



RESEARCH ARTICLE

# A new species of *Parthenocissus* (Vitaceae) from India with notes on *Causonis trifolia*

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## ARTICLE HISTORY

Received: 22 February 2023

Accepted: 08 May 2023

Available online

Version 1.0 : 30 June 2023

Version 2.0 : 01 July 2023



## Additional information

**Peer review:** Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

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## CITE THIS ARTICLE

Dominigose N C, Anto P V, Pradeep A K, A new species of *Parthenocissus* (Vitaceae) from India with notes on *Causonis trifolia*. Plant Science Today. 2023;10(3): 106–110. <https://doi.org/10.14719/pst.2456>

## Abstract

A new species of *Parthenocissus*, *P. wallichianus* is described and illustrated from Kerala, India. This taxon was found and collected previously from India but misunderstood by earlier Indian botanists for names under various combinations among the such as *Vitis*, *Cissus*, *Cayratia*, and *Causonis*. The combinations were based either on the Linnaean *Vitis trifolia* or on Lamarck's *Cissus carnosa*. Both these names are currently accepted as con-specific and validated now as belonging to *Causonis trifolia* (L.) Mabb.et J. Wen. The new taxon has separated from all these genera by a suit of characters and is shown fit best to the genus *Parthenocissus*. A key for the identification of Indian species of *Parthenocissus* is also provided.

## Keywords

*Cayratia*; *Cissus*; Kerala; South India

## Introduction

The genus *Parthenocissus* Planch. comprises c. 16 species with an intercontinental disjunct distribution between Asia and North America. Thirteen species occur in Asia and three in North America with one extending to the Caribbean (1-4). Among them, three species and two varieties are known to occur in India (5,6). The genus includes deciduous lianas, with leaves usually palmately 3–5 (-7) foliolate, tendrils monochasially 3-12 branched and usually tipped with adhesive discs. The inflorescence is generally a loose dichasium, corymbose cyme, or an umbel, without a tendril at its base. The floral discs are inconspicuous and fused with the base of the ovary (4). During their taxonomic studies on Vitaceae in South India the authors came across an interesting taxon which initially thought it belong to *Causonis trifolia* (L.) Mabb. & J. Wen [= *Cayratia trifolia* (L.) Domin.], a species fairly common in the plains of South India, and usually associated with mangroves. A close examination of the specimens in consultation with protologue and type of *C. trifolia* (*Samuel Brown* 67, BM-SL [Petiver, 165f.84] digital image!) and the names cited under its synonymy (7) revealed *C. trifolia* was rather misunderstood, and this name was used by some authors (8-11) for a mixture of elements and partly not belonging to *Causonis*. Linnaeus (1753) originally described it as *Vitis trifolia*, “VITIS foliis ternatis; foliolis subrotundis serratis. Vitis pearme doorica, foliis ternis subrotundis serratis, Raj.dendr. 68. Habitat in India” However, he did not mention any specimen except for a reference to “Raj dendr. 68” which was evidently based on Petiver (1702), consequently Shetty and Singh (1988) designated “Petiver 67” (BM-SL) as the neotype. Trias–Blasi *et al.* (12) have rightly pointed out that the neotype should

