'Asoka' – an important medicinal plant, its market scenario and conservation measures in India

'Asoka chhal' is the bark of Asoka (*Saraca asoca* (Roxb.) Willd.) tree, commonly known as 'Sita Ashok', and assessed as Endangered (Karnataka), and Data Deficient (Kerala and Tamil Nadu)[1]. It is an important medicinal plant used largely by India's herbal industry and in the preparation of Ayurvedic formulations, including 'Asoka arishtam'. Field studies reveal inadequate wild populations of *S. asoca* (Roxb.) Willd. to cater to the needs of the herbal industry. It suggests the probable substitutes and adulterants used in place of genuine raw drug and efforts taken towards the conservation and resource augmentation.

Asoka is one of the sacred trees of Hindus and Buddhists[2]. As the name signifies, the tree is believed to be capable of relieving the sorrows of people. Asoka bark has been widely used in Indian medicine from time immemorial for the treatment of menorrhagia, leucorrhoea, dysmenorrhea, all uterine disorders particularly for weak uterus. It is also used in diarrhoea, dysentery, blood disorders, dysuria and urinary stones[3,4] and in piles, helminthic infestations, scrofula and all types of wounds[5]. The leaves are used to cure stomach ache; flowers are considered to be excellent uterine tonic to cure biliousness and syphilis[2].

Are *Saraca indica* and *Saraca asoca* the same? The genus *Saraca* comprises about 20 species[6]. In India, four species of this genus have been reported, of which *S. asoca* (Roxb.) Willd. is the only one growing in the wild as well as in gardens and avenues, the remaining three species namely *S. declinata* Miq., *S. indica* L. and *S. thaipingensis* Prain are seen only in botanical gardens[7–12].

The botanical identity of 'Asoka chhal' has been reported as *S. indica* L.[13]. However, it is now clearly established that *S. indica* L. occurs naturally in the east of Irrawady River in Myanmar[12]. In India its recorded presence is restricted to the rare trees planted in the Indian Botanical Garden, Howrah[14]. Taxonomically, the original description of *S. indica* is incomplete (*pro parte*). *S. asoca* (Roxb.) Willd. has the synonym *Saraca indica auct non* L. In India, even today many researchers working on pharmacological aspects, Ayurvedic physicians and herbal industries, and several publications continue to erroneously refer to the Indian plant *S. indica* instead of its proper identity, i.e. *S. asoca*. So far, there are no reports on the trade aspects of *S. indica*. The two plants belong to different species and these can be easily differentiated based on the taxonomic and distribution data (Table 1 and Figure 1).

The market raw drug sample of *S. asoca* consists of curved, channelled or sometimes quilled pieces of bark, which is about 12 mm thick. The outer surface is rough, greyish-brown, covered with warty protuberances and circular to transversely elongated lenticels. The inner surface is smooth, reddish-brown and finely mottled with black dots. Transversely cut surface shows long, radially elongated, but irregularly running medullary rays. The cut bark is tough and fibrous. It has astringent and has mild aciduous taste[15].

The accepted source of plant drug 'Asoka' is the bark of *S. asoca* (Roxb.) Willd. (Caesalpiniaceae). It is, however, reportedly substituted/adulterated with plant materials obtained from *Humboldtia vahliana* Wight (Caesalpinaceae; N. Sashidharan, KFRI, pers. commun.), *Shorea robusta* Gaertn. (Dipterocarpaceae)[16] and *Mallotus nudiflorus* (L.) Kulju & Welzen (Euphorbiaceae)[17].

Polyalthia longifolia (Sonnerat) Thwait. (Annonaceae) is also popularly known by the vernacular name 'Ashok'. A few scholars have inferred that the bark of this species is also being traded as 'Asoka chhal'. In view of the huge demand for Ashoka chhal by the Indian herbal industry (>2000 mt per year), it seems highly improbable that such a large quantity of bark could be obtained from this species alone, which exists only as avenue trees and not as a sizeable wild or planted population in India[18].

A comparative overview of the therapeutic usage of substitutes/adulterants reveals that of *H. vahliana* is used in biliousness, leprosy, ulcers and epilepsy. Roots of *M. nudiflorus* are used in gout and rheumatism. Shoots are used to relieve flatulence and in the treatment of swellings. *P. longifolia* bark is used as febrifuge and resin of *Shorea robusta* is used in diarrhoea, dysentery, skin diseases and ear pain[2].

The trade shows heavy usage of 'Asoka chhal' and according to field studies, there is no documentation of known plantations. The wild presence of this species has been recorded only from a few scattered patches in the Western Ghats of Maharashtra[19,20], Goa[21], Karnataka[1,22–23], Tamil Nadu[1,24], Kerala[25] and the Eastern Ghats of Odisha[26] and Meghalaya[9]. In these states, surveys were undertaken by FRLHT (Bangalore) botanists during 2007–2009, who recorded wild fragmented population. Apart from

Table 1. Salient distinguishing features of *Saraca indica* L. and *Saraca asoca* (Roxb.) Willd[27]

