

*DIMORPHANTHERA* (F.MUELL. EX DRUDE) F.MUELL. –  
ERICACEOUS GEMS FROM NEW GUINEA AT THE ROYAL  
BOTANIC GARDEN EDINBURGH

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ABSTRACT

The Royal Botanic Garden Edinburgh (RBGE) holds major collections of plants from the family Ericaceae. One of the smaller genera within the collections in the glasshouses at Edinburgh is *Dimorphanthera* (F.Muell. ex Drude) F.Muell. A brief introduction and history is given for the genus *Dimorphanthera* along with an outline of the literature, a summary of its distribution, an overview and history of the collections at RBGE and cultivation notes.

INTRODUCTION

As a glasshouse horticulturist at RBGE one has the opportunity to look after a range of specialist collections which are cultivated (Conlon, 2010). There is also an opportunity to research and find out more about these often under-studied and little-known plants, some of which have great horticultural merit (Fig. 1). The particular collections under the author's care include the tropical montane Ericaceae of Southeast Asia. Most of the plants in these collections are *Rhododendron* species in the subgenus *Vireya* (Argent, 2006) or section *Vireya* (Craven *et al.*, 2008), depending on which of these authorities is followed. These are referred to as 'Vireya rhododendrons' or 'vireyas'. There are also smaller collections often collected from the same ecological habitats as the *Rhododendron* in other genera such as *Diplycosia*, *Vaccinium*, *Agapetes* and *Dimorphanthera*. This paper will provide information on the genus *Dimorphanthera*.

*Dimorphanthera* is a genus of plants that occurs mainly on the island of New Guinea, in the biogeographical region of Malesia (Davis *et al.*, 1995). Taxonomically, it lies within subfamily Vaccinioideae in the family Ericaceae.

HISTORY

*Dimorphanthera* was named for the first time in 1890 by Baron Sir Ferdinand Jakob Heinrich von Mueller (1825–1896), a German-born Australian physician, geographer and botanist who rose to the ranks of Director of Melbourne Botanic Gardens (1857–1873) (Muir, 1994). He is well remembered for introducing the blue gum, *Eucalyptus globulus* Labill., around the world.

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Fig. 1 *Dimorphanthera elegantissima* K.Schum. growing at RBGE. Photo: Tony Conlon.

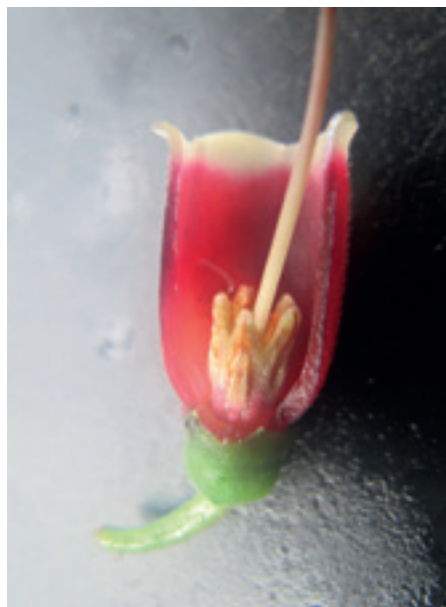


Fig. 2 Dimorphic anthers of *Dimorphanthera robbinsii* Sleumer. Photo: Tony Conlon.

The name *Dimorphanthera* comes from the Greek *dimorphos* (two-formed) and *anthera* (anther), referring to the almost woody dimorphic anthers (Fig. 2) (Quattrocchi, 2000). This trait makes it morphologically distinct from its close relatives *Agapetes*, *Vaccinium* and *Paphia* between which there has been some taxonomic confusion in the past (Stevens, 1974; 2003/4).

