Vaccinium carmesinum (Ericaceae), a new species of blueberry from Mt. Tago Range, Mindanao Island, Philippines

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Abstract

Vaccinium carmesinum is described as a new species of Ericaceae from Mt. Tago Range, Mindanao Island, Philippines. It is similar to V. platyphyllum Merrill and V. luzoniense S.Vidal but is distinct from the former by longer and wider leaves, longer racemes, longer bracts, glabrous corollas, and glabrescent fruits, and from the latter by longer petioles, leaf glands distributed along the blade margin, glabrous rachis, and lanate filaments. Vaccinium carmesinum bears the widest leaves among Philippine Vaccinium. Its discovery increases the number of Vaccinium species recognized in the Philippines to 37.

Key words: Mindanao, Pantaron Mountain Range, Vaccinieae, volcanic-igneous

Introduction

Vaccinium Linnaeus (1753: 349) (Vaccinieae: Vaccinioideae) is one of the most species-rich genera in the family Ericaceae, estimated to comprise ca. 450–500 species distributed around the world except in Antarctica and Australia (Sleumer 1966–1967; Argent 2014). The floristic region of Malesia is considered to be the center of diversity of the genus (Sleumer 1966–1967) with species generally inhabiting montane forests (Argent 2018), particularly mossy forest, on exposed mountain ridges or summits. Although the genus is diverse, its taxonomic limits are still uncertain (Argent 2008; Frisch et al. 2020). Evidence of its monophyly has not been resolved (Vander Kloet & Dickinson 2009) with the current phylogenetic data based on DNA sequences strongly suggesting nonmonophyly (Kron et al. 2002).

The island of Mindanao is the largest southern island in the Philippines and is known to harbor great biodiversity and species endemicity (Amoroso et al. 2019). Within this island lies Mt. Tago Range—a component of the central cordillera of Mindanao Island separating the provinces of Bukidnon in the west and Agusan del Sur in the east (Gronemeyer et al. 2019).
2014). This mountain range is part of the ancestral land of the Higaonon tribe and is considered a terrestrial Philippine Key Biodiversity Area (KBA) that supports the Tagoloan River watershed spanning the provinces of Bukidnon and Misamis Oriental (BWPDC 2012). Mt. Tago Range harbors one of the remaining intact forests in Northern Mindanao. However, it is currently not legally protected (Coritico et al. 2020a) and is relatively unexplored because of political instability (Lagunday et al. 2017; Lagunday & Amoroso 2019). Nonetheless, documenting and collecting the flora of this range has been successful (Coritico et al. 2020a, b). Preliminary data from this work demonstrate that the range boasts a high degree of biodiversity and endemism. For example, many of the new Philippine *Nepenthes* (Linnaeus 1753: 955) species discovered and described during the past decade were discovered in this range (Gronemeyer et al. 2011a, b, 2014; Lagunday et al. 2017; Lagunday & Amoroso 2019).

Previous fieldwork aimed at collecting specimens in botanically unexplored areas of the Philippines has led to the discovery of several new *Vaccinium* species (e.g. Salares et al. 2018; Fritsch et al. 2020; Tamayo et al. 2021). These discoveries have demonstrated that Philippine *Vaccinium* contains a higher species diversity than previously understood. Presently, 36 species of *Vaccinium* are recognized for the Philippines (Pelser et al. 2011 onwards; Tamayo et al. 2021). However, many of these need further taxonomic study, as half of the Philippine *Vaccinium* species are rare and often known only from the type locality (Vander Kloet 1996).

During fieldwork in Mt. Tago Range (2014–2019) as part of botanical survey projects, a species of *Vaccinium* with a scrambling habit, notably wide leaves, and lustrous white flowers was vouchered. The specimen was compared with other similar species and based on detailed study of its vegetative and floral characters it is concluded that the specimen represents an undescribed taxon. Here we describe this new species under a morphological species concept (Cronquist 1978) and provide an illustration and photographic images of the living plants. This discovery raises the number of species of *Vaccinium* documented in the Philippines to 37.

**Materials and Methods**

Dried herbarium specimens and *in situ* photographs of the plant were used as the basis for the description. Microscopic details were described with the use of an AmScope stereomicroscope of up to 64× magnification. Herbarium specimens from A, BRIT, CAS, and K were also studied for comparison. The taxonomic works of Copeland (1930), Sleumer (1966–1967), Argent (2008), and recent Philippine *Vaccinium* literature (Co et al. 2002; Salares et al. 2018; Fritsch et al. 2020; Tamayo et al. 2021) were consulted to ensure the uniqueness of the species and to compare it with the other known species of *Vaccinium* in the region.

