Quality Evaluation of Commercial Samples of Some Herbal Drugs of Leaf Origin

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Abstract

Commercial samples of three herbal drugs of leaf origin viz. *Adhatoda zeylanica* Medicus., *Azadirachta indica* A. Juss. and *Ocimum tenuiflorum* L. were evaluated to assess their quality in respect of identity, purity and strength. The samples were resourced from Delhi, Hardwar and Cochin/Trichur markets. Evaluation is based on specific parameters and limits prescribed in Ayurvedic, Unani and Siddha Pharmacopoeia and as well in other literature.

Keywords: Pharmacognostic evaluations, Commercial herbal drugs, Quality assessment.

Introduction

Use of plants as a source of medicine has been an ancient practice and is an important component of the health care system in global scenario. In the various traditional systems of medicine practised in globally, most practitioners formulate and dispense their own recipes from the locally available medicinal plants. The use of herbal medicines is growing with approximately 40 per cent of population reporting use of herb to treat medical diseases within the past year. India has 16 Agro climatic zones, 45000 different plant species out of which 15000 are medicinal plants. The Indian Systems of Medicine have identified 1500 medicinal plants, of which more than 500 species are mostly used in the preparation of drugs direct or indirect ways and highly potential spices in the trade related practices in Indian and Global markets. A part from requirement of medicinal plants for internal consumption, India exports crude drugs mainly to developed countries, viz. USA, Germany, France, Switzerland, UK and Japan. The supply base of 90% herbal raw drugs used in the manufacture of Ayurveda, Siddha, Unani & Homoeopathy systems of medicine is largely from the wild. According to the report of the World Health Organisation (WHO), a large population of the world relies on the traditional systems of medicines, largely plant based to meet their primary health care needs. According to WHO, the international market of herbal products is estimated to be US $ 62 billion which is poised to grow to US $ 5 trillion by the year 2050, but India's share in the global export market of medicinal plants related trade is just 0.5 per cent (Singh, 2006). The demand for medicinal plants to fetch the need of different stakeholders is growing at a very fast pace. In India, about 90% of medicinal plants used by the industries are collected from the wild resources. It is estimated that about 800 species are used in

production by the pharmaceutical industry, whereas less than 40 species of plants are under commercial cultivation. Over 70% of the plant collection involves destructive harvesting. This poses a definite threat to the genetic stocks and to the diversity of medicinal plants.

The major sources of medicinal plants are wild sources viz. forest areas, open land, non-cultivated sources etc. The medicinal plants collected from wild sources remain questionable for their quality especially when they have been procured from trade channels owing to fair chances of adulteration, substitution and inappropriate storage condition which lead to deterioration in quality. All the medicinal plants which is available in dried form in the trade are termed as crude drugs and is always subject to quality check in a laboratory on the basis of pharmacognostical, physico-chemical, phyto-chemical, microbiological and other analytical specifications. At times mere look alike species are used as a substitute, which may not even contain the active ingredients available through the main plants nor the effects of the end product is the same as that obtained from that of original plant (Sharma, 1987, Rai *et al.*, 2011, 2012a&b and Padmakumar *et al.*, 2012). In some cases, pharmacopoeia and formularies permits the use of substitutes in place of original plants thus, giving legitimacy to the substitutes.

Materials and Methods

The leaf herbal drugs under study were collected from natural habitats and authenticated with references to pharmacopoeial standards and other literature. The commercial samples sold under the trade names purported to be prescribed species were drawn from the different market sources (Hardwar, Delhi and Cochin/Trichur). Standard protocols/methods prescribed in pharmacopoeia were followed for pharmacognostical, physico-chemical and phytochemical values prescribed in Ayurvedic, Unani and Siddha Pharmacopoeia of India were taken as standards values (Anonymous, 1986, 1998, 1999, 2007a,b and 2008).

Table 1: Commercial Herbal Drugs under study

Botanical Name	Official Name	Trade Name	Official Standards
Adhatoda zeylanica Medicus	Vasa	Bansa	Leaves
Azadirachta indica A. Juss.	Neem	Neem	Leaves
Ocimum tenui florum L.	Tulasi	Tulasi	Leaves

Abbreviation- API-Ayurvedic Pharmacopoeia of India, Part -I, UPI-Unani Pharmacopoeia of India, Part- I, and SPI-Siddha Pharmacopoeia of India, Part-I.

