A NEW SPECIES OF DEGENERIA (DEGENERIACEAE) FROM THE FIJI ARCHIPELAGO

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The Degeneriaceae have long been of interest to plant systematists, biogeographers, and paleobotanists as "living fossil" magnoliid trees. Recent collections of flowering material from the island of Vanua Levu, in the Fiji Archipelago, South Pacific Ocean, reveal extraordinary departures from the floral morphology of Degeneria vitiensis. Self-perpetuating populations of Degeneria that bear striking pinkish, rose, and magenta flowers, and fruits half as large as those of D. vitiensis, are recognized as a new species of Degeneria.

Historically regarded as monotypic, the family Degeneriaceae has long been of interest as a possible "living fossil" group within the angiosperms (Takhtajan, 1969). The only known species at that time was Degeneria vitiensis I. Bailey & A. C. Smith, described in 1942. This peculiar plant has been a focus of study by plant morphologists, anatomists, systematists, phylogenists, paleobotanists, and biogeographers in their attempts to understand the origin and history of flowering plants.

The Degeneriaceae combine a number of primitive features that have sparked considerable debate (Thorne, 1974; Cronquist, 1981), including carpels believed to be unsealed, whorled perianths, laminar microsporophylls, multilacunar nodal anatomy, anasulcate pollen, and polycotyledony (Bailey & Swamy, 1951; Takhtajan, 1954, 1969; Dahl & Rowley, 1965; Takhtajan & Meier, 1976; Endress, 1984). Until now, the monotypic Degeneria vitiensis has been thought to exhibit only modest variation in floral morphology and coloration (Smith, 1981).

During the course of my studies, flowering material has been collected from the island of Vanua Levu for the first time in January (J. M. Miller 1075, 1084). Earlier collections that I have studied from the Wainunu River catchment on this island (A. C. Smith 1754, DA 15773) and from trees collected on the island of Taveuni (A. C. Smith 8200, DA 16937) are sterile or have only buds or fruits. Therefore, important floral differences with Degeneria vitiensis were not seen by Professor Smith or collectors associated with the Fiji Department of Agriculture. This is understandable in view of the seasonality of flowering and the relative inaccessibility of the flowers, which generally occur high in the canopy (Smith, 1981).

The primary purpose of this paper is to describe these heretofore-unknown...
floral differences of the self-perpetuating *Degeneria* populations on the island of Vanua Levu. A fuller account of past literature, coupled with studies on the morphology, biogeography, and basic biology of *Degeneria*, will appear in a separate work.
Degeneria roseiflora J. M. Miller, sp. nov.

A Degeneria vitiense in cortex fulva vel cinnamomea floribus et petalis parvioribus petalis roseis vel purpureis staminodiis 5–11 apice purpureis microsporophyllis atropurpureis different.

Trees up to 30 m in height, with tan to cinnamon-colored bark; vegetative parts otherwise as in Degeneria vitiensis. Flowers 20–40 mm in diameter, pinkish white to rose to magenta, with fragrance similar to that of musty rose. Sepals 3, 5–6 mm long. Outer petals pinkish to magenta; inner ones in several whorls, 16–24 × 5–12 mm, pinkish white to magenta. Microsporophylls purple, 7 × 2 mm. Staminodes 5 to 11, in 2 whorls, 8 × 2 mm, purple distally. Fruits kidney shaped, less than 6 cm long, bearing orange or reddish seeds.

Type. Fiji, Vanua Levu, Macuata Province, central spine of island between catchments of Wailevu and Dreketi rivers, J. M. Miller 1075 (holotype, A; isotypes, K, NSW, RSA, SUVA).

Additional specimens examined. Fiji. Vanua Levu. Bua Province: lower Wainunu R. valley, A. C. Smith 1754 (SUVA); N of Cogea, Wainunu R., DA 15773 (SUVA). Cakaudrove Province: Nacewa Peninsula, in drainage of Navonu R., J. M. Miller 1158 (SUVA), 1161 (SUVA); Wailevu distr., drainage of Navilagolago R., J. M. Miller 1167 (SUVA); between Keka and Vatuvonu, J. M. Miller 1200 (RSA); Yanawai R. region, 41 km W of Transinsular Hwy., J. M. Miller 1188 (RSA, SUVA). Macuata Province: slopes of Delaikoro, J. M. Miller 1084 (RSA, SUVA), TAVEUNI: slopes of Mt. Manuka, E of Wairiki, A. C. Smith 8200 (SUVA); Qacavulo Estate, DA 16937 (SUVA).

The Vanua Levuan name for Degeneria roseiflora is “karawa.” The species is a class-III noncommercial timber tree frequently cleared for cattle schemes and as a source of cooking fuel, but individuals seem to persist in logged forest even after preplantation thinning and restocking with Swietenia and Cordia.

