

New combinations for two species in the genus *Synima* (Sapindaceae, Cupanieae) from Queensland (Australia)

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Abstract

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Synima Radlk. is a small genus of *Sapindaceae* distributed in Australia, Indonesia (Moluccas and Western New Guinea) and Papua New Guinea with three species currently accepted. The genus can be recognized by its crested scales on the petals, a pericarp that dries thin and wrinkled, and the seed which has a fleshy, yellow-orange sarcotesta that is either small and basal or \pm enclosing the seed. Previous taxonomic studies expressed doubts regarding the generic placement of two species belonging to the genus *Sarcotoechia* Radlk.: *Sarcotoechia serrata* S.T. Reynolds and *Sarcotoechia heterophylla* S.T. Reynolds. A phylogenetic framework has shown that *Sarcotoechia* is paraphyletic and *Sarcotoechia serrata* is sister to *Synima*. Further morphological evidence (e.g., crested petals) support the transfer of the latter two species to *Synima* and the new combinations are proposed here: *Synima heterophylla* (S.T. Reynolds) Callm. & Buerki and *Synima serrata* (S.T. Reynolds) Callm. & Buerki. A key to all species of *Synima* is presented.

Keywords

SAPINDACEAE – Cupanieae – *Sarcotoechia* – *Synima* – Australia – New combination

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Introduction

Synima Radlk. is a small genus of *Sapindaceae* with currently three species recognized (FORSTER, 2006). All the species occur in north-east Queensland in Australia with *S. cordieri* (F. Muell.) Radlk. extending to Papua New Guinea and Indonesia (Moluccas and Western New Guinea) (LEENHOUTS & ADEMA, 1994). *Synima* is morphologically closely related to *Sarcotoechia* Radlk. and *Toechmia* Radlk. based on their fruits with fleshy valves, hairy inside walls, and seeds usually bearing a small sarcotesta (REYNOLDS, 1985a: 176; see ADEMA et al., 1994 for a discussion on the use of sarcotesta instead of aril).

BUERKI et al. (2012) published a phylogenetic framework aiming at testing generic monophyly in the Cupania group (corresponding mostly to the tribe *Cupanieae* Radlk.; Buerki et al., unpubl. data) by focusing on taxa in the southern Pacific islands. This study demonstrated that *Synima* belonged to clade B together with *Sarcotoechia*, and *Toechmia* (BUERKI et al., 2012: 115, fig. 2B). *Synima* was inferred sister to the new genus *Neorarytera* Callm. et al. endemic to New Caledonia and Vanuatu (BUERKI et al., 2020), whereas *Toechmia* was shown to be sister to the SE Asian and Australian genus *Mischocarpus* Blume. Finally, *Sarcotoechia* was inferred to be paraphyletic with *S. villosa* S.T. Reynolds sister to the New Caledonian genus *Storthocalyx* Radlk. and *S. serrata* S.T. Reynolds sister to *Synima*. Although *Sarcotoechia* and *Synima* are morphologically closely related, they can be discriminated by their petal morphology. *Synima* has crested scales on petals (vs. no petal crests in *Sarcotoechia*), pericarp that dries thin and wrinkled (vs. not wrinkled) and the seed with a fleshy, yellow-orange sarcotesta that is either small and basal or ± covering the seed (vs. sarcotesta rudimentary or absent) (REYNOLDS, 1985a, 1985b; FORSTER, 2006).

REYNOLDS (1985a: 184) has previously warranted some caution related to the generic placement of *Sarcotoechia serrata* and an allied species by stating that “*Sarcotoechia serrata* and *S. heterophylla* differ from all other species of *Sarcotoechia* in having serrate or serrulate leaflets, crispate indumentum, very small rudimentary aril [sarcotesta] and slightly larger seed. The testa also is dull compared to the shiny ones of other species and the fruit valves are not fleshy. Until more collections become available both these species are tentatively included under *Sarcotoechia* because the flowers, especially petals, are those of the genus. The fruits and seeds are unlike any other known Sapindaceae in Australia”.

Based on RADLKOEFER (1931–1934: 1255, translated from Latin by R. Gereau), *Synima* is morphologically characterized by “a testa of the seed [that is] drupaceous [and] covered, except for the dorsal groove, with a fleshy layer of tissue almost adnate to the aril”. With the description of two further species in the genus, we know that the sarcotesta is quite variable in *Synima*. *Synima cordieri* (F. Muell.) Radlk and *S. reynoldsiae* have seeds +/- entirely covered by the sarcotesta, whereas in

S. macrophylla S.T. Reynolds this structure is small and only at the base of the seed (FORSTER, 2006). Previous phylogenetic analyses provided strong evidence supporting convergent evolution of fruit morphology in *Sapindaceae* as shown by the polyphyly of tribes and genera, which were mostly established based on fruit characters (BUERKI et al., 2009). This is especially the case in the Cupania group where genera previously assigned to *Cupanieae* and *Schleichereae* based on contrasting fruit morphologies (mostly dehiscent fruits with ceraceous, coloured sarcotesta in *Cupanieae* vs. indehiscent fruit with fleshy, translucent sarcotesta in *Schleichereae*) were retrieved in the same clade (BUERKI et al., 2009, 2011). Phylogenetic analyses of Malagasy taxa inferred species of *Neotina* Capuron previously classified as *Cupanieae* nested within species of *Tinopsis* Radlk. previously classified as *Schleichereae* (BUERKI et al., 2011). A more in-depth morphological analysis recovered distinct floral and vegetative characters supporting the phylogeny (BUERKI et al., 2011). What these examples provide is evidence that fruit morphology in *Sapindaceae* could be deceptive and that emphasis should be shifted towards flower morphology accompanied by key vegetative characters.