more accurately be referred to as “*Samuel Brown 67*” as he was the collector, and Petiver was the source of the bound volume at Sloane Herbarium. *Cissus carnosa* Lam. and combinations based on this name in *Cayratia* and *Vitis* were also treated as belonging to *Causonis trifolia*. The lectotype of Lamarck’s name, *Cissus carnosa* was Rheede’s illustration of “Tsjori-Valli” in *Hortus Malabaricus* (7: t.9.1688) which was a perfect match for what is currently treated as *Causonis trifolia*. However, Robert Wight and Walker Arnott (1834, 1840 probably misunderstood *C. trifolia* (= *Vitis carnosa*) as their illustration (1840. t.171) in *Icones Plantarum Indiae Orientalis* is apparently not pertaining to *C. trifolia*, instead, it belongs to the genus *Parthenocissus*. An examination of Wallich’s specimens (14) at Kew, and those cited by Wight and Arnott (9) also shows a mixture of elements partly belonging to *Causonis trifolia* and *Parthenocissus*. Lawson (13) also followed a similar broader concept by placing different elements, some of which have since been segregated (14). The present collection of *Parthenocissus* specimens by the authors from the Trichur district of Kerala perfectly agrees with the illustration by Wight and Arnott (9) and Roxburgh’s *Flora Indica* drawing (No. 541.) Moreover, some of Wallich’s collections (Barcodes K001122820, & K001122827, *Wall. Cat.* 6018, digital image! *Wall. Cat.* 6021C, digital image!) (15) and Rottler’s specimens (Barcodes K001089947, K001089948 digital images!) at K cited by Wight and Arnott (l.c.) are strikingly different from *Causonis trifolia* in having many branched tendrils tipped with adhesive discs, a character diagnostic to the genus *Parthenocissus*. However, Roxburgh’s *Flora Indica* (16) description, citation of Rheede’s plate (“vii.p.17.t.9”), and Rumphius’s (17) *Herbarium Amboinense* (5:540.f.t.166, f.2) are in corroboration with the present circumscription of *Causonis trifolia*, while the figures in Roxburgh’s *Icone* (t. 541), and Wight’s *Icone* (t.171) belongs to a hitherto undescribed *Parthenocissus* which is described here as a new species.

According to Lu *et al.* (18), “*Parthenocissus* can be easily distinguished from the other genera of Vitaceae by its highly branched tendrils, adhesive discs at tendril apices, inconspicuous floral discs and two long ventral infolds extending from the apex to the base of the seed” (4,19,20,21). Our new species satisfy above mentioned key characters of *Parthenocissus*. But unfortunately, Parmar *et al.* (22) and Trias-Blasi (23) misidentified our species as *Causonis trifolia*. Findings and descriptions of *C. trifolia* by Parmar *et al.* (22) and Trias-Blasi (23) make a puzzle among *Causonis* and *Parthenocissus* species. This paper intends to solve the puzzle of the above two genera of Vitaceae. According to Parmar *et al.* (22), *C. trifolia* shows 2-8 furcate tendrils with adhesive pads and he also suggest that the adhesive disc at the tip of the tendrils is more prominent in populations from the limestone areas. From these words, we can understand that highly branched tendrils and adhesive pads cannot be taken as the key characteristics of the *C. trifolia*. Another fact is that none of the other species of the *Causonis* genus shows these characteristics. If the genus *Causonis* shows the key char-

acter of *Parthenocissus* it will be a big question to the existence of the *Parthenocissus* genus.

## Materials and Methods

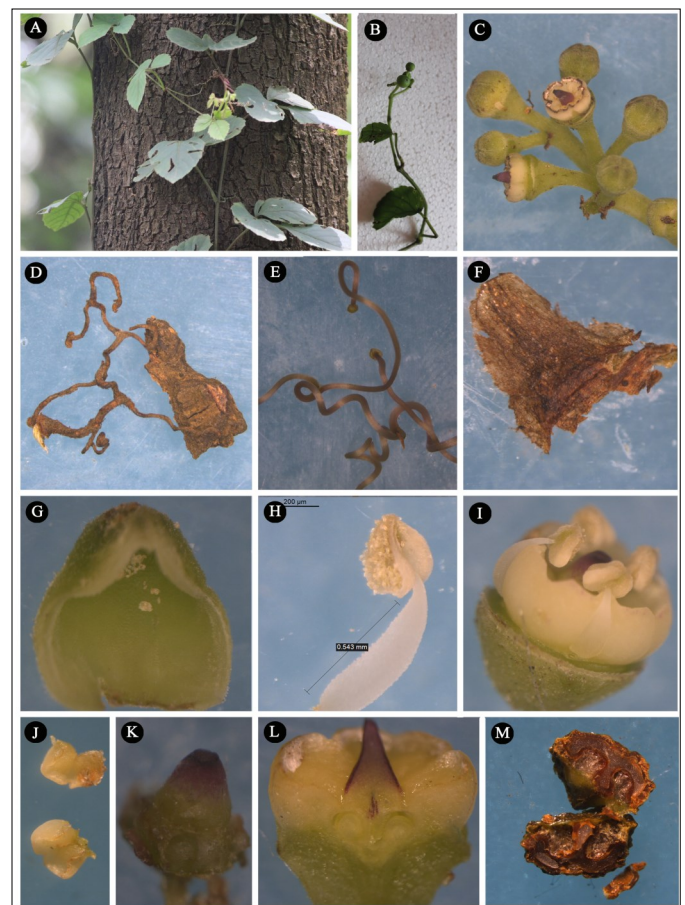
The description of the species is based on live specimens collected from different parts of Kerala. A detailed comparative morphological study was carried out with specimens of closely resembling species and by referring to herbarium specimens housed at various herbaria (BM, CALI, K, and online databases (<http://www.ipni.org>, <http://www.tropicos.org>)). Field photograph was taken with a DSLR Camera and morphological observations were made using a Leica S8AP0 stereo microscope attached to the digital camera. The acronyms of herbaria are as per Thiers (continuously updated).

