

# Pharmaco-Botanical Studies on Commercial Samples of Herbal Drugs for Their Identification\*

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## Abstract

Herbal drugs are procured by the pharmaceutical industries and other allied manufacturers from the commercial sources. In India, herbal drug trade is well established to fetch the demand of stockholders. Herbal drugs are resourced from various channels for marketing. The drugs are subject of intentional and unintentional adulteration or substitution. To address this problem, identification exercise of herbal material at various level is essential. Genuine herbal ingredients are the basis of quality, safe and efficacious medicines. Pharmaco-botanical studies are the tools for identification of herbal drugs. In present studies, commercial samples were collected from vendors and subjected to identification employing pharmaco-botanical tools and matching their diagnostic macro and microscopic features with established quality standards.

**Keywords:** Pharmaco-botanical studies, Herbal drugs in commerce, Identification.

## Introduction

The trade of herbal medicine and crude drugs are fast growing sectors in India. Large scale commercial production of herbal medicines in more than 9044 pharmaceuticals industries of Ayurvedic, Siddha, Unani and Homoeopathic system of medicines, increased the demand of herbal drugs (Anonymous, 2015). There are number of trading centres of herbal drugs, located in different parts of India (Table-1). These trading hubs fetch the demand of herbal drugs to industry. The herbal drugs reach to trading centres through various channels after collection from forests, wild sources or cultivation (Tiwari *et al.*, 2014a, b; Ved and Goraya, 2008). The unprecedented demand and gap between supply and demands leads to adulteration and substitution in herbal drugs. The incidences of adulteration impact on quality of herbal drugs and also on therapeutics of finished medicinal products. To address the problem of adulteration, quality standards of herbal drugs are indispensable tool. The quality standards are available as pharmacopoeial (regulatory) and non-pharmacopoeial standards. Pharmacopoeial standards are compiled in the Pharmacopoeia as individual monographs comprising descriptive and analytical bench marks to ensure the quality of herbal drug in respect of its identity, purity and strength. In India, Ayurvedic, Siddha, Unani, Homoeopathic and Indian Pharmacopoeia are published under the purview of Drugs Cosmetics Act 1940 and Rules thereunder. All these Pharmacopoeias have monographs on herbal drugs (Anonymous, 1940;

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**Table 1:** Important Herbal Drug Trade Centres in India

| State            | Trade Centres  |
|------------------|--|
| Assam            | Guwahati, Nagaon   |
| Bihar            | Rexaul, Patna  |
| Chhattisgarh     | Bilaspur, Raipur, Raigarh, Dhamtari, Kanker, Jagdalpur, Dantewada                                      |
| Delhi            | Delhi  |
| Gujrat           | Sidhpur, Unjha, Ahmedabad, Godhra  |
| Himachal Pradesh | Kullu, Mandi   |
| Jammu & Kashmir  | Srinagar, Jammu  |
| Jharkhand        | Sahibganj  |
| Karnataka        | Tumkur, Bangalore, Mysore  |
| Kerala           | Palakkad, Thrissur, Chochin  |
| Madhya Pradesh   | Gwalior, Sheopur, Shivpuri, Katni, Neemuch, Mandsaur, Sagar, Vidhisha, Bhopal, Jabalpur, Indore, Betul |
| Maharashtra      | Mumbai, Navi Mumbai, Ratangiri, Kolhapur, Junnar, Pune   |
| Manipur          | Imphal   |
| Meghalaya        | Shillong   |
| Orissa           | Jharsuguda, Cuttack, Berhampur   |
| Punjab           | Amritsar, Ludhiana   |
| Rajasthan        | Jaipur, Jodhpur, Ajmer, Barmer, Sojat  |
| Sikkim           | Gangtok  |
| Tamil Nadu       | Krishnagiri, Chennai, Salem, Erode, Dindigul, Pudukkottai, Madurai, Virudhunagar, Tuticorin, Nagercoil |
| Uttarakhand      | Dehradun, Haridwar, Ramnagar, Tanakpur   |
| Uttar Pradesh    | Moradabad, Bareilly, Hathras, Lucknow, Kanpur, Varanasi, Allahabad, Lalitpur                           |
| West Bangal      | Kolkata, Siliguri  |