#### LITERATURE

After the formal naming of the genus by F. von Mueller in 1890 (Mueller, 1890) – it had also been used in synonymy in 1886 but there is ambiguity over this – the next person to do any major work on the genus was J.J. Smith, a prolific collector especially of Orchidaceae and Ericaceae in Malesia, particularly in Java, the Moluccas (Maluku Islands, also known as the Spice Islands) and Sulawesi (Celebes), who between 1912 and 1936 named about 19 new species. Herbert Fuller Wernham, a worker at the British Museum (Natural History), published three new species in 1916. Friedrich Schlechter, another prolific plant explorer, added seven new species in 1918 (Missouri Botanical Garden, 2010). Hans Sleumer, who worked out of Leiden and was a major player in the world of Malesian Ericaceae, was the next significant person, publishing about 39 new names in *Dimorphanthera* between 1939 and 1963 and producing an account in *Flora Malesiana* (Sleumer, 1961; 1963; 1967). Peter Stevens, a researcher and professor at Missouri, then did the bulk of the more recent molecular work, adding about 24 new

species between 1974 and 2004 (Missouri Botanical Garden, 2010), whilst notably transferring Sleumer's *Vaccinium* section *Pachyantha* into *Dimorphanthera*. Patrick Woods of RBGE added three new species in 1984 in an article that introduced *Dimorphanthera* to a wider audience (Woods, 1984a) as a subject for the temperate greenhouse; George Argent and Maureen Warwick (Argent & Warwick, 1989), also of RBGE, added a new species from Seram in the Moluccas, *D. seramica* Argent & M. Warwick (Fig. 9). As it stands today, after taking into account synonymy and the various changes made over the years, there are about 87 currently accepted taxa (Stevens, 2003/4) of the approximately 116 names that have ever been published in *Dimorphanthera*.

#### DESCRIPTION AND IDENTIFICATION

Of the 100 or so species that have ever been described, the genus contains shrubs, large lianas and occasionally small trees, often with a thickened stem base and roots. Their habit is commonly epiphytic whilst also being climbing, scandent or scrambling. Leaves can range from as small as  $1.5 \times 0.5$ cm in the aptly named *D. microphylla* Sleumer (Fig. 3) or up to  $28 \times 13$ cm, as in *D. macleaniifolia* Wernham. Whilst the plants themselves can be less than a metre, such as *D. breviflos* Sleumer and *D. peekelii* Sleumer, some have been recorded as climbing to 30m or more, such as *D. amblyornidis* (Becc.) F.Muell. (Sleumer, 1967).



Fig. 3 *Dimorphanthera microphylla* Sleumer in cultivation at RBGE. Photo: Tony Conlon.



Fig. 4 *Dimorphanthera kempteriana* Schltr. growing at RBGE. Photo: Tony Conlon.

Generic division in *Dimorphanthera* is based on differences in the calyx and corolla shape (Argent, pers. comm.). In *Flora Malesiana* Sleumer (1967) arranged the species in three sections: *Pteridosiphon*, *Dimorphanthera* and *Trochilanthe*. Then in 1974 Stevens transferred *Vaccinium* section *Pachyantha*, creating a new section in the genus on account of the similarity of the stamens.

Flower colour can be white, through to red, orange, pink (Fig. 4), green or yellowish, or almost purple (Fig. 5), whilst the fruit tends to ripen from green to black (Fig. 6).

Pollination, or at least the visiting of the flowers by certain nectar-sucking birds (*Amblyornis inornata* Schleg. (Vogelkop gardener bowerbird), *Myzomela rosenbergii* Schleg.), has been observed (Sleumer, 1967).

*Dimorphanthera* flowers have also been known to be used for decoration by the indigenous peoples of New Guinea and for the decoration of bowerbirds' display areas (Argent, pers. comm.).

#### DISTRIBUTION AND HABITAT

The map on the facing page (Fig. 7) shows the biogeographical area of Malesia with the current known distribution of *Dimorphanthera*. The distribution lies in the tropics between  $< 15^{\circ}\text{N}$  and  $< 15^{\circ}\text{S}$  and from roughly  $120^{\circ}\text{E}$  to  $155^{\circ}\text{E}$  longitude. Although the majority of species are endemic to the island of New Guinea and its close islands





Fig. 5 *Dimorphanthera robbinsii* Sleumer in cultivation at RBGE. Photo: Tony Conlon.



