. shall be used when they are fresh

iv. Place of Growth

Drugs that may result in *Usna Veerya* (exothermic) effect should be collected from exothermic areas like *Vindhya* region and those with endothermic effect from the endothermic areas like Himalayan region.

v. Season

Different useful parts will be collected in different seasons as indicated in the ancient classics

Young Stems and tender leaves	<i>Varsa ritu</i> (autumn), <i>Vasanta ritu</i> (spring)
Stems and leaves of trees which have shed-off their old leaves and newly regenerating	<i>Greesma ritu</i> (summer), <i>Sisira ritu</i> (winter)
Bark, tubers/rhizomes, latex	<i>Sarat ritu</i> (late autumn)

vi. Mode of collection

Raw material is advised to be collected under sterile conditions and during morning preferably.

vii. Preservation

Smooth material shall be kept for shade-drying and hard material shall be kept for drying under hot-sun. Afterwards, the herb will be wrapped in a sterile white cloth and kept in a jar with tight-lid.

viii. Shelf life of the prepared products

Specific shelf life has been prescribed for each of the prepared products viz.,

Usual shelf life	- 1 year
Powders	- 2 months
Tablets & tinctures	- 1 year
Medicated oils & clarified butters	- 4 months
<i>Asavas & Aristas</i> (fermented products like tonics)	- the older is the best
<i>Swaras & Kalka</i> (expressed juice & drug made in to paste)	- immediate after preparation
<i>Kasayas</i> (one kind of expressed juice)	- 6 hours

ix. Standards in manufacturing

Standard weights and measures have been used while preparing the medicines. Maghada mana was preferred over the Kalinga mana. The following ratios were strictly followed while preparing the basic formulations. Such as:

<i>Kasaya or Kwatha</i> (Decoction)	1:8 to 1: 64 (drug: water) & reduced 1/8 to 1/32
<i>Seeta Kasaya</i> (cold-infusion)	1: 6 Soaked in cold water
<i>Phanta Kasaya</i> (heat-infusion)	1: 8 Soaked in hot water
<i>Mantha Kasaya</i> (churned-infusion)	1: 4 churned in water
<i>Arka</i> (distillate)	1: 10 soaked in water for a day and distilled
<i>Kseerapaka</i> (medicated boiled milk)	1:8:32 (drug: milk: water)
<i>Snehas</i> (medicated oils & clarified Butters)	1:4:16 (drug: oil: clarified Butters)

x. Standard purification methods

Whenever there is a necessity for poisonous plant in the therapeutics, a specific *sodhana* (purification) procedure is delineated e.g., Aconite root soaked in cow's urine for 7 days and exposed to sunlight proved that the crude root alkaloid contents came down from 1.4% to 1.27%. Above all, a partial change of toxic alkaloids aconite and pseudo aconite into a far less poisonous substances benzyl-aconite and veratroylaconine is reported (Indian Medicinal Plants Vol.I, Kirtikar & Basu). Poisonous herbs like Abrus seeds and Nux-vomica seeds are boiled in milk for 6 hours to purify them.

xi. Guide lines of clinical trials for the standardization

'*Bhesaja pariksa*' and '*Rogi pariksa*' i.e. testing of the drug as well as the patient are of paramount importance in the ancient period. The drugs are advice to be tested under similar experimental and clinical conditions. *Caraka & Vagbhata* have emphasized the following criteria.

1. A drug must be tested in two possible similar individuals.

2. The drug should possess similar pharmacological properties
3. It should give rise to similar therapeutic effects.
4. The herb must be collected from its natural flora.
5. It must be collected in the respective season as described in the text.
6. The drug must be collected in the proper way as advised.
7. The drug must be administered through the prescribed route and in the Recommended time.
8. Must be administered after carefully considering the side effects and the contra indications.
9. The drug must be treated/purified as mentioned.
10. Must be administered in the adequate dose.
11. The drug must be given in the similar pathological status.
12. Drug should be administered to the patient with similar constitution.

Mineral Drug Standards in Ayurveda

The minerals introduced abundantly into Indian Materia Medica after 6th A.D. The metallic preparations were administered orally after *sodhana* (purification) and *Marana* (calcinations). These processes will make the mineral drugs safer as the conversion of lipophilic colloidal into lipophobic colloidal takes place.