1971-2006; 1986-2008; 1998-2009; 2008-2011; 2009a, b; 2011a; 2014). Indian Council of Medical Research (ICMR) and Indian Drugs Manufacturers Association (IDMA) have also published monographs on quality standards of herbal drugs but these are non-regulatory (Anonymous, 2003-2015; 2011b). Besides these

monographs, research papers on quality aspect of herbal drugs can be consulted for the identification of herbal drugs. In the present communication, commercial samples of herbal drugs were collected from different vendors and drug exhibitors of south India so as to ascertain their botanical identity sold in their region.

### Material and Methods

The herbal drug samples were collected from different vendors/exhibitors during Arogya fair (November, 2014) at Pragati Maidan, New Delhi and subjected to pharmaco-botanical studies (organoleptic, macro and microscopic) (Figure-A & B). These samples were soaked in water for 8-10 hours depending upon their



Figure A (1-6): Display of commercial herbal drugs by exhibitors

hardness to soften the tissues for hand sections. The observed macro and microscopic characters were matched with the diagnostic characters described in pharmacopoeias and other standard literature in order to confirm their botanical identity. The samples were also matched with the preserved drug specimens in Museum of PLIM, Ghaziabad.

## Observations

The identification of collected commercial samples of herbal drugs are given in Table 2.

**Table 2:** Botanical Identification of Commercial Samples of Herbal Drugs

| S. No. | Trade Name in South India | Other Trade Names   | Botanical species                             | Morphological Part | Reference               |
|--------|---------------------------|---|---|--------------------|-------------------------|
| 1.     | Adalodakam (M)            | Vasa, Arusa, Vasaka, Arusa (Bansa)                                      | <i>Adhatoda vasica</i> Nees.                  | Stem               | Prasad and Prabhu, 1950 |
| 2.     | Amukkuram (M)             | Ashwagandha, Amukhra, Asgandha, Asgand                                  | <i>Withania somnifera</i> (L.) Dunal.         | Root               | SPI-I                   |
| 3.     | Aratha(M)                 | Granthimula   | <i>Alpinia calcarata</i> Rosc.                | Rhizome            | API- VI                 |
| 4.     | Banafshapatti (M)         | Banafsa, Banaksha, Wild violet, Tryman, Vanpsa, Sweet violet, Nilapuspa | <i>Viola odorata</i> L.                       | Whole plant        | HPI-IV                  |
| 5.     | Chakkarakolli (M)         | Gudmar, Gudhmar, Gudmar, Bedki, Medhshingi                              | <i>Gymnema sylvestre</i> (Retz.) R.Br. ex Sm. | Whole plant        | API -V                  |
| 6.     | Cheenapavu (M)            | Parangipattai, Madhusnuhi, Chobchini, Parankiccakkai                    | <i>Smilax china</i> L.                        | Tuber root         | SPI-I                   |
| 7.     | Chukku (M)                | Sunthi, Ardraka, Zanjabeel  | <i>Zingiber officinale</i> Roscoe             | Dried Rhizome      | SPI-I                   |
| 8.     | Elam (M)                  | Elathari, Elaichi, Cardamom, Malabar cardamom, Elakkai                  | <i>Elettaria cardamomum</i> Maton             | Fruit              | SPI-II                  |