Fig. 6 *Dimorphanthera amplifolia* P.F. Stevens fruit. Photo: Tony Conlon.

(Waigeu, Yapen, Goodenough, Normanby) the distribution is also shown encompassing the Bismarck archipelago (New Ireland), with a few outliers in the south-western part of the Philippines (Mindanao, Panay, Negros Islands) and the Moluccas (Buru, Ambon, Seram) between New Guinea and Sulawesi.

Most species are found in tropical montane rain forest, in the upper moss forest or forest edge with grassland (1,300–3,560m), generally between 1,000 and 3,000m, but according to Sleumer (1967) are known to exist from as low as 75m (*D. tridens* J.J. Sm.) to well over 4,000m with specimens of *D. alpivaga* Sleumer found at 4,300m in alpine meadows and savannah on Puncak Jaya or Carstensz Pyramid and Mount Carstensz, the highest summit in New Guinea (in Indonesian Papua) at 4,884m, which is the highest point between the Himalayas and the Andes (Anderson, 1976).

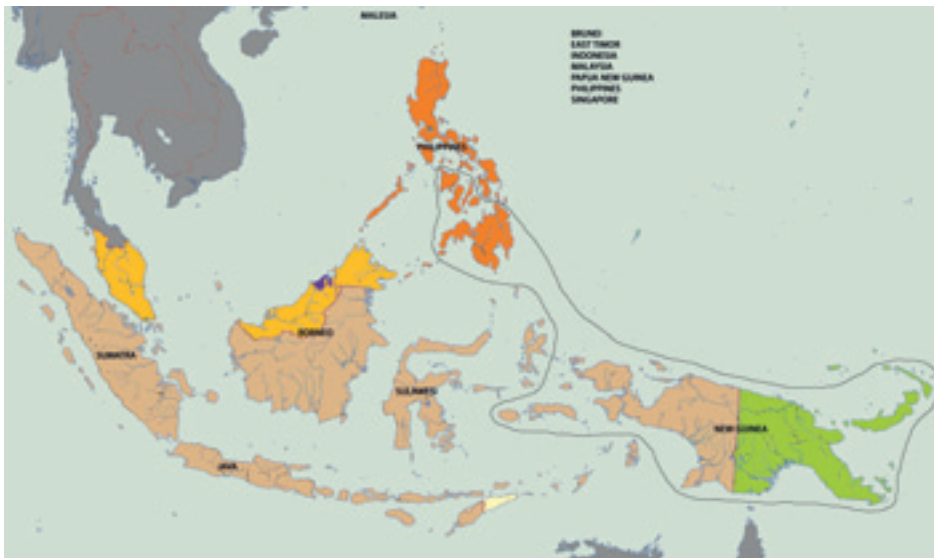


Fig. 7 Map of Malesia in Southeast Asia, showing distribution of *Dimorphanthera*. Map drawn by Tony Conlon.

Malesia has a wet equatorial climate with very varied topography. Temperatures can range from 30 to 40°C close to sea level to occasional night time frosts at higher altitudes, with permanent (but diminishing) snow cover on the top of the highest mountains, whilst humidity can often be stifling during the day with rainfall, often heavy, occurring most days.

#### THE COLLECTIONS AT RBGE

RBGE's long association with the family Ericaceae still continues today, with collections that exist both as living material and as herbarium or spirit collections. *Dimorphanthera* is not widely grown and the collections at RBGE probably represent the largest collection of living material in any botanic garden.

The majority of the plants at RBGE were collected in the 1960s and 1970s by Patrick Woods and later by George Argent, with other collections courtesy of the Department of Botany from the National Herbarium of Papua New Guinea and John Sandham, a former employee in the glasshouse department at RBGE. The first plant collections of *Dimorphanthera* were accessioned at RBGE in 1963 from collections made by Woods in 1962 from the Obaka range of mountains near the border of northern and central Papua



Fig. 8 *Dimorphanthera amplifolia* (F.Muell.) P.F.Stevens var. *gigantea* (Sleumer) P.Woods has been grown at RBGE for 50 years. Photo: Tony Conlon.