Distinguishing features	*Saraca indica* L.	*Saraca asoca* (Roxb.) Willd.
Taxonomic characters		
Bracteoles	Caducous or persistent bracteoles during anthesis, not clasping the pedicel	Persistent bracteoles during anthesis, erect and clasping the pedicel
Ovules	6–8 ovules	8–10(–12) ovules
Pods – shape and size	Oblong or narrowly oblong–lanceolate; 6–25 × 2–6 cm	Oblong or elongate–oblong, or scimitar–shaped; 12.5–25 × 3.5–6.5 cm
Global distribution	Thailand, Laos, S. Vietnam; Malaysia (Sumatra, Malay Peninsula, Java)	India, Sri Lanka, Bangladesh and Myanmar (west of Irrawaddy River). Introduced and cultivated in Malaysia

Figure 1. ***a–g***, *Saraca asoca*: ***a***, Habit; ***b***, Debarked stem; ***c***, Inflorescence; ***d***, Pod; ***e***, Dehiscing pod; ***f***, Seeds; ***g***, Raw drug–bark; ***h–j***, *Saraca indica*: ***h***, Habit, ***i***, Close-up of branch, ***j***, Inflorescence.

this, sporadic population was seen in the North East Indian states of Meghalaya, Assam and Manipur.

It is observed that almost throughout the tropical regions of the country, this species is sporadically planted in home gardens and as avenue trees, in parks and around temples, etc.[7–11].

In this scenario, it is indeed intriguing as to where such a sizeable quantity of 'Asoka chhal' is being obtained. There are two possible answers to this. Either that the wild populations of the species from some inadequately known remote localities are being completely stripped of bark, putting this threatened species under greater threat of extinction, or a very large proportion of 'Asoka chhal' being presently traded and used is not the bark of *S. asoca* (Roxb.) Willd. at all[18].

Field survey revealed threats to the population of *S. asoca* (Roxb.) Willd., e.g. the sweet kernels of seeds are eaten by wild boar and other insects. Seeds that fall in the streams may get carried away by the water current, thus affecting their regeneration. Large quantities of seeds/seedlings are collected by the Forest Department for nursery raising, leaving less room for natural regeneration in the original habitat. The pioneering efforts for medicinal plant conservation initiated by FRLHT in collaboration with the Karnataka State Forest Department beginning in 1993, resulted in identifying *S. asoca* (Roxb.) Willd. as a species of conservation concern. The wild gene pool of this species was located in Kollur (lat. 13°43′, long. 77°49′, altitude: 120–240 m amsl) in Udupi district, Karnataka, which was demarcated as MPCA (Medicinal Plant Conservation Area) for *S. asoca* (Roxb.) Willd. The National Medicinal Plant Board, New Delhi has provided funding to the State Forest Departments of Karnataka and Odisha to undertake *in situ* conservation and resource augmentation.

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Consequence of cyclonic storm *Phailin* on coastal morphology of Rushikulya estuary: an arribada site of vulnerable Olive Ridley sea turtles along the east coast of India

A very severe cyclonic storm *Phailin*, a category-5 hurricane, was developed over the north of Andaman and Nicobar Islands on 9 October 2013. Subsequently, it propagated towards north–northwest and made landfall at the Gopalpur coast, Odisha on 12 October[1]. The present study area, Rushikulya estuary is in close proximity (15 km north) to the landfall point. Significant changes occurred in the geomorphologic structure of the estuary due to effect of *Phailin* (Figure 1). The study area receives international recognition due to episodic mass nesting event (arribada) of endangered Olive Ridley (*Lepidochelys olivacea*) sea turtles. A long sand spit which was running parallel to the coast, as a result separating the estuary from the sea, was eroded significantly due to the strong surge exerted by cyclone *Phailin*. Large areas of the coastal region were inundated due to storm surge (recorded 2.5 m) during the storm[2]. The spit development in the estuary mouth regions is correlated with the longshore transportation of sediments and the dominant influence of the southwest monsoon. The sand spits develop due to accumulation of sand derived from the adjacent sea bed or sand from the land through the river on the southern part[3]. In the present study, we have attempted to assess the spatio-temporal changes that occurred in the sand spit and shoreline using sequential satellite data pertaining to the period 2003–2014. Satellite remote sensing and Geographic Information System (GIS) have proved as meaningful tools to

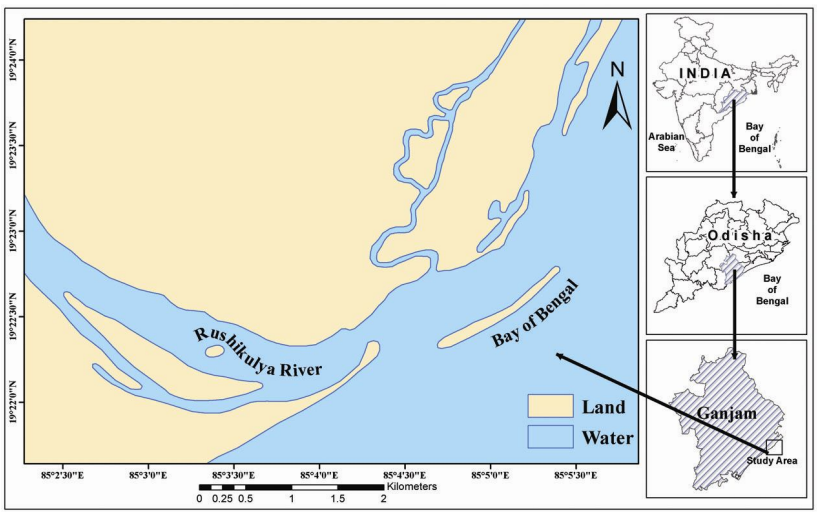

Figure 1. Geographic position of Rushikulya estuary.