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Adulteration of *Argyreia nervosa* (Burm.f.) Boj. with *Rivea hypocrateriformis* Choisy– A new report

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Plants form the basis for traditional medicines throughout the world for thousands of years and continue to provide new remedies to mankind. Adulteration and substitutions are frequent in herbal raw material trade. Legally it has been treated as an intentional malpractice and economically motivated; however, it is unintentional too. Several studies have been done for a number of important herbal substances of indigenous systems of medicine to distinguish and authenticate the genuine material from adulterant. Adulterants are not legal, however, substitutes are legal and in practice to manufacture or prepare traditional medicines of AYUSH. There are several reports from India, by numerous researchers, who are authenticating the market samples of herbal substances and also identifying and characterizing them (both authentic and spurious). In general, the identification of market sample is achieved through reliable suppliers who will connect the researchers to the field collectors. Botanical pharmacognosy, describing organoleptic, macroscopic and microscopic characteristic features will help after the taxonomic identification of the spurious material. Until then it is difficult to identify the correct source of the adulterant. Though few reports are available on the adulteration on *Argyreia nervosa* (Burm.f.) Boj., in this article, we bring to light, another adulterant, the stem of *Rivea hypocrateriformis* Choisy found in trade. We followed the conventional methodology of tracing back the origin of the herbal substance from the wholesale dealers, to the local agents and finally approached the field collectors, to know the botanical origin of the adulterant. In this article we described the diagnostic pharmacognostical characteristic features to differentiate the authentic and adulterant in market samples.

Keywords: Adulteration; *Argyreia nervosa; Argyreia speciosa; Rivea hypocrateriformis;* Pharmacognosy; Ethnobotany; Bidhara.

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Introduction

Argyreia nervosa (Burm.f.) Boj., syn. *Argyreia speciosa* Sweet belonging to the family Convolvulaceae is known as Vidhara or Bidhara in Sanskrit. It is one of the popular Ayurvedic drugs, especially in northern parts of India. After reviewing the characters of Bidhara in various Ayurvedic texts, it was concluded that *A speciosa* is the authentic source[1], in line with few others also[2, 3]. It was found that the market sample of Bidhara is a mixture of stem, root, and rootstock of *A speciosa* sold in Allahabad and Dehra Dun markets[1] and also in Kanpur market[4], However, the herbal substance sold in Lucknow market as Bidhara was derived from stem of *Cocculus hirsutus* (L.) Diels, which resembles the authentic species in external appearance[1]. It is also reported that the stem of *A speciosa* is substituted instead of its root[5]. There are different opinions existing, whether stem of *C. hirsutus* sold in Lucknow market is a substitute[1] or an adulterant[5]. Diagnostic pharmacognostical characters of *A speciosa* root and stem, and stem of *C. hirsutus* are described[5] to authenticate the market samples. The samples purchased at Banaras market is stem pieces and roots are very rare. Also, the actual drug sold is derived from *Ipomoea petaloidea* Choisy. syn: *Merremia peltata* (L.) Merr. and *Operculina petaloidea* (Choisy) Ooststr. and not from *A. speciosa*[2]. *Ipomoea pes-caprae* Roth. is also considered as a substitute or an adulterant[3].

Pharmacognostical characters of *A. speciosa* have already been described[6] wherein, the official part of *A. speciosa* (Bastantri in Sanskrit) is mentioned as root. Most of the market sample identification was done for the samples sourced from various places of North India. However, there was no market survey and none of them have identified the samples sold in South Indian markets. Hence, the present article is on

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the identification/ authentication of market samples of *A. nervosa* sold in South Indian markets.