| S. No. | Trade Name in South India | Other Trade Names   | Botanical species                                 | Morphological Part | Reference                      |
|--------|---------------------------|---|---|--------------------|--------------------------------|
| 9.     | Elavargam (M)             | Twak, Dalchini, Gudutwaka, Tamalaka, Valkala, Kankutla, Lavangachakke, Lavangapatte | <i>Cinnamomum zeylanicum</i> Blume                | Stem bark          | API- I                         |
| 10.    | <i>Erattimadhuram</i> (M) | Glycyrrhiza, Yasti, Asl-us-Soos, Athimathuram                                       | <i>Glycyrrhiza glabra</i> L.                      | Stolon & Root      | SPI-I                          |
| 11.    | Ezhilampaala (M)          | Chattiyam, Kaadusaale, Saptaparni, Captaparanam, Kashim, Saptaparna Kashim (Chatim) | <i>Alstonia scholaris</i> (L.) R. Br.             | Stem bark          | API- I                         |
| 12.    | Gramboo (M) Karampoo      | Lavanga, Launga   | <i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry | Flower bud         | SPI-I                          |
| 13.    | Jatamanji (M)             | Jatamansi, Mansi, Bal char, Balchar, Laljari  | <i>Nardostachys jatamansi</i> (D.Don) DC.         | Rhizome            | API- I                         |
| 14.    | Jeerakam (M)              | Zeera, Zeera Safaid, Ajjikka, Dipaka, Dirghaka, Jeera, Jeeraka, Cumin               | <i>Cuminum cyminum</i> L.                         | Fruit              | SPI-I                          |
| 15.    | Kacholam (M)              | Chandramoola, Kachoram, Gandhamoolaka   | <i>Kaempferia galanga</i> Linn                    | Rhizome            | QSIMP-7 (Anonymous, 2003-2015) |
| 16.    | <i>Kadukka</i> (M)        | Halela Zard, Katukai, Haritaki Halela, Katukkai                                     | <i>Terminalia chebula</i> Retz.                   | Fruit              | SPI-I                          |
| 17.    | Kanhiram(M)               | Kuchla  | <i>Strychnosnux-vomica</i> L.                     | Seed               | SPI-II                         |
| 18.    | Kanikonna (M)             | Bahava, Bhavshenga, Amaltas, aargavadh, Khyarshamber                                | <i>Cassia fistula</i> L.                          | Stem bark          | SPI-I                          |
| 19.    | Karimjeerakam (M)         | Caraway, Kalazera, Seemaisompu  | <i>Carum carvi</i> L.                             | Fruit              | API- I                         |

| S. No. | Trade Name in South India               | Other Trade Names  | Botanical species   | Morphological Part | Reference |
|--------|---|--|---|--------------------|-----------|
| 20.    | Karivelam/<br>Karivelakam<br>(M)        | Talisa   | <i>Abies webbiana</i><br>(Wall. ex D.Don)<br>Lindl.   | Leaf and stem      | API- IV   |
| 21.    | Karuvelam (M)                           | Babulla, Babul,<br>Gum, Kikar,<br>Barbura                          | <i>Acacia arabica</i><br>(Lam.) Willd.  | Gum                | IP,2007   |
| 22.    | Kattuvizhalari<br>(M)                   | Bhungi,Gaiya,Vaiva<br>rang, Ambati,<br>Nununiya                    | <i>Embelia robusta</i><br>Burm.f., Syn<br><i>Embelia tsjeriam-<br/>cottam</i> (Roem. &<br>Schult.) A.DC | Fruit              | API- I    |
| 23.    | Katukurokini<br>(M)                     | Kutki, Kadwi,<br>Kedar Kadwi                                       | <i>Pichrohiza kurroa</i><br>Royle ex. Benth.  | Rhizome            | SPI-I     |
| 24.    | Kiriyatha (M)                           | Kalmegh, Kiryat  | <i>Andrographis<br/>paniculata</i><br>(Burm.f.) Nees.   | Stem               | HPI-I     |
| 25.    | Kothambala-<br>yari (M)                 | Dhaniya  | <i>Coriandrum<br/>sativum</i> L.  | Fruit              | SPI-I     |
| 26.    | Kottam (M)                              | Kustha   | <i>Saussurea<br/>costus</i> (Falc.)<br>Lipsch.  | Root               | SPI-I     |
| 27.    | Kunthirikkam<br>(M)                     | Kundur, Pazhingu<br>Sambhirani, Sallaki                            | <i>Boswellia serrata</i><br>Roxb. ex Colebr.  | Gum<br>(Exudate)   | API- IV   |
| 28.    | Kurumulaku<br>(M)                       | Kali mirch, Maricha,<br>Golmarich, Milagu,<br>Murem                | <i>Piper nigrum</i> L.  | Fruit              | SPI-I     |
| 29.    | Kurunthotti<br>(M)                      | Mahabala   | <i>Sida rhombifolia</i><br>L.   | Root               | API- III  |
| 30.    | Kutakappala/<br>Kutakapala-<br>yari (M) | Kudassl,<br>Kudashenga   | <i>Holarrhena<br/>antidysenterica</i><br>(Roth) Wall. ex<br>A.DC.                                       | Seed               | API- III  |
| 31.    | Mahaniki-<br>zhangu (M)                 | Sveta Sariva   | <i>Decalepis<br/>hamiltonii</i><br>Wight & Arn.   | Root               | SPI-I     |
| 32.    | Manhal (M)                              | Haldi, Turmeric,<br>Haridra, Harita,<br>Haali, Arashing,<br>Haladi | <i>Curcuma longa</i><br>L.  | Rhizome            | SPI-I     |