**Taxonomic Treatment**

*Vaccinium carmesinum* M.N.Tamayo & P.W.Fritsch, *sp. nov.* (Figs. 1–2)

_Type:_—PHILIPPINES. Mindanao Island, Bukidnon Province, Municipality [City] of Malaybalay, Barangay Kibalabag, Mt. Limbawon, [Mt. Tago Range,] accessory trail to peak, 8.26217°N, 125.18055°E, 1546 m elevation, 10 June 2019, *Plants and Lichens of the Southern Philippines Survey 611* (holotype PNH!, isotypes A!, BRIT BRIT572077!, CAS!, CMUH!, NY!).

_Paratypes:_—PHILIPPINES. Mindanao Island: Province of Bukidnon, Municipality [City] of Malaybalay, Barangay Kibalabag, Mt. Limbawon, [Mt. Tago Range,] open area with *Pandanus*, 8.26217°N, 125.18055°E, 1546 m elevation, 10 June 2019, *Plants and Lichens of the Southern Philippines Survey 611* (holotype PNH!, isotypes A!, BRIT BRIT572077!, CAS!, CMUH!, NY!).

_Diagnosis:_—*Vaccinium carmesinum* resembles *V. platyphyllum* Merrill (1917: 294) and *V. luzoniense* S.Vidal (1886: 168), but differs from the former by longer and wider leaves, longer racemes, longer bracts, glabrous corollas, and glabrescent fruits, and from the latter by longer petioles, leaf glands distributed along the length of the blade margin, a glabrous inflorescence rachis, and lanate filaments.
**FIGURE 2.** *Vaccinium carmesinum*. **A, B.** Flowering branchlet. **C.** Leafy branchlet. **D.** Inflorescences showing flower buds and foliaceous bracts. **E.** Longitudinal section of flower showing corolla, style and stamens. **F.** Immature fruits. Photographs: **A, D** by DSP; **B, E, F** by MAKP; **C** by DNT.
Description:—Terrestrial leaning shrub or tree, evergreen, 2–5 m tall, sparsely branched. Branchlets glabrous, red when young, grayish brown at maturity, terete, 3–8 mm wide, lenticellate; perennating buds compressed-ovoid, 1.5–2.5 mm long; bud scales overlapping with minutely ciliate margins. Leaves persistent on older branchlets, spirally and evenly arranged, slightly overlapping, internodes 1–5 cm long; petiole crimson red, in cross section rounded abaxially and slightly raised adaxially, 10–18 × 1–5 mm, glabrous; lamina broadly elliptic, ovate, or rarely subrounded, with the larger leaves on each branchlet 7–15 × 0.4–9 cm, coriaceous, both surfaces reddish when young turning pale green abaxially and glossy adaxially, in sicco both surfaces light brown to ferrugineous, without punctae, glabrous; midvein flattened or sunken adaxially, strongly raised abaxially, secondary veins 3 or 4 on each side of midvein with first pair arising from base and remainder along midvein, arc-ascending, abaxially raised, adaxially sunken, tertiary veins faintly evident or obscure, base cuneate to truncate, margin entire, weakly revolute, apex slightly acuminate, first pair arising from base and remainder along midvein, arc-ascending, abaxially raised, adaxially sunken, tertiary veins faintly evident or obscure, base cuneate to truncate, margin entire, weakly revolute, apex slightly acuminate.

Distribution and Habitat:—Vaccinium carmesinum is endemic to two mountains (Mt. Kiamo and Mt. Limbawon) in Mt. Tago Range, Mindanao, growing in tropical lower montane rainforest to upper montane rainforest. Populations of V. carmesinum were mostly found near summits where they thrive on volcanic-igneous or clay substrate with abundant humus. They also occur in areas of open shaded mossy forests, or on ridges covered in heathland scrub. Paratypes of the new species were collected on ca. 10–30% west-facing slopes.

Etymology:—The epithet carmesinum is derived from the Greek word for crimson (blood red), as depicted by its crimson red petioles, floral bracts, peduncle, rachis, pedicels, hypanthium, and calyces. Moreover, a crimson red stain is extracted in notable quantity when the plants are soaked in a denatured alcohol solution.

Phenology:—Flowering in June. Fruiting from January to May.

Proposed Conservation Status:—Mt. Tago Range has not been extensively explored botanically, which results in uncertainty as to the conservation status of the species. This range is a non-protected area; thus, the extent of occurrence and area of occupancy for the species cannot be assessed. There are only two populations currently known. Hence, we recommend a conservation status of data deficient (DD) (IUCN Standards and Petitions Committee 2019).