## Results and discussion

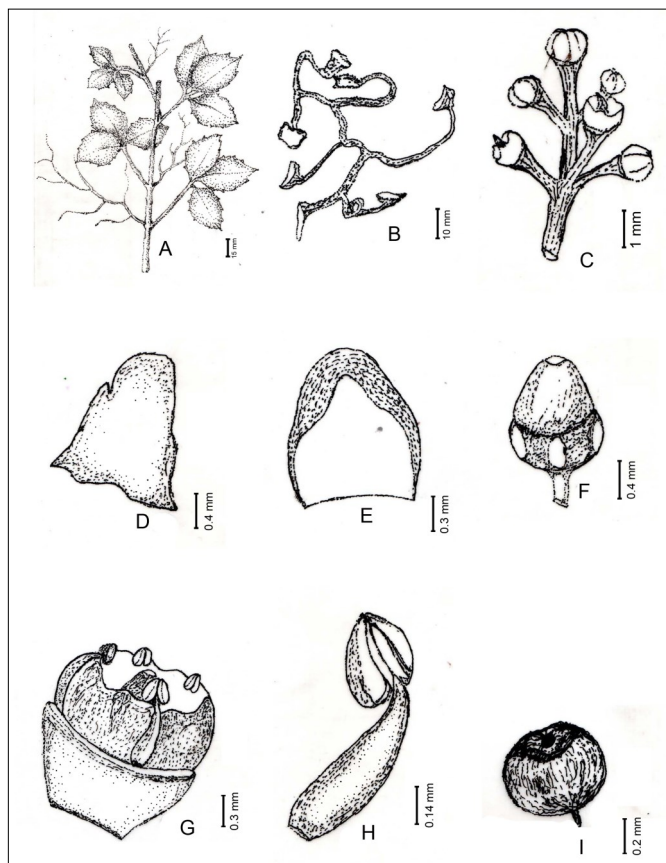
### Taxonomic Treatment

*Parthenocissus wallichianus* Anto, Nimmi & Pradeep, *sp. nov.* (Fig:1, Fig:2)

New species have terete stem, tendrils with 6–7 branches and the tip of the tendril modified as adhesive pads, extra axillary inflorescence, inflorescence length is larger than the length of the leaf, and ovary partially fused with disc. It is separated from *Parthenocissus semicordata* having tetramerous flowers and a moniliform root.



**Fig.1.** *Parthenocissus wallichianus* Anto, Nimmi & Pradeep. **A.** Habit, **B.** Branch enlarged, **C.** Inflorescence, **D.** Tendril with twig, **E.** Tendril with pad, **F.** Stipule, **G.** Petal, **H.** Stamen, **I.** Flower bud dissected, **J.** Nectariferous disc, **K.** gynoecium, **L.** Flower LS, **M.** Seed CS



**Fig.2.** *Parthenocissus wallichianus* Anto, Nimmi & Pradeep. **A.** Habit, **B.** Tendril, **C.** Inflorescence, **D.** Stipule, **E.** Petal, **F.** Gynoecium, **G.** Flower bud dissected, **H.** Stamen, **I.** Fruit

### Type

INDIA, Kerala, Thrissur District, Kayambuvum, N10°41'1", E76°23'1", 200 m, 31.07. 2018, Anto & Nimmi 102 (holo CAL! iso MH! CAL! STC!).