| S. No. | Trade Name in South India           | Other Trade Names  | Botanical species   | Morphological Part | Reference                        |
|--------|-------------------------------------|--|---|--------------------|----------------------------------|
| 33.    | Maramanjil (M)                      | Daru-haridra, Mara manjal  | <i>Coscinium fenestratum</i> (Gaertn.) Coleb.               | Stem               | API- V                           |
| 34.    | Masikka (M)                         | Manzuphal  | <i>Quercus infectoria</i> G. Olivier                        | Gall               | SPI-II                           |
| 35.    | Mathalathodu/ Urumampa-zhathodu (M) | Anardana, Anar Dadima, Dadimba, Sunila, Darmu, Daran, Darim, Pomegranate | <i>Punica granatum</i> L.                                   | Fruit rind         | SPI-II                           |
| 36.    | Mullilavu (M)                       | Pashadbhed   | <i>Bergenia ligulata</i> (Wall) Engl.                       | Rhizome            | Sharma & Sharma, 1979            |
| 37.    | Munja (M)                           | Gejeru, Ganikarnika, Arani, Ganiyari                                     | <i>Premna serratifolia</i> Linn.                            | Stem               | George, et al. 2006              |
| 38.    | Murunkaipattai (T) / Muringa (M)    | Sabinjana, Sabunjana   | <i>Moringa oleifera</i> Lam.                                | Stem bark          | SPI-II                           |
| 39.    | Muthanga (M)                        | Nagarmotha, Motha, Musta, Varida, Khana, Kuruvinda                       | <i>Cyperus rotundus</i> var. <i>centiflorus</i> C.B. Clarke | Rhizome            | API- III                         |
| 40.    | Nagapoovu (M)                       | Nagkesara, Narmushk, Nageshor, Nahor                                     | <i>Mesua ferrea</i> L.                                      | Flower             | Shome, Mehrotra and Sharma, 1982 |
| 41.    | Neermarthu (M)                      | Arjuna, Arjan, Dhanvi, Indradrum, Indra Vriksha                          | <i>Terminalia arjuna</i> (Roxb.ex DC.) Wight & Arn.         | Stem bark          | SPI-I                            |
| 42.    | Nelli, Nellikka (M)                 | Amla, Amalaki, Dhatri, Vayastha, Amritaphala                             | <i>Phyllanthus emblica</i> Linn                             | Dried fruit        | UPI-I                            |
| 43.    | Njerinjil (M)                       | Gokhru, Nerinnil, Bahukantaka, Acuvacattiram, Chirupalleru               | <i>Tribulus terrestris</i> L.                               | Fruit              | SPI-I                            |
| 44.    | Orila (M)                           | Salwanpachang, Shalparni (Sarivan), Vidarigandha                         | <i>Desmodium gangeticum</i> (L.) DC.                        | Root               | API- VI                          |
| 45.    | Pachotty (M)                        | Lodha  | <i>Symplocos racemosa</i> Roxb.                             | Stem bark          | API- I                           |

