

Article

## Seeds of *Ruellia tuberosa* L. as a new adulterant for the seeds of *Hygrophila auriculata* (Schumach.) Heine

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Received 5 March 2020; Accepted 5 April 2020; Published 1 June 2020



### Abstract

*Hygrophila auriculata* (Schumach.) Heine. (Family: Acanthaceae) is called as Kokilaksha in Sanskrit, Neermulli in Tamil, and Marsh Barbel in English. It is commonly found in tropical Asia and Africa; in India, this aquatic annual herb is generally found in moist places, especially in agriculture fields, on banks of canals and rivers, in ponds, and in other water-stagnant areas (during rainy season). The whole plant, roots, and seeds are used in the treatment of various ailments in Ayurveda. Also, the whole plant and seeds are being traded. Till date, there is no report on the adulteration of the market sample of *H. auriculata* seeds. In the present study, we aimed to report the presence of *Ruellia tuberosa* seeds as an adulterant in market samples of *H. auriculata*. The characters that help distinguish these both samples are also discussed. The authentic *H. auriculata* seeds are dark brown, angled, nonreflective, and dull, whereas the spurious seeds are brick red, circular, disc like, and shining.

**Keywords** *Ruellia tuberosa*; *Hygrophila auriculata*; adulteration; Ayurveda.

Ornamental and Medicinal Plants

ISSN 2224-4263

URL: <http://www.iaees.org/publications/journals/omp/online-version.asp>

RSS: <http://www.iaees.org/publications/journals/omp/rss.xml>

E-mail: [omp@iaees.org](mailto:omp@iaees.org)

Editor-in-Chief: WenJun Zhang

Publisher: International Academy of Ecology and Environmental Sciences

### 1 Introduction

*Hygrophila auriculata* (Schumach.) Heine (Syn: *Asteracantha longifolia* (L.) Nees; *Barleria auriculata* Schumach.; *B. longifolia* L.; *H. spinosa* T. Anderson) is an aquatic herb that belongs to the family Acanthaceae. In Sanskrit, it is commonly called as Kokilaksha, Ikshura, and Ikshagandha; in Tamil, it is called as Neermulli; and Swampweed or Marsh-Barbel in English. It is native to tropical Asian and African countries. It is an aquatic, annual herb, ready colonizer, and commonly found in moist areas like agriculture lands, especially in paddy and sugarcane fields and on the edges of ponds, canals, and rivers. It is also found in other water-stagnant areas like swamps after the rainy season. The stem is stout, square, hairy, and thick at nodes. The most prominent characteristics of this plant are sharp reflexed yellowish-brown irritant spines on the leaf axils and bluish-purple flowers. The whole plant, roots, and seeds are used in the treatment of various diseases per Ayurveda (Nandakarni, 1976; Chopra et al., 1956), and a few ethnomedical uses of the herb are also reported (Hussain et al., 2010; Singh et al., 2012).

## 2 Materials and Methods

The market samples of Kokilaksha seeds were purchased from various suppliers across India. The seeds were authenticated based on the pharmacognostical characters described in Ayurvedic Pharmacopoeia of India (Anonymous, 1999). These seeds were cultivated till flowering and fruit set then taxonomically identified and confirmed using floras (Gamble, 1997; Matthew, 1983).



**Fig. 1** Market samples of Kokilaksha seeds.

## 3 Results

Two types of seeds were supplied by different suppliers in the name of Kokilaksha. The seeds from one batch (Fig. 1a) were flat or compressed; rectangular to ovate and rarely triangular; domed on one side and slightly tetrahedron with clear lines of angle on the other side; smooth surface; dull;  $3.5 \times 1.5$  mm; and brown to dark brown. The characteristics of these seeds match with the description provided in the Ayurvedic Pharmacopoeia of India. Whereas the seeds in the other batch (Fig. 1b) were disclike; obliquely triangular or square or rectangular or clear circle; thin; slightly shiny; around 1 mm; reddish brown; and hilum like notch in the narrowed region. These characteristics did not match the description provided in the Ayurvedic Pharmacopoeia of India. However, in both the seeds, one side was domed and the other side was faintly or obliquely tetrahedron with clear lines of angle. Also, when soaked in water, both the seeds immediately absorbed water and a mucilage coating was formed around them. In order to identify the second batch of seeds, the characteristics of which did not match the description in the Ayurvedic Pharmacopoeia of India, they were cultivated to flowers and evaluated taxonomically. It was identified that the characteristics of these seeds matched with description provided for *R. tuberosa*.

## 4 Discussion

Identification of plant species in the herbal industrial products is important and it requires special attention to identify the authentic herbal raw materials usage (Osathanukul et al., 2018). Botanical techniques provide the greatest confidence for ensuring the identity and quality of such botanical medicines (Upton et al., 2019). The pharmacognostical authentication of any herbal substance is a routine process in herbal drug manufacturing (Adeoye et al., 2017; Zhang, 2017a-b). Our study results indicate that *R. tuberosa* is an adulterant for *H.*

*auriculata*, which was not reported earlier. Hence, this is the first study reporting the adulteration of *H. auriculata* seeds. Another interesting fact is that *R. tuberosa* seeds are available only with south Indian suppliers, the exact reason for which is not clear. As both the herbs can be easily differentiated macroscopically, in-depth study of microscopical features is not described here. Although the macroscopical characters are sufficient to identify the adulterant species, microscopic and phytochemical differentiation methods provide precise information to identify the authentic seeds.

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