Materials and Methods

Reference samples of stem of *A. nervosa* were collected from suburbs of Udupi (N13 20.567 E74 45.606) and Hampi (N15 22.562 E76 29.726) in Karnataka and also from Paderu (N17 59.023 E82 43.979) in Visakhapatnam, Andhra Pradesh. In this study, the traditional and conventional methods have been followed for the taxonomic identification of the market samples. The market samples were purchased from various suppliers and were traced back from the wholesale dealers (in cities) to the field persons who were involved in drug collection and supply to the village agents. Hence, actual drug collectors were approached and the areas of collection were personally visited in various seasons to collect the actual plant in flowering and fruiting stages. Latitudes and longitudes of all collection spots were marked with the Global Positioning System (GPS) for further access to the same population. The collected samples were taxonomically identified and pharmacognostically compared with the supplied market samples.

Results and Discussion

In general, the suppliers will never disclose the source of the herbal materials, which is a trade secret for them. However, for this study, it has been able to trace the sources of herbal materials successfully through the trustworthy suppliers.

Some of the publications on *A. nervosa* are pertaining to its leaf[7–9] or aerial parts[10]. However, since the roots are the official part, research on roots[11, 12] is based on the field-collected material and not sourced from the crude drug market. It indicates that the availability of authentic root in crude drug market is doubtful or it is not available at all. Some of the reviews published on the authentic plant has covered the pharmacognosy but not about the adulterations[13, 14].

During the field visits, it was found that stem of *Rivea hypocrateriformis* (N9 33.319 E77 58.936), called by the same vernacular name (of the authentic Samuttrappalai) was collected (Plate 1) as *A. nervosa*. Field collectors were not aware of the authentic plant; also, authentic plant was not observed in these areas. Field collectors were confirmed that they are collecting *R. hypocrateriformis* stem for many years and this is one of the regular item. It is an unintentional adulteration[15] due to confusion in the local vernacular name and also because of non-availability of the authentic plant.

Almost all market survey reports of *A. nervosa* revealed that the root is not a commercially available material, whether it is authentic or spurious. Hence, it has to be examined for the use of stem instead of root as suggested in case of Pipali mool[16].

Stem pieces collected from taxonomically identified *R. hypocrateriformis* are similar as the supplier's sample. Both, authentic and spurious plants have anomalous secondary growth in their stem. The pattern of anomalous growth facilitates to differentiate the materials with their visual features in the cut ends (Plate 2). Stem of *A. nervosa* is brown and darker in color with irregular patches of xylem, bordered with black-colored phloem cells due to laticiferous exudation. Xylem vessels are randomly arranged inside the patches. Whereas in *R. hypocrateriformis,* xylem is arranged in successive circles with dark colored phloem cells in successive rings; xylem vessels are radially arranged. Detailed

Plate 1—Flowering twig of *Rivea hypocratiformis*.

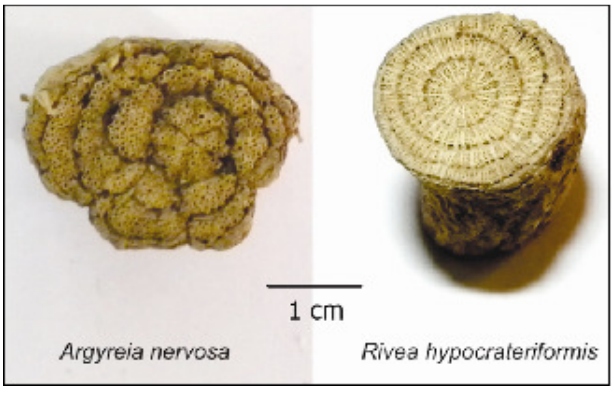

Plate 2—(a) Cut ends of *Argyreia nervosa;* (b) *Rivea hypocrateriformis* stem showing the difference in pattern of anomalous secondary structure.

pharmacognostical and phytochemical studies to differentiate the authentic (*A. nervosa*) with its all reported adulterants (*R. hypocrateriformis*, *I. petaloidea,* and *C. hirsutus*) is under progress.

Conclusion

It is concluded with rationale that *R. hypocrateriformis* cannot be the source of Bidhara, as per the Ayurvedic literature and it is profusely available than *A nervosa* in the South Indian markets. The natural population of *A. nervosa* in South India is restricted to few places and in those places also, it is not abundant to explore commercially. However, the adulteration is not considered to be intentional or economically motivated.

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