| S. No. | Trade Name in South India | Other Trade Names   | Botanical species  | Morphological Part | Reference                                   |
|--------|---------------------------|---|--|--------------------|---|
| 46.    | Padavalam (M)             | Peipudal, Patola, Parwal  | <i>Trichosanthes cucumerina</i> L.   | Whole plant        | Sandhya, Chandra-sekhar, David and Rao,2010 |
| 47.    | Pananeer (M)              | Satapatrika, Gul-e-Surkh  | <i>Rosa centifolia</i> L.  | Petal              | API- III                                    |
| 48.    | Pavakka / Kaipakka (M)    | Karela, Kandula, Karakantaki, Bitter gourd, Carella fruit                 | <i>Momordica charantia</i> L.  | Fruit              | API- II                                     |
| 49.    | Perarattai (T)            | Peravathai, Perarattai, Kulanjan, Koracha, Malaya vacha, Greater galangal | <i>Alpinia galangal</i> (L.) Sw.   | Rhizome            | SPI-I                                       |
| 50.    | Poolamaram (M)            | Abresham  | <i>Bombyx mori</i> Linn.   | Silk Cocoon        | UPI-VI                                      |
| 51.    | Pushkaramoolam (M)        | Pushkarmool   | <i>Inula racemosa</i> Hook.f.  | Root               | API- IV                                     |
| 52.    | Rakthachandanam (M)       | Raktachandan, Sandal Surkh  | <i>Pterocarpus santalinum</i> L.f.   | Heart wood         | SPI-II                                      |
| 53.    | Ramacham (M)              | Vettiver, Usira, Vettiver, Khas   | <i>Vetiveria zizanioides</i> var. <i>tonkinensis</i> A.Camus                         | Root               | SPI-II                                      |
| 54.    | Ratanjot (M)              | Ratanjot  | <i>Onosma hispidum</i> wall. ex. D. Don. syn. <i>O. echioides</i> C.B. Clarke non L. | Dried roots        | UPI-III                                     |
| 55.    | Sathakuppa (M)            | Sowa, Soya, Dillseed, Kattucatakuppai, Sompaa                             | <i>Anethum graveolens</i> L.   | Fruit              | UPI-V                                       |
| 56.    | Sathavari (M)             | Satavari, Shatawari   | <i>Asparagus racemosus</i> Willd.  | Root               | SPI-II                                      |
| 57.    | Thakaram (M)              | Tagar, Farasiyun  | <i>Valeriana wallichii</i> DC.   | Rhizome            | API- I                                      |
| 58.    | Thamalpatram (M)          | Tejpat, Tamal patri, Sajaz hindi  | <i>Cinnamomum tamala</i> Ness and Eberm  | Leaf               | SPI-I                                       |

| S. No. | Trade Name in South India | Other Trade Names   | Botanical species  | Morphological Part | Reference                    |
|--------|---------------------------|---|--|--------------------|------------------------------|
| 59.    | Thamarayalli (M)          | Tamarai malar   | <i>Nelumbo nucifera</i> var. <i>lutea</i> (Willd.) Kuntze. | Stamen             | SPI-I                        |
| 60.    | <i>Thannikka</i> (M)      | Bhibhitaki, Tanrikkai, Balela, Bibhitaka  | <i>Terminalia bellerica</i> Roxb.                          | Fruit              | SPI-I                        |
| 61.    | <i>Thazhuthama</i> (M)    | Mukkirattaicca-mulam, Mookkirattai, Punarnava, Raktapunarnava   | <i>Boerhaavia diffusa</i> L.                               | Root               | API- III                     |
| 62.    | <i>Thippali</i> (M)       | Filfil Daraz, Pippali   | <i>Piper longum</i> L.                                     | Fruit              | SPI-I                        |
| 63.    | Trikolpakonna (M)         | Danthal Tambacoo  | <i>Operculina turpethum</i> (L.) Silva Manso               | Root               | API- III                     |
| 64.    | Uluva (M)                 | Methi, Hulba Chandika, Jyothi, Methika, Pithabeeja, Vdhini, Fenugreek                                 | <i>Trigonella foenum-graecum</i> L.                        | Seed               | SPI-I                        |
| 65.    | Vayambhu (T)              | Vekhand, Bachal, Vacha, Waj-e-Turki, Bare, Baryan, Boiye, Boi, Halbou, Bach, Sweetflag, Camlamus root | <i>Acorus calamus</i> L.                                   | Rhizome            | API- II                      |
| 66.    | Vazhuthina (M)            | Vartaku, Valuthalai   | <i>Solanum melongena</i> L.                                | Root               | Narayana, and Kolammal, 1962 |
| 67.    | Veluthulli (M)            | Akadiyalahsun, ek-kali lahsun, Ek-pothiyalahsun   | <i>Allium ampeloprasum</i> Linn.                           | Bulb               | Bedi, 2005                   |
| 68.    | White kidney bean         | Soyabean  | <i>Glycine max</i> (L.) Merr.                              | Seed               | HPI-VI                       |