*Cissus carnosaauct.* Roxb., Fl. Ind.1:427.1820, ed.2, 1:409.1832, excl. cit. *Tsjori-Valli*, Rheede & Rumph., Herb. Amboinense, non Lam.1783.

*Vitis carnosaauct.* Wight & Arn., Prodr. Fl. Pen. Ind. Orient. 1:127.1834, pro parte, quoad Wallich Num. L.n., 6021c.

Robust climber. Stem terete, young stems villous, old stems rough and laterally compressed furrowed, lenticellate. Tendrils, 6–7 branched, wiry, glabrous, leaf-opposed, tips bulbous into forming attaching pads. Leaves 3-foliolate; petiole 2.5–8 cm., petiolules sub sessile to 2 cm long., terminal leaflet obovate, 5–17 × 2.5–12 cm, base rounded to oblique, apex mucronate to apiculate; lateral leaflets oblique, ovate to oblong-ovate. 5–16 × 2.5–9 cm, margin serrate, glabrous above, villous below, especially on veins, secondary veins 5–6 pairs. Stipules c.1.5 mm long, hairy. Inflorescence extra axillary, compound dichasial cyme; peduncle 6 – 8 cm, generally glabrous, pedicels 1–3 mm long, glabrous. Sepals 4, cup shaped, entire, margins sinuate, villous. Petals 4, ovate, 2–3 × 0.75–1.5 mm, coherent to the margins; early caducous. Anthers 4, ovate, 0.35 – 0.75 mm, antipetalous, dorsifixed, dithecous, introse, filaments compressed, broadened at the base, 0.54 mm long. Ovary glabrous, partially fused with a nectariferous disc. Style conical 0.4 mm long. Stigma indistinct,

hairy, violet coloured. Fruit oblate, dark purplish-black berries, 2–4seeded, 4–7 mm in diameter.

### Key to the species of *Parthenocissus* in India

- 1a. Leaves simple or 3-lobed
- 2a. Leaves 3-lobed.....*P. tricuspidata*
- 2b. Leaves simple, unlobed..... *P. renukae*
  
- 1b. Leaves palmately compound, 3 or 5-foliolate
- 3a. Leaves 5-foliolate ..... *P. quinquefolia*
- 3b. Leaves 3-foliolate..... 4
- 4a. Tendrils 8- branched, flowers pentamerous.....  
.....*P. semicordata*
- 4b. Tendrils 6–7 branched, flowers tetramerous.....  
.....*P. wallichianus*

### Flowering & fruiting

Flowering starts from June to September and fruiting from September to October.

### Etymology

The specific epithet is in honor of the great Danish-born botanist, Nathaniel Wallich (1786-1854), who collected this taxon from Peninsular India.

### Habitat

Occurs in the moist deciduous forest along with trees such as *Acacia auriculiformis* A. Cunn. ex Benth., *Mangifera indica* L., *Getonia floribunda* Roxb. and *Borassus flabellifer* L. subshrubs such as *Ageratum conyzoides* L and *Mesosphaerum suaveolans* (L.) Kuntze.