Observations and Results

All the commercial samples of the drugs were evaluated as per the specifications laid in Pharmacopoeia and other literature. Observation made are given in Table 2 to 4 -

Table 2: Pharmacognostical Evaluation of Commercial Crude Drug Samples of *Adhatoda zeylanica* Medicus

Specifications	Market Sample		
	Delhi	Haridwar	Cochin
Entire Drug			
1. Macromorphological characteristics	Conforms	Conforms	Conforms
2. Micromorphological characteristics	Varies slightly	Conforms	Conforms
Powdered drug	Conform	Conforms	Conforms
Major organic groups			
(i) Alkaloids	√	√	√
(ii) Tannins	-	-	-
(iii) Glycosides	-	-	-
(iv) Sterols	-	-	-
(v) Volatile Oil	-	-	-
(vi) Flavonoids	√	-	√
(vii) Anthraquinone	-	-	-
(viii) Resins	-	-	-
(ix) Fixed oil	-	-	-
(x) Poly phenolic compounds	-	-	-
	-	-	-
	-	-	-
Physico-Chemical Characteristics			
(i) Moisture content %	2.20	4.20	4.50
(ii) Total ash %	17.00	16.20	19.00
(iii) Acid insoluble ash %	0.70	0.90	1.20
(iv) Water soluble extractives	28.20	30.40	26.50
(v) Alcohol soluble extractives %	6.40	4.60	3.50
Foreign Matter %	2.20	1.60	1.90

Table 3: Pharmacognostical Evaluation of Commercial Crude Drug Samples of *Azadirachta indica* A. Juss.

Specifications	Market Sample		
	Delhi	Haridwar	Cochin
Entire Drug	Conforms	Conforms	Conforms
1. Macromorphological characteristics			
2. Micromorphological characteristics	Varies	Conforms	Conforms
Powdered Drug	Conforms	Varies	Conforms
Major Organic Groups			
	-	-	-
(i)　Alkaloids	-	√	-
(ii)　Tannins	-	-	-
(iii)　Glycosides	√	√	√
(iv)　Sterols	-	-	-
(v)　Volatile Oil	-	-	-
(vi)　Flavonoids	-	-	-
(vii)　Anthraquinone	-	-	-
(viii)　Resins	-	-	-
(ix)　Fixed oil	-	-	-
(x)　Poly phenolic compounds	-	-	-
Physico-Chemical Characteristics			
(i)　Moisture Content %	1.80	2.40	4.50
(ii)　Total ash %	9.70	12.50	8.20
(iii)　Acid insoluble ash %	1.70	1.55	0.90
(iv)　Water soluble extractives	13.52	21.30	23.50
(v)　Alcohol soluble extractives %	11.50	18.70	14.80
Foreign Matter %	0.20	3.20	1.80

Table 4: Pharmacognostical Evaluation of Commercial Crude Drug Samples of *Ocimum tenui florum* L.

Specifications	Market Sample		
	Delhi	Haridwar	Cochin
Entire Drug	Conforms	Conforms	Conforms
1. Macromorphological characteristics			
2. Micromorphological characteristics	Conforms	Conforms	Slightly varies
Powdered Drug	Conforms	Conforms	Conforms
Major Organic Groups			
(i) Alkaloids	-	-	-
(ii) Tannins	-	-	-
(iii) Glycosides	-	-	-
(iv) Sterols	-	-	-
(v) Volatile Oil	√	√	√
(vi) Flavonoids	-	-	-
(vii) Anthraquinone	-	-	-
(viii) Resins	-	-	-
(ix) Fixed oil	-	-	-
(x) Poly phenolic compounds	-	-	-
	-	-	-
Physico-Chemical Characteristics			
(i) Moisture Content %	3.50	3.90	4.50
(ii) Total ash %	12.00	15.80	18.20
(iii) Acid insoluble ash %	2.50	2.70	1.80
(iv) Water soluble extractives	13.50	12.80	14.10
(v) Alcohol soluble extractives %	6.80	8.00	6.30
Foreign Matter %	1.80	2.30	0.90

Discussion and Conclusion

Pharmaco-botanicall evaluation of commercial samples of leaves of different herbal drugs with comparison to genuine and authenticated crude drug sample as well with pharmacopoeial standards reveal the extent of authenticity of commercial samples. Each drug is discussed in detail below-