Discussion:—In its combination of morphological characters, Vaccinium carmesinum matches no other species treated in relevant taxonomic treatments. In the artificial key to the species of Philippine Vaccinium (Copeland 1930), V. carmesinum keys to V. platyphyllum. The new species differs from V. platyphyllum by having longer and wider leaves (7–15 × 0.4–9 cm vs. 11–14 cm × 5–7 cm), longer racemes (6–8 cm vs. 4–6 cm), longer bracts (6–15 mm vs. ca. 8 mm), longer pedicels (3.5–15 mm vs. ca. 8 mm) that are glabrous (vs. slightly pubescent) and ebracteolate (vs. bracteolate), a glabrous (vs. sparsely pubescent) corolla outside, longer anthers (2.0–2.3 mm vs. ca. 1.5 mm), and longer (4.0–6.0 mm vs. ca. 3 mm) and glabrescent (vs. pubescent) fruits (Merrill 1917).
Vaccinium carmesinum can be distinguished from all other species of Philippine Vaccinium by its leaves, which are the widest of any Vaccinium in the Philippines. The pedicels are also notably ebracteolate and have 0 to 2 globose glands near the base or occasionally on the apical half. These glands might be homologous with bracteoles (typically two per pedicel in Vaccinium) with a reduction in size and/or number. Copeland (1930) mentioned pedicel glands in V. luzoniense. Unfortunately, this character was not thoroughly described for the other Philippine species in former publication where the absence of bracteoles in a specimen is noted as “unobserved” (i.e. Sleumer 1966–1967).

Vaccinium carmesinum is a member of V. section Bracteata Nakai in Nakai & Koidzumi (1927: 234) sensu Sleumer (Sleumer 1966–1967) as based on the combination of many-flowered racemose inflorescences, caducous foliaceous bracts, absence of a membranaceous wing at the sinuses of the corolla, and anthers that open by short intorse slits or terminal pores (Sleumer 1966–1967; Co et al. 2002; Salares et al. 2018). In Sleumer’s (1966–1967) key to the Malesian V. section Bracteata, V. carmesinum keys to V. luzoniense. Vaccinium carmesinum differs from V. luzoniense, however, by having longer petioles (10–18 mm vs. ca. 10 mm), longer and wider leaves (7–15 × 0.4–9 cm vs. 7–9 cm × 3–4.5 cm), with leaf glands distributed along the length of the leaf margin (vs. with merely a pair of glands near the base), glabrous rachis (vs. with capitulate-glandular trichomes), white (vs. red) corollas, and densely lanate (vs. sparsely pubescent) filaments (Vidal 1886; Copeland 1930).

In the key to the Bornean species of Vaccinium (Argent 2018), V. carmesinum keys to V. sarawakense subsp. montanum Argent (2018: 108) but differs from it by having an inflorescence with fewer flowers (10- to 12-flowered vs. 7- to 20-flowered), glabrous rachis (vs. densely covered by short brown curved glandular trichomes), calyx lobes with a sessile terminal gland (vs. absent), white (vs. pale pink) corollas, and the absence of anther spurs (vs. presence).

In the sectional treatment of Vaccinium (Vander Kloet and Dickinson 2009), V. carmesinum can be treated as a member of V. section Euepigynium Schlechter (1919: 174) by its evergreen habit, monomorphic perennating buds, each with more than two scales, one perennating bud per leaf axil, plinerved leaf blade venation, entire leaf blade margin, peduncle longer than pedicels, calyx tube completely fused to the ovary, and pseudo-10-locular ovary. However, the boundaries of V. section Euepigynium and other sections of Malesian Vaccinium delimited by Vander Kloet and Dickinson (2009) were vaguely defined (i.e. the species included in each section are not provided). Hence, the sectional limits of Vaccinium in Malesia need further study.

During the process of diagnosing Vaccinium carmesinum as distinct from other Philippine species, we have become cognizant of problems in the taxonomy of the Philippine species. For example, V. ilocanum Merrill (1919: 441) and V. rizalense Merrill (1925: 43) were synonymized under V. platyphyllum by Copeland (1930) but characters seem divergent among these species and the justification relied mainly on macroscopic characters. A detailed study of this complex is currently in progress with emphasis on, e.g., ovary indumentum, corolla surfaces, and stamen characters.

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**Vaccinium Carmesinum**

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APPENDIX 1. Additional *Vaccinium* specimens examined for morphological comparison.

*Vaccinium luzoniense* S.Vidal. PHILIPPINES. Luzon Island: Province of Benguet (District of Lepanto), S. Vidal 1535 (holotype K K000780748!).