### Conservation status

Data deficient

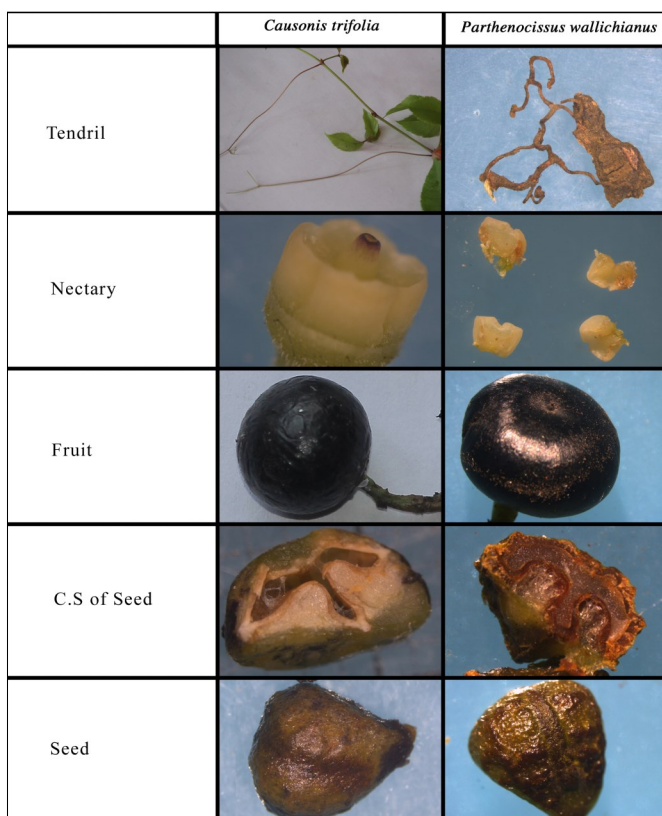
### Conclusion

This new taxon was previously confused with *Causonis trifolia* (L.) Mabb. & J. Wen (also with names in combinations with genera such as *Cayratia* and *Cissus* based *Vitis trifolia* L.) although it possesses extra axillary inflorescences and a 6–7branched tendril with adhesive pads at its tip, are the diagnostic characters of the genus *Parthenocissus*. We have studied *Parthenocissus wallichianus* for the past 5 years. According to us our species morphologically (Table 1, Fig 3) and palynologically (Fig 4) differs from *C. trifolia*. The SEM study of pollen grains re-

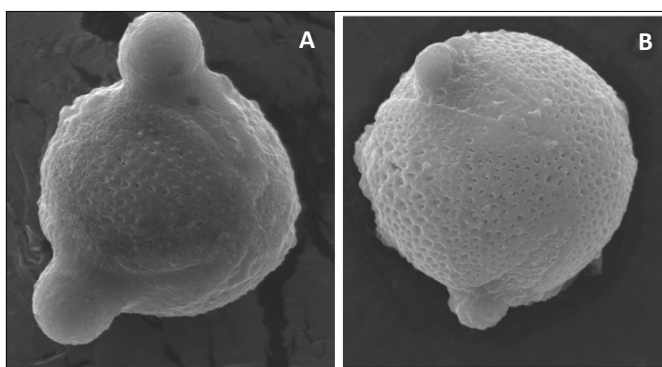
**Table 1.** Difference between *Parthenocissus wallichianus* and *Causonis trifolia*

	<i>P. wallichianus</i>	<i>C. trifolia</i>
Altitude	Above 100 m	Below mean sea level
Habitat	Moist deciduous forest	Mangroves and sea shore areas
Tendril	Tendril branches 6 or 7 with adhesive pad at tip and ≤10 cm long	Tendril branches 3 without adhesive pad and ≥10 cm long
Climbing pattern	Climbing on host with coiled tendril and sticking pads	Climbing on host with coiled tendrils.

Inflorescence length	Shorter than petiole	Longer than petiole
Nectariferous disc	Present, four distinct lobed	Absent
Fruit shape	Oblate	Globose
Seed	Rough	Smooth
Ruminate endosperm	m-shaped	T-shaped



**Fig. 3.** Difference between *Causonis trifolia* and *Parthenocissus wallichianus*



**Fig. 4.** Pollen grains of **A.** *Causonis trifolia*, **B.** *Parthenocissus wallichianus*

veals that both are tricolporate. But they differ from each other in lateral lobes > 8-micrometer length, colpi width > 6micrometer and heteropolar in *C. trifolia* and lateral lobes < 5-micrometer length, colpi width 10 micrometer and isopolar in *P. wallichianus*.

### Acknowledgements

The authors are thankful to scientists of the herbarium database division of the Royal Botanic Garden, Kew, and BM. The authors are thankful to DST-FIST funded SIFC Department of Botany and Zoology St. Thomas College (Autonomous), Thrissur, STIC CUSAT, for their assistance.

### Authors contributions

NCD contributed in plant collection, workout and drafting, APV in plant collection and identification and AKP as Taxonomy expert

### Compliance with ethical standards

**Conflict of interest:** We declare that there is no financial/commercial conflict of interest

**Ethical issues:** None.

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