Dried leaves of *Adhatoda zeylanica* Medicus is sold in the market with the trade name of Bansa or Adusa patti or Vasaka leaves. Epidermal cells with

anomocytic stomata on both surfaces with few trichomes. Cystolith is present in mesophyll cells. Acicular and prismatic forms of calcium oxalate crystals present in mesophyll. It contains alkaloids and essential oils. Total ash value for the commercial sample varies from 16.2% to 19%. Alcohol soluble extractive varies from 3.5% to 6.4%. Moisture content varies from 2.2% to 4.5%. All the commercial samples conform to the values of authentic sample. However, Delhi and Cochin sample contains foreign matter of 2.2% and 1.9% respectively. Dried leaves *of Azadirachta indica* A. Juss. is available in trade as Neem patti. Stele of the midrib composed of one crescent shaped vascular bundle and parenchymatous cells with rosette crystals of calcium oxalate Phloem surrounded by non-lignified fibre strand. Parenchymatous cells of lamina also contain rosette crystals of calcium oxalate. It contains triterpenoids and sterols. Foreign matter varies from 0.2% to 3.2% in the studied commercial samples. Cochin sample conforms to the values of authentic samples. Micromorphological characteristics of Delhi sample varies. *Ocimum tenuiflorum* L. is available as dried leaves in commerce. Epidermal cells of the leaves consist of a number of glandular trichomes. Petiole consists of three vascular bundles; middle one is larger than the other two. Lamina also contains trichomes similar to that of petiole with anamocytic and diacytic stomata present on both surfaces. Powder is light green in colour. Active chemical constituents are essential oils. All the commercial samples collected conform to the values of authenticated samples. However, Delhi and Haridwar samples shows higher percentage of foreign matter compared to Cochin sample. Foreign matter content varies from 0.90% to 2.30%.

The present study reveals that commercial samples are always subject to quality control for their authenticity to ensure identity, purity and strength as per pharmacopoeial and other quality standards before their use to formulate the medicine. This quality evaluation practice may also ensure the safety and efficacy of medicine up to larger extent.

Adhatoda zeylanica Medicus   *Azadirachta indica* A. Juss.

Ocimum tenui florum L.

Fig. Herbal Drugs of Leaf Origin Under Study

References

Anonymous, 1979. The United States Pharmacopoeia, 20th rev. U.S. Pharmacopoeial Convention Inc., Rockville, U.S.A.

Anonymous, 1986. The Ayurvedic Pharmacopoeia of India, Part- I, Volume–I, First edition, Govt. of India, Ministry of Health & Family Welfare, New Delhi.

Anonymous, 1998. The Unani Pharmacopoeia of India, Part-I, Vol.-I, Govt. of India, Ministry of Health & Family Welfare, New Delhi.

Anonymous, 1999. The Ayurvedic Pharmacopoeia of India, Part- I, Volume–II, First edition, Govt. of India, Ministry of Health & Family Welfare, New Delhi.

Anonymous, 2007a. The Unani Pharmacopoeia of India, Part-I, Vol.-II, Govt. of India, Ministry of Health & Family Welfare, New Delhi.

Anonymous, 2007b. The Unani Pharmacopoeia of India, Part-I, Vol.-IV, Govt. of India, Ministry of Health & Family Welfare, New Delhi.

Anonymous, 2008. The Siddha Pharmacopoeia of India, Part-I, Vol.-I, Govt. of India, Ministry of Health & Family Welfare, New Delhi

Padmakumar, N., Nitin Rai, Rajeev Kr. Sharma and R. N. Johari, 2012. Pharmaco-botanical studies for quality assessment of commercial samples of some herbal drugs of root and rhizome origin. *Hippoccratic J. Unani Medicine* 7(2): 55-67.

Rai, Nitin, Rajeev Kr. Sharma, Sunil Dutt and V. K. Singh, 2011. Market survey of commercially exploited Unani herbal drugs: Availability, Resources and Quality Assurance. *Hippocreatic Journal of Unani Medicine* 6(4): 97-123.

Rai, Nitin, Lalit Tiwari and Rajeev Kr. Sharma, 2012. Quality standards on medicinal plants with special reference to regulatory aspects. In: Modern Technologies for Sustainable Agriculture (Eds.: Birendra Prasad and Sunil Kumar), pp. 147-175.

Rai, Nitin, Rajeev Kr. Sharma, Lalit Tiwari and A. K. Verma, 2012. Studies on quality evaluation of some commercial herbal drugs and spices. *Hippocratic J. Unani Medicine* 7(2): 115-130.

Singh, Harbir, 2006. Prospects and Challenges for Harnessing Opportunities in Medicinal Plants Sector in India, 2/2 Law. *Environment and Development Journal*, 196. (http://www.lead-journal.org/ content/06196.pdf).

Sharma, Rajeev Kr., 1987. Pharmacognostic studies leading to standardization for identification and authentication of some commercially exploited roots and rhizomes employed as drug in Ayurveda. D. Phil Thesis. Garhwal University, Srinagar-Garhwal, Uttrakhand.