Fig. 9 Digitised image of the type specimen of *Dimorphanthera seramica* Argent & M. Warwick collected from Mount Binaia, Seram in 1987. Scan: M. Ghazali, RBGE.



Fig. 10 *Dimorphanthera amoena* Sleumer in cultivation at RBGE. Photo: Tony Conlon.



Fig. 11 *Dimorphanthera bracteata* P.F.Stevens in cultivation at RBGE. Photo: Tony Conlon.

New Guinea – this was *D. amplifolia* (F.Muell.) P.F.Stevens var. *gigantea* (Sleumer) P. Woods, and it is still growing well in the glasshouses today (Fig. 8). The most recent collections were made from Irian Jaya and Yapen Island, New Guinea in early 2009 by RBGE staff's fieldtrip (acronym ABEG) to New Guinea. As these plants have yet to flower further work is required to determine their identity.

The 58 accessions that have been introduced to RBGE have generally been brought back as plants (45) or seed (8), with seedlings (2) and cuttings (2) making up the rest. One accession has uncertain origin, while 53 accessions are still alive today and growing either behind the scenes in the research glasshouses or on display in the Montane Tropics (formerly the Peat House). These 53 accessions account for 19 different taxa, with a small number of accessions (9) still named as *Dimorphanthera* sp., representing 120 plants in total. Appendix 1 shows the origins of the current living collection. However, in the herbarium (E) about 50 different taxa are represented. Appendix 2 shows all taxa represented in the herbarium or as living plant accessions at RBGE.

Of the approximately 3 million herbarium specimens held at RBGE, there are about 230 sheets of *Dimorphanthera*. Approximately 59 of these have been catalogued (scanned and databased) and can be viewed online via the herbarium catalogue on the RBGE website (RBGE, 2010). The oldest specimens in the collection include *D. amblyornidis* var. *moorhousiana* (F.Muell.) Sleumer, which appears to have been collected around 1885 by H.O. Forbes (an alumnus of Edinburgh University) in the Sogeri Region of New Guinea, followed closely by *D. apoana* (Merr.) Schltr., collected by A.D.E. Elmer, an American botanist, in August 1909 from Mount Apo (2,954m) on the island of Mindanao, the highest point in the Philippines. A more recent collection, *D. seramica* Argent & M. Warwick, can be seen in Fig. 9. This image is a high-quality scan made as part of the ongoing 'Global Types Initiative' project which is databasing and digitising type specimens in the herbarium.

The majority of the specimens have been collected in New Guinea with others coming from the Moluccas, the Philippines and New Ireland in the Bismarck archipelago. Some of these species can also be seen as living collections in the glasshouses at



RBGE, including *D. amoena* Sleumer (Fig. 10) and *D. bracteata* P.F.Stevens (Fig. 11), both of which were collected in New Guinea.

### *Cultivation and display*

Cultivation of these plants at RBGE is based on the techniques described in *Sibbaldia* 8 (Conlon, 2010). Most are grown in plastic or clay pots, or half pots, also known as pans. They are not particularly fussy and generally seem to cope with a wide range of environmental factors. In early January 2012, when storm force winds removed over 400 panes of glass from the research and main display glasshouses at RBGE, the *Dimorphanthera* survived the sudden blast of cold air over several days until the glass was repaired. It must be noted that the temperature was unseasonably mild at the time; the damage could have been worse if the weather had been colder.

Even though *Dimorphanthera* originate from the tropics, the temperature at higher altitudes can be relatively low. For every 1,000m ascended the temperature can be assumed to fall by about 6°C. This ability to withstand fairly low temperatures partly accounts for their ease of cultivation in Edinburgh in a relatively cool glasshouse, with a night minimum temperature of 10°C. It must be remembered, however, that even though low temperatures may be tolerated overnight, the daytime temperatures and light levels in the tropics can rise quickly relatively soon after sunrise. These are not easy conditions to reproduce in the depths of an Edinburgh winter where northern European diminished light levels and low day and night temperatures prevail.

