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A Note on Unintentional Adulterations in Ayurvedic Herbs

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Abstract

Medicinal plants constitute an effective source of traditional and modern medicine. Adulterations and substitutions are common in raw material trade of medicinal plants. In general, adulteration is considered as an intentional malpractice. However, in raw material trade unintentional adulteration also exists. This article explains some of the reasons for unintentional adulterations with examples and key characters to distinguish them.

Introduction

Medicinal plants constitute an effective source of traditional (e.g., Ayurvedic, Chinese, Homeopathy and Unani) and modern medicine. Herbal medicine has been shown to have genuine utility. Germany and France, together represent 39% of the \$14 billion global retail market. In India, about 80% of the rural population depend on medicinal herbs and/or indigenous systems of medicine. In fact today, approximately 70% of “synthetic” medicines are derived from plants. Popularity among the common people increased the usage of medicinal plants/herbal drugs. Herbal adulteration is one of the common malpractices in herbal raw material trade. Adulteration is described as intentional substitution with another plant species or intentional addition of a foreign substance to increase the weight or potency of the product or to decrease its cost. In general, adulteration is considered as an intentional practice. However, unintentional adulterations also exist in herbal raw material trade due to various reasons and many of them are unknown even to the scientific community. This article reviews some of the unintentional adulterations, reasons behind them and methods for easy identification of the spurious plant and authentication of the authentic plant.

Adulteration

A treatise published two centuries ago (in 1820) on adulterations in food and culinary materials is a proof for this practice as an age-old one¹. Due to adulteration, faith in herbal drugs has declined². Adulteration in market samples is one of the greatest drawbacks in promotion of herbal products³. Many researchers have contributed in checking adulterations and authenticating them^{4, 5, 6, 7, 8, 9, 10 & 11}. It is invariably found that the Adverse Event Reports are not due to the intended herb, but rather due to the presence of an unintended herb¹².

Medicinal plant dealers have discovered the 'Scientific' methods in creating adulteration of such a high quality that without microscopic and chemical analysis, it is very difficult to trace these adulterations¹³.

Unintentional adulteration

Unintentional adulteration may be due to following reasons.

1. Confusion in vernacular names between indigenous systems of medicine and local dialects
2. Lack of knowledge about the authentic plant
3. Non-availability of the authentic plant
4. Similarity in morphology and or aroma
5. Careless collection
6. Other unknown reasons

Name confusion

In Ayurveda, 'Parpatta' refers to *Fumaria parviflora*. In Siddha 'Parpadagam' refers to *Mollugo pentaphylla*. Owing to the similarity in the names in traditional systems of medicine, these two herbs are often interchanged or adulterated or substituted. Because of the popularity of Siddha medicine in some parts of South India, traders in these regions supply *M. pentaphylla* as Parpatta/Parpadagam and the North Indian suppliers supply *F. parviflora*. These two can be easily identified by the presence of pale yellow to mild brown colored, thin wiry stems and small simple leaves of *M. pentaphylla* and black to dark brown colored, digitate leaves with narrow segments of *F. parviflora*. *Casuarina equisetifolia* for *Tamarix indica* and *Aerva lanata* for *Bergenia ciliata* are some other examples for adulterations due to confusion in names.

Lack of knowledge about authentic source

'Nagakesar' is one of the important drugs in Ayurveda. The authentic source is *Mesua ferrea*. However, market samples are adulterated with flowers of *Calophyllum inophyllum*. Though the

authentic plant is available in plenty throughout the Western Ghats and parts of Himalayas, suppliers are unaware of it. There may also be some restrictions in forest collection. Due to these reasons, *C. inophyllum* (which is in the plains) is sold as Nagakesar. Authentic flowers can be easily identified by the presence of two-celled ovary whereas in case of spurious flowers they are single celled.

Similarity in morphology

Mucuna pruriens is the best example for unknown authentic plant and similarity in morphology. It is adulterated with other similar papilionaceae seeds. *M. utilis* (sold as white variety) and *M. deeringiana* (sold as bigger variety) are popular adulterants. Apart from this, *M. cochinchinensis*, *Canavalia virosa* and *C. ensiformis* are also sold in Indian markets. Authentic seeds are up to 1 cm in length with shining mosaic pattern of black and brown color on their surface. *M. deeringiana* and *M. utilis* are bigger (1.5-2 cm) in size. While *M. deeringiana* is dull black and *M. utilis* is white or buff colored.

Lack of authentic plant

Hypericum perforatum is cultivated and sold in European markets. In India, availability of this species is very limited. However, the abundant Indo-Nepal species *H. patulum*, sold in the name of *H. perforatum*. Market sample is a whole plant with flowers and it is easy to identify them taxonomically. Anatomically, stem TS of *H. perforatum* is has compressed thin phloem, hollow pith and absence of calcium oxalate crystals. Whereas *H. patulum* has broader phloem, partially hollow pith and presence of calcium oxalate crystals.

Similarity in color

It is well known that in course of time, drug materials get changed to or substituted with other plant species. 'Ratanjot' is a recent day example. On discussion with suppliers and non-timer forest product (NTFP) contractors, it came to be known that in the past, roots of *Ventilago madraspatana* were collected from Western Ghats, as the only source of 'Ratanjot'. However, that is not the practice now. It is clearly known that *Arnebia euchroma* var *euchroma* is the present source. Similarity in yielding a red dye, *A. euchroma* substitutes *V. madraspatana*. The description to identify these two is unnecessary because of the absence of *V. madraspatana* in market. Whatever is available in the market, in the name of Ratanjot, was originated from *A. euchroma*.

Careless collections

Some of the herbal adulterations are due to the carelessness of herbal collectors and suppliers. *Parmelia perlata* is used in Ayurveda, Unani and Siddha. It is also used as grocery. Market samples showed it to be admixed with other species (*P. perforata* and *P. cirrhata*). Sometimes, *Usnea* sp. is also mixed with them. Authentic plants can be identified by their thallus nature.

Unknown reasons

'Vidari' is another example of unknown authentic plant. It is an important Ayurvedic plant used extensively. Its authentic source is *Pueraria tuberosa* and its substitute is *Ipomoea digitata*. However, market samples are not derived from these two. It is interesting to know that an endangered gymnosperm *Cycas circinalis* is sold in plenty as Vidari. The adulterated materials originated from Kerala, India. Though both the authentic plant and its substitute are available in plenty throughout India, how *C. circinalis* became a major source for this drug is unknown. *P. tuberosa* can be easily identified by the presence of papery flake like tubers and *I. digitata* by the presence of its concentric rings of vascular bundles and their adulterant *C. circinalis* by its leaf scars and absence of vessel elements.

Conclusion

It is not that all adulterations are intentional malpractice as stated in many literatures. With our experience it is noted that the herbal drugs are adulterated unintentionally also. Suppliers are illiterate and not aware about their spurious supply. Major reasons are name confusion, non-availability and lack of knowledge about authentic plant. Even scientific community and traditional physicians are unaware of it. Nowadays, herbal drug industries follow, high quality standards using modern techniques and instruments to maintain their quality. World Health Organization (WHO), in its publication on quality standards for medicinal plant materials¹⁴, recommends rejecting any batch of raw material, which has more than 5% of any other plant part of the same plant (eg. stem in leaf drugs), even though they derived from the authentic plant. Based on these standards, adulteration whether, intentional or unintentional, should be rejected. Also, suppliers and traders should be educated about the authentic sources.

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