KEY TO THE SPECIES OF DEGENERIA

Flowers pinkish white to magenta, 20–40 mm in diameter; microsporophylls rich purple; staminodes 5 to 11, in 2 whorls, distally purple; fragrance of musty Rosa; fruits generally less than 6 cm long; bark cinnamon-brown or light gray; Vanua Levu and Taveuni. .......................................................... D. roseiflora.

Flowers white to light beige, 40–80 mm in diameter; microsporophylls white to beige, rarely purple; staminodes 9 to 15, in 2 or more whorls, distally brown and coated with brilliant yellow exudate (rarely streaked with pink); fragrance of Cananga odorata; fruits generally 6–12 cm long; bark dark gray to black; mostly on Viti Levu. .......................................................... D. vitiensis.

DISCUSSION

The type species of the family, Degeneria vitiensis, was described from Degener 14537 (holotype, A), collected near Nadarivatu, in the interior of the
largest island, Viti Levu. This specimen has flowers with a well-documented morphology (Bailey & Smith, 1942; Smith, 1949). The type material is similar to other flowering collections from Viti Levu, including those illustrated in Smith (1981, fig. 1). It cannot be confused with *D. roseiflora*, as the flowers of *D. vitiensis* (see Figure 1C) are up to twice as large (see Figure 1A, B) and are white to light beige. *Degeneria vitiensis* has beige (rarely purple) microsporophylls, and two or more whorls of staminodes that are sometimes streaked with (rarely wholly) pink and are coated with bright yellow exudate. On the other hand, microsporophylls of *D. roseiflora* are rich purple; the staminodes have purple tissue and are not coated with yellow exudate. The bark of *D. vitiensis* is black or dark gray, while that of *D. roseiflora* is generally cinnamon-brown but sometimes light gray. The fruits of *D. vitiensis* are generally much larger than those of *D. roseiflora* (6–12 vs. 6 cm or less in length). *Degeneria vitiensis* flowers October to January; *D. roseiflora*, January to March.

So far as is presently known, *Degeneria roseiflora* occurs on the islands of Vanua Levu and Taveuni (see Map 1). It is a common species with a patchy distribution on the central spine and plateau of Vanua Levu, being generally more abundant on the older volcanic formations in the zone of tropical forest.

Many other genera of Fijian plants contain distinct but related endemic species, of which one occurs on Viti Levu and the other on Vanua Levu; examples include *Polyalthia angustifolia* A. C. Smith/*P. amoena* A. C. Smith and *Cyathocalyx insularis* A. C. Smith/*C. stenopetalus* A. C. Smith (Annonaceae), *Elatostema filicoides* (Seemann) Schröter/E. comptonioides A. C. Smith
(Urticaceae), *Elaeocarpus subcapitatus* Gillespie/ *E. laurifolius* A. Gray (Elaeocarpaceae), *Melochia mollipila* A. C. Smith/M. *grayana* A. C. Smith (Sterculiaceae), *Glochidion gillespiei* Croizat/G. *multilobum* A. C. Smith, and *Maca-ranga magna* Turrill/M. *membranacea* Muell. Arg. (Euphorbiaceae). In *Endospermum* (Euphorbiaceae) a completely distinct species (*E. robbieanum* A. C. Smith) occurs only on Vanua Levu, being restricted to central and western parts of the island, while the principally Viti Levuan *E. macrophyllum* (Muell. Arg.) Pax & Hoffm. is sparingly sympatric (Smith, 1981). Other examples are well documented (Smith, 1979, 1981, 1985). The two islands are separated by water hundreds of meters deep and may never have been connected, even during the glacial maxima when mean sea levels were much lower than at present. I presume that speciation took place on Vanua Levu among early colonizers of *Degeneria vitiensis*, possibly dispersed over a relatively short distance there from Viti Levu or another, now submerged source, by endemic pigeons, parrots, or fruit doves that eat the seeds. Alternatively, the floral and fruit reductions seen in *D. roseiflora* may be due to long-term reproductive isolation and neotenic evolution, which could have occurred as a result of the original pollinator not being dispersed to the island of Vanua Levu with the colonizing populations of *Degeneria*.

The oldest rocks on Vanua Levu have been dated at ~7.5 million years (Rodda & Kroenke, 1984). If this radiometric age is any indication of the actual age of the island, then relatively recent dispersal and subsequent speciation is a possibility. Alternatively, *Degeneria roseiflora* may be the harmonic remnant of a more widespread and ancient species of *Degeneria* that existed in forests of the now-fragmented Vitiaz Island Arc. According to Rodda & Kroenke (1984), portions of the Vanuatu and Fijian archipelagoes were once part of the Vitiaz Island Arc that existed during the Miocene epoch. If this is true, then relictual *Degeneria* may possibly occur on the older rock formations of Vanuatu, provided that these islands were not ravaged by cataclysmic volcanism in the past.

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