While describing both *Sarcotoechia heterophylla* and *S. serrata* in *Sarcotoechia*, REYNOLDS (1985a: 182, fig. 5C) described both species with petals having “scales densely crispate hairy”, which contradicts her statement that the “petals are those of the genus [*Sarcotoechia*]” for both species (REYNOLDS, 1985a: 184). This flowering character is absent in *Sarcotoechia* and considered as a synapomorphy for *Synima*. FORSTER (2006) had the same dilemma in describing *S. reynoldsiae*, a species long known as *Sarcotoechia* sp., which he formally described in *Synima* based notably on the presence of crested scales on petals.

Transfer of *Sarcotoechia heterophylla* and *S. serrata* into the genus *Synima* satisfies monophyly of *Sarcotoechia* while also maintaining coherent generic morphologies. The new combinations *Synima heterophylla* (S.T. Reynolds) Callm. & Buerki and *S. serrata* (S.T. Reynolds) Callm. & Buerki are proposed.

Key to the genus *Synima*

Adapted from REYNOLDS (1985b) and FORSTER (2006).

1. Leaflet margin uniformly serrate or serrulate; indumentum of crispate hairs; sarcotesta minute or absent 2
 - 1a. Leaflet margin entire or with occasional teeth towards apex; indumentum of straight hairs; sarcotesta larger 3
2. Leaflets 3–6 pairs, regularly serrate, 2–5.5 cm long, 1.2–2.5 cm wide ***S. serrata***
 - 2a. Leaflets 2 or 3 pairs, irregularly and apically serrate or serrulate, 5.5–12 cm long, 2.5–4.2 cm wide ***S. heterophylla***



Fig. 1. – *Synima heterophylla* (S.T. Reynolds) Callm. & Buerki: **A.** Inflorescence; **B.** Branch with juvenile and older leaves. *Synima serrata* (S.T. Reynolds) Callm. & Buerki: **C.** Inflorescence; **D.** Mature fruits; **E.** Branch with juvenile and older leaves. [A–B: cultivated tree in Airlie Beach from seeds originating from Eungella (West of Mackay, Queensland); C–E: cultivated tree in Atherthon from seeds originating from Gadgarra (Atherthon Tableland, Queensland)] [Photos: A–B: S. and A. Pearson; C–E: G. Sankowsky]

3. Branchlets 6–10 mm in diam.; inflorescences unbranched, or with only 1 to 3 side branches; cymules subsessile; sarcotesta covering only base of seed *S. macrophylla*
- 3a. Branchlets less than 5 mm diameter; inflorescences paniculate; cymules pedunculate; sarcotesta covering lower third or nearly whole of seed 4
4. Petals slightly keeled, with scattered to localised sparse indumentum externally, with uncrested scales; fruit obovoid, valve sutures white; leaflet midvein raised adaxially *S. cordieri*
- 4a. Petals not keeled, with dense indumentum externally with crested scales; fruit subglobose, valve sutures yellowish; leaflet midvein flush adaxially *S. reynoldsiae*

Taxonomy

Synima heterophylla (S.T. Reynolds) Callm. & Buerki, **comb. nov.** (Fig. 1A–B).

= *Sarcotoechia heterophylla* S.T. Reynolds, Fl. Australia 25: 201. 1985.

Holotypus: AUSTRALIA. **Queensland:** South Kennedy pastoral distr., Eungella, 10.XI.1982, *Williams 82244* (BRI [BRI-AQ037732]!).

Note. – *Synima heterophylla* resembles *S. serrata* in having serrate leaves and crispate hairs. It can nevertheless be distinguished by its larger leaves (5.5–12 cm long, 2.5–4.2 cm wide vs. 2–5.5 cm long, 1–2.5 cm wide in *S. serrata*), having some leaflets with irregularly serrate margin (vs. always regularly serrate) and sarcotesta nearly absent (vs. rudimentary) (REYNOLDS, 1985b).

Synima serrata (S.T. Reynolds) Callm. & Buerki, **comb. nov.** (Fig. 1C–E).

= *Sarcotoechia serrata* S.T. Reynolds, Fl. Australia 25: 201. 1985.

Holotypus: AUSTRALIA. **Queensland:** Cook distr., Gadgegarra, IX.1954, *White 895* (BRI [BRI-AQ0010264]!); iso-: CANB [CANB242040, CANB242041] images seen, L [L0014599]!, CNS [QRS501879].

Note. – *Synima serrata* can be easily distinguished in *Synima* by its 3–6 pairs of deeply serrate leaflets, the crispate indumentum and the rudimentary sarcotesta (REYNOLDS, 1985b).

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