**Abbreviations:** API-Ayurvedic Pharmacopoeia of India, SPI-Siddha Pharmacopoeia of India, UPI-Unani Pharmacopoeia of India, HPI-Homoeopathic Pharmacopoeia of India, IP Pharmacopoeia of India, QSIMP- Quality Standards of Indian Medicinal Plants, M-Malayalam-Tamil.



Figure-B



Figure-B Contd...



Figure-B Contd...



Figure-B Contd...



**Fig B (1-68):** 1. Adalodakam; 2. Amukkuram; 3. *Aratha*; 4. Banafshapatti; 5. Chakkarakolli; 6. Cheenapavu; 7. Chukku; 8. Elam; 9. Elavargam; 10. *Erattimadhuram*; 11. Ezhilampaala; 12. Gramboo; 13. Jatamanji; 14. Jeerakam; 15. Kacholam; 16. *Kadukka*; 17. Kanhiram; 18. Kanikonna; 19. Karimjeerakam; 20. Karivelam/ Karivelakam; 21. Karuvelam; 22. Kattuvizhalari; 23. Katukurokini; 24. Kiriyaatha; 25. Kothambalayari; 26. Kottam; 27. Kunthirikkam; 28. Kurumulaku; 29. Kurunthotti; 30. Kutakappala/ Kutakapalayari; 31. Mahanikizhangu; 32. Manhal; 33. Maramanjai; 34. Masikka; 35. Mathalathodu/ Urumampazhathodu; 36. Mullilavu; 37. *Munja*; 38. Murunkaipattai/ Muringa; 39. Muthanga; 40. Nagapoovu; 41. Neermarthu; 42. Nelli; Nellikka; 43. Njerinjil; 44. Orila; 45. Pachotty; 46. Padavalam; 47. Pananeer; 48. Pavakka /Kaipakka; 49. Perarattai; 50. Poolamaram; 51. Pushkaramoolam; 52. Rakthachandanam; 53. Ramacham; 54. Ratanjot; 55. Sathakuppa; 56. Sathavari; 57. Thakaram; 58. Thamalpatram; 59. Thamarayalli; 60. *Thannikka*; 61. *Thazhuthama*; 62. *Thippali*; 63. Trikolpakonna; 64. Uluva; 65. Vayambhu; 66. Vazhuthina; 67. Veluthulli and 68. White kidney bean

## Conclusion

There are number of herbal drugs reported to be adulterated or substituted in the trade (Dutt and Sharma, 2010; Sharma *et al.*, 2010, 2011; Sharma and Dutt, 2010). It may be intentional as malpractice or unintentional. The adulteration took place by replacement of specified species with allied species or different genera, admixing with degraded material or other species etc. The adulteration in herbal drugs occur due to collection of herbal drugs by unskilled gatherers, scarcity of plant species in the collection area, higher price value of the drug in the market, confusion in vernacular names and other reasons. Herbal drugs of root and bark origin are found to be adulterated more often.

The incidence of adulteration or substitution can be curbed by proper identification of herbal drugs at the time of collection and prior to herbal drug formulations. The identification of herbal drugs not only prevent use of adulterated or substituted material but it is also a prime requirement to assure the quality of manufactured herbal medicine. Quality of herbal drugs is not only confined to their identification, but freedom from foreign matter, biological (microbial or animal) and non-biological (heavy metals, pesticide residue) contaminants are also equally important for ensuring safety and efficacy of medicine formulated with these herbal drugs as ingredient.

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