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NOTE

Important Notes on the Identity of *Alpinia fax* (Thwaites) B.L. Burtt & R.M. Sm.

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ABSTRACT: During a recent revision of the genus *Alpinia* Roxb. of the family Zingiberaceae in Sri Lanka , we came to notice a set of ambiguous morphological descriptions on *Alpinia fax* Burtt and Smith. This is particularly pertaining to few earlier collections and especially to the description of the species discovered from India recently. In this short note, we address ambiguity of these morphological characteristics which do not add up with the accepted revision on the species, also giving reference to the currently accepted description, our field collections and the Indian species.

KEY WORDS:, *Alpinia fax*, Sri Lanka, Taxonomic notes, Wild gingers, Zingiberaceae.

INTRODUCTION

Diversification of Zingiberaceae in the Asian tropics especially in the Southeast Asia has been a key factor for the presence of more genera of Zingiberaceae in the Southeast Asia than anywhere else in the world (Kress *et al.*, 2002). Although the family is believed to have a Laurasian origin (105–72 Ma), it has been speculated that the tribe Alpinieae has migrated to south-east across Sundaland and crossing Wallace's Line from the west to the east obtaining the highest diversity of the genera of the tribe exclusively in the Southeast Asian region (Kress *et al.*, 2005b; Droop, 2012). Further, *Alpinia*, the type genus of the tribe Alpinieae has been the dominant genus of the family in this particular region and hence it is the largest genus of the family Zingiberaceae (Larsen *et al.*, 2005; Sakai and Nagamasu, 1998). However, the diversity of Zingiberaceae in the Indian sub-continent and Sri Lanka shows a different pattern by having more *Amomum* species than *Alpinia* species compared to the other regions.

According to recent molecular phylogenetic analyses, several species of native *Alpinia* in India and Sri Lanka show close affinity to native African Zingiberaceae (Kress *et al.*, 2002; Droop, 2012); in particular to *Aframomomum* and *Renealmia*. Evolutionary relationship analysis further showed that a certain group of *Alpinia* which was identified as one of the infra-generic clades within the genus: *Fax* clade, showing this close affinity (Kress, 2005a). Some of the morphological characters also agree with this observation; for example the presence of a radicle inflorescence, in most cases basal to the vegetative parts (Kress *et al.*, 2007). Kress *et al.* (2007) also suggested the need for acquiring a new generic name for the three species listed under this clade (*A. fax*, *A. abundiflora* Burtt and Smith and *A. rufescens* Schuman). Smith (1990) placed these three species in the section *Fax* considering their morphological characteristics such as the radical inflorescence and a cincinni with up to seven flowers. Close relationship of the *Fax* group to the sister African and American genera might explain the long distance dispersal mechanisms of species (Droop, 2012). Overall all the members of this unique group of Zingiberaceae seems very important from a phylogenetic and biogeographical perspective. Of the three species included in the *Fax* clade, *A. rufescens* which is endemic in Sri Lanka has never been recollected since its type gathering in 1864 (Burtt and Smith, 1983).

A. fax and *A. abundiflora* (Figure 1) are the only currently existing species of this clade and they are found only in Sri Lanka and several parts of South India. The preceding species was first described from Sri Lanka by Thwaites in 1864 and there have been several ambiguities pertaining to the identity of this species since. However, in the last revision of the family Zingiberaceae in the country by Burtt and Smith (1983), they have clearly identified the morphological characters that may cause ambiguities and they have extended their descriptions making comments on these identified characters (discussed later). Burtt and Smith also stated that the confusion of descriptions in several earlier books may be a result of mixing up of Thwaites' specimens of *A. abundiflora* and *A. fax*.

Burtt and Smith (1983) made clear attribution to several morphological characteristics to distinguish *A. fax* from *A. abundiflora*. These morphological characters are basically the characters that earlier

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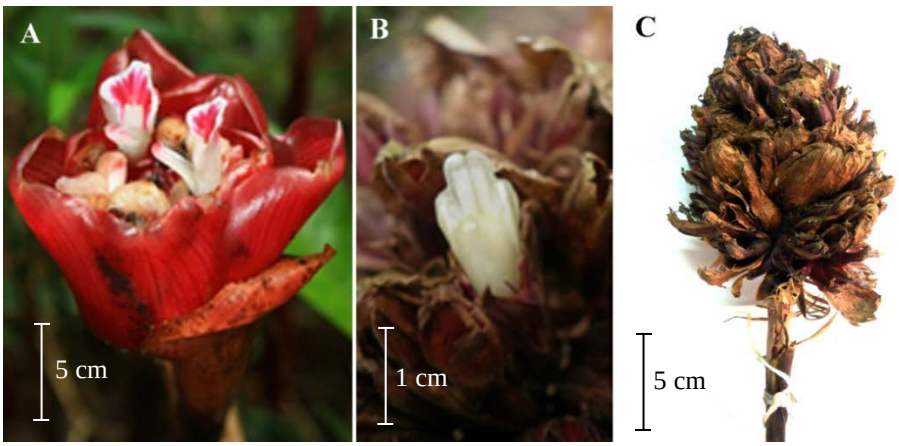