The processing of these mineral/metallic drugs is done under standard procedures for each of the materials. Aspects like quantity of heat to be given, duration of exposure to heat and material for firewood for a particular process were also well documented. *Putra*, the process of calcinations is done with definite standards. e.g.

S. No.	Name of the <i>Putra</i>	No. of cow-dung cakes	Size
1.	<i>Maha Putra</i>	1500	60'x60'x60'
2.	<i>Gaja Putra</i>	1000	30'x30'x30'
3.	<i>Varaha Putra</i>	500	16'x16'x16'
4.	<i>Kukkuta Putra</i>	100	18'x18'
5.	<i>Kapota Putra</i>	8	

Dr. A. D. Kulkarni (IMS, BHU) had standardized the size of cow-dung cake as 2-3" in thickness and 5-6" in diameter. A well-prepared *bhasma* will have the following properties such as:

1. Colloidal form
2. Catalytic form
3. Atomic-energy
4. Atomic form
5. Radioactive power.

Certain standard tests are suggested for the quality control of *Bhasmas* in the *latro-Chemistry*. They are:

i Physical tests

1. Taste
2. Color
3. Shape i.e. organoleptic characters
4. Other tests like
 - a. *Niscandrikarana* (should loose original shining)
 - b. *Rekha purana* (should be fine powder)
 - c. *Varitara* (should float on water)
 - d. *Uttama* (should be the best)

ii Chemical tests

1. *Apunarbhava* (should not attain its original metallic form when heated along with Guggulu etc)
2. *Nirutha* (should not attain its original form if heated along with silver)

Mineral drugs are prepared through a specific process called '*Marana*' (Calcinations). Specific number and types of *Putas* are given to each mineral /metal. Calcinations are defined as strong heating processes i.e. conversion of metals into their oxides by heating in air. *Bhasma* (Oxide) is the binary compound with oxygen. It is an ultimate therapeutic state of a mineral or metal and can be administered to patient safely.

It proves that the ancient medical scientists have practiced GLP & GMP within their limitations and thus provided the innovative standards of the preparations. Similarly the present day researchers must give necessary importance to the methods of standardization as described in the ancient classics. It will enable us to carry out the research in close relation to the fundamentals of ancient Indian Medicine.

It is general belief that the plant formulations are safe, this is not correct. Plant preparations in crude state are to contain essential antidotes to minimize the toxic effects of the active principles. Plant extracts and formulations are prepared as per the texts, to reduce their toxic effects and to obtain therapeutic values. Safe tests by bioassays before release of herbal products. Acute and chronic toxicity tests should be conducted for plants preparation after storage. As plant formulation contain good number of plants, after preparation, it is very difficult to test each component qualitatively and quantitatively. Stress is given on quality control of raw drugs, preparation and finished formulations.

As Susruta said

*'EKAMSASTRAMADHIYANO NA VIDYATH SASTRA NISCHAYAM
TASMADVAHUSRUTAH SASTRAM VIJNANEYA CIKISTAK'*

means he who knows only one branch of science is not a complete physician. Hence a good physician should try to acquire knowledge of all allied disciplines. Emphasis should be given sincerely in the studies of inter disciplinary nature of work by utilizing the services of scientists with botanists, chemists, pharmaceutical chemists and other allied scientists, only can help in proper standardization of crude drug preparation.

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सारांश

ओषधि एवं औषधीय औद्योगिक विवाद - उसके कार्यवाही : एक दृष्टीकोण ए. नारायण

आदिकाल से मनुष्य का जिवनचक्र प्राकृति से जुडाहुआ है । इसमे कोई संशय नही मनुष्य ने अपनी भूख मिटाने के लिए पशुओं कि हत्या कि और उसे अपना भोजन बनाया उसके पश्चात द्रव्यों के उपयोग से उन्हे अपना भोजन एवं औषधी के रूप में उपयोग का ज्ञान प्राप्त हुआ । ऐसे कई औषध (द्रव्य) है जो भूतविध्या मे प्रयोग में आते है जिनके प्रयोग द्वारा रोग निवारण भी किया जाता है । प्राचिन काल से भारत में द्रव्यों का प्रयोग जो आज भी प्रचलित है । प्रस्तुत लेख मे मुख्य रूप से औषधीयों का मानकीकरण एवं औषधी निर्माण उद्योग विषय विस्तार से प्रस्तुत किया गया है ।