Fig 1. Floral images of A. *A. abundiflora*, B. and C. *A. fax*.

authors have attributed erroneously or characters that seem to differ between different specimens. Hence according to Burtt and Smith (1983), petioles are not a constant characteristic of *A. fax* as they tend to have both petiolate and sessile leaves. The main characters that they have highlighted to be very useful in the identification of the species are the presence of hairs on the inflorescence, especially on the bracts and bracteoles which is lacking in *A. abundiflora*; secondly the unmarked white color labellum which in the counterpart species is marked with pink stripes. The inflorescence of *A. fax* is rarely truncate and they rather elongate considerably as they mature. It should also be noted that descriptions of the species by Trimen (1885) and Hooker (1931) are confusing and seemingly they are referring their descriptions to *A. abundiflora*. Our observation of the live collections, type material and other specimens confirmed this observation and we also agree with description made by Burtt and Smith (1983).

As an extension of the geographical distribution of this important species, Prasanth Kumar *et al.* (2002) recorded the occurrence of *A. fax* in South India. It was found in Periyar Tiger Reserve of Kerala State in South India. Authors mention that although the specimen bears several morphological characters that deviate from the Sri Lankan specimen (labellum with pink stripes, presence of distinct anther crest and comparatively shorter anther lobe), they identify it as *A. fax* (specimens: *Prasanthkumar 86184* (CALI) and *Jomy Austine 1374* (CALI)). However, our observation of the description by earlier workers and live specimens points out something contrary to what Prasanth Kumar *et al.* (2002) refers to as "highly variable characters" and thus pose a question about the taxonomic ranks of these two records.

TAXONOMIC ASSESSMENT

We would like to focus on several morphological characters that are confusingly interpreted in the currently accepted description of Sri Lankan species and the Indian species. Those characters are color of the flower, especially the labellum color patterns, anther crest, bract size and shape, leaf petioles and fruit characters. Despite controversial, phylogenetic studies have not eliminated these morphological characters as insignificant for characterizing the *Fax* clade (Kress *et al.*, 2005a).

Reading through the earlier descriptions of the *A. abundiflora* and *A. fax*, one can easily understand that there have been mix-ups of the specimens and several misidentifications of these two species. It is also apparent that the name *Amomum involucratum* is a synonym for both these species; this explains why there have been many descriptions of overlapping character combinations of *A. abundiflora* and *A. fax*. Although Thwaites described it under *Elletaria involucrate* (Thwaites 1864), by the time Trimen's observation, these specimens might have been mixed up for some reason. This has also been acknowledged by Burtt and Smith (1983) when they examined the older specimens It is confusing why protologue stated that the flower was pale yellowish brown although none of the later descriptions mention about the flower being pale yellowish brown nor any of the two species bear such color flowers. However, after examining these specimens together with their field collections, Burtt and Smith (1983) clearly stated that the labellum of *A. fax* is white without any markings although on the other hand Kumar *et al.* (2002) recorded the presence of pink stripes radiating from the middle of the labellum. However, in our field collections, we recorded the same observation as Burtt and Smith (1983) recorded from their field collections.

There are no special statements on the anther crest of *A. fax* in any of the earlier descriptions whereas Burtt and Smith (1983) recorded the absence of an anther crest in either *A. fax* or *A. abundiflora*. One of the noticeable characters of the section *Fax* of *Alpinia* is the absence of an anther crest (Smith, 1990). However,

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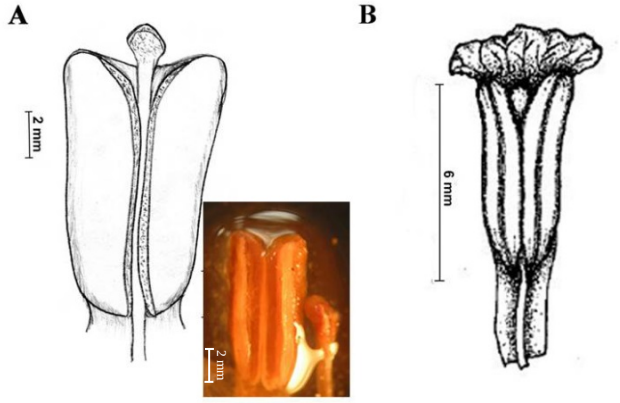


Fig. 2. A. Illustration of the stamen of Sri Lankan *A. fax*, B. Illustration of the stamen of Indian specimen of *A. fax* (extracted from *Kumar et al.*, 2002).

in contrast, Indian *A. fax* species is recorded to bear an anther crest of ca. 0.2 × 0.5 cm (Kumar *et al.*, 2002). Contrary to Kumar's observation, we observed the absence of an anther crest both in our own field collections and previous collections. Figure 2 shows an enlarged view of the stamen of *A. fax* as a reference. Although Kumar *et al.* (2002) identified the anther crest as a highly variable character, it seems very unlikely in our collections. Size of the bract in Kumar's description seems bizarrely different from the type material or our field collections. *A. fax* has a basal spiral of sterile bracts with the same characteristics as first few spirals of fertile bracts whereas fertiles become narrower towards the top of the inflorescence. Supposedly, there has been a printing mistake in Kumar *et al.* (2002) description of the bracts. Our observation of the bract characters are as follows; Steriles restricted to the basal most spiral of bracts, fertile bracts subtending a cincinni (4–6 × 3–3.5 cm) with 3-5 flowers, first (basal most) and second bract at the base of the inflorescence comparatively large, (4–6.5 × 3–3.5 cm), others narrower, pink-red/ maroon, pubescent, denser towards tip, all bracts usually oblong and mucronate, those at the upper part much smaller: 2.5–3 × 2–2.5 cm.

Leaf petioles is not a significant character in *A. fax* or *A. abundiflora* where both of them tend to have both petiolate leaves (up to 1 cm petiole) and sessile leaves and sometimes even on the same specimen. Capsule of *A. fax* is ovate with persistent calyx. Cross section of the fruit is more irregular shaped usually resembles that of *A. abundiflora* and the fruit is red-maroon color and pubescent (Figure 3).

Beside these characters, stamen characteristics seems to be different in the Indian species and the Sri Lankan species. Type materials and field collection of *A. fax* in Sri Lanka bear sessile anthers and the thecae being at least 1 cm long whereas as Kumar *et al.* describes it is much smaller and possesses an anther filament.

CONCLUSION

Considering the variation of morphological characters between the Indian and Sri Lankan species of *A. fax*, it can be stated that the Indian specimen is significantly different form the Sri Lankan species and it is rather a different species, probably a new one. Hence we suggest thorough examination of the morphological characters of the Indian species and further molecular biological evaluation might aid distinguishing the possible relationships between these two species. Re-evaluation of the *Fax* clade of *Alpinia* is necessarily important for possible re-circumscriptions of the genus and the family Zingiberaceae as these species are very important from biogeographic and phylogenetic perspectives of the plant families in the world.

Summary of characteristics of Alpinia fax: Herb exceeding 2 m, ligule 6–7 × 8–10 mm, one lobe. Leaves sessile, lamina broadly lanceolate, 55–65 × 10–15 cm, acuminate tip and attenuate base, margin entire. Peduncle 30–55 cm long. Inflorescence with up to 60 flowers, length 12-18 cm, elongates with age. Bract: steriles restricted to the basal most spiral of bracts, fertile bracts subtending a cincinni (4–6 × 3–3.5 cm) with 3–5 flowers, first (basal most) and second bract at the base of the inflorescence comparatively large, (4–6.5 × 3–3.5 cm), others narrower, pink-red/ maroon, pubescent, denser towards tip, all bracts oblong and mucronate. Bracteoles tubular but splits towards the base, Flower 3–4 cm long. Calyx tubular unilaterally split, 15–20 mm long, 5 mm diameter at broadest, sparsely pubescent, bilobed. Corolla tube 20–25 mm long glabrous, three corolla lobes, ovate, apiculate, concave, dorsal lobe broader than laterals. Lateral staminodes absent/not observed. Labellum indecisively tri-lobed, obovate, 10–11 × 5–8 mm, apex obtuse to retuse, pure white or greenish white, no stripes or any other colored patterns, glabrous. Stamen 5–7 mm long, anther sessile, white, attached at about 170º, white or light cream, anther thecae parallel and diverging at the apex, dehiscing longitudinally for its entire length, connective not prolonged to a crest, glabrous. Ovary rather elongated and no distinct shape appears to have three sides, 8–10 mm long, 4–5 mm diameter at middle, white-pink, pubescent. Fruits. capsules, elongated, 1.5–2 cm. long 1–1.5 cm. wide, dark red-maroon at young stage, densely pubescent at young stage becomes less with age (Table 1).

Specimens studied: **Sri Lanka**: Central Province, Colbert's gap-Knuckles Range, *Piyal Karunarathne* and *Deepthi Yakandawala* 2516 (PDA); Nuwara Eliya *Piyal Karunarathne* and *Deepthi Yakandawala* 2541 (PDA).MATALE DISTRICT: Kaluphana Forest, *Jayasuriya* 1217 (PDA, E). BADULLA DISTRICT: Tangamalai Forest Reserve, Haputale, *Jayasuriya* and *Norwicke* 1236 (PDA, E).

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Table 1. Some of the important morphological characters that deviate between the Sri Lankan and Indian species of *A. fax*.

Character	Character state of the Sri Lankan species (present study)	Character state of the Indian species (Kumar *et al.* 2002)
Labellum color	Pure white, no stripes of other colors	White color, pink color strips radiate from the middle
Anther crest	Absent	Present
Fruit	Ovate, cross section irregular	Obovate

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