To take account of the often poor acid soils and generally epiphytic habit found in nature, the most suitable potting mix consists of a medium-sized potting bark (3–15mm) with horticultural charcoal (5–15mm) added at a ratio of 70 litres of bark to 4 litres of charcoal. To take account of the lack of nutrients in this mix, a balanced weak feed (NPK 1:1:1) is applied at half strength every two to four weeks over the summer months. Plants are potted on when required and are generally repotted annually in the spring when small, but they can stay in the same pots for three years or more when larger. However, once planted out they tolerate a variety of situations, often growing well in places where it is difficult to establish other plants.

The watering regime varies in relation to the weather conditions but in general, a daily watering using a lance suffices, covering the whole plant (not just the compost) in the summer, with an extra damping down of the surrounding areas to keep the humidity high on the hottest of days. This watering can be reduced to once a week in the winter months with only occasional damping down. Larger *Dimorphanthera* plants cope well with slightly drier conditions and can often miss a number of waterings, especially if planted in a glasshouse bed. Shading (preventing transmittance of approximately 50 per cent of natural light) is applied to the glasshouse for the spring and summer months to prevent scorching of the new foliage.

### *Propagation*

**Vegetative:** Propagation of *Dimorphanthera* requires patience. Generally, cuttings will strike from semi-ripe stem material in one to three months (with or without rooting hormone), but the time taken for them to become established can vary and will often take well over a year. Cuttings are struck in a mix of propagating bark (2–7mm) with a handful of medium vermiculite or medium-grade perlite, charcoal and chopped sphagnum moss depending on availability. The cuttings are then placed in a closed case with bottom heat and watered or misted daily as required to maintain humidity.

**Seed:** Seed can be sown in pots on a mix of small propagating bark (2–7mm) or growbark (0–6mm) which has been sterilised using boiling water. Once sown, pots can be placed in a three-quarter-closed case, with supplementary lighting, suspended on a metal grille above a reservoir of heated water (21°C) to keep humidity high with a fan at one end to encourage good air movement and ventilation.

*Dimorphanthera* have been grown at RBGE for 50 years but they do not appear to be grown in any great numbers in any other collections around the world. Although initially slow growing, once established, plants outgrow their areas and pruning is often required



Fig. 12 *Dimorphanthera kempteriana* Schltr. in the Montane Tropics Display House at RBGE.  
Photo: Tony Conlon.

in older plants. This is best done in winter but subsidiary pruning can be carried out at any time of year without major detrimental effects. Caution must be taken, though, because some species such as *D. kempteriana* Schltr. (Figs 4 & 12) flower on older wood (two years old) and therefore careful pruning is required to maintain a good show of flowers each year (Woods, 1984b).

The public displays in the Montane Tropics glasshouse have been planted in a naturalistic manner (Fig. 12), growing as they would in the wild. Some relatively large *Dimorphanthera* species can be seen here, particularly the climbers or scramblers. This provides an excellent opportunity for the public to see these plants.

#### CONCLUSION

Although the smaller genera of plants in Ericaceae are frequently overlooked, they can often show surprising horticultural worth for relatively little input. Species of *Dimorphanthera* have huge amenity value, but careful consideration needs to be given to the species selected as some become rather large. They require minimal care and attention while giving outstanding displays of flowers, often twice a year in some cases (*D. kempteriana* Schltr.; Figs 4 & 12). However, for those with less space some of the more alpine or shrubby species, such as *D. collinsii* var. *montis-wilhelmi* Sleumer, could be grown in a small greenhouse or conservatory or even simply on a windowsill.

Although new collections have been made as recently as 2009, a number of species have only been collected once or very rarely. There is still much work to be done to fully understand the complex interactions and evolutionary origins of this group. More collections of plants, herbarium specimens and DNA samples are essential for a more comprehensive understanding of these fascinating plants. I am sure there may be other gems awaiting discovery in the remote mountains of New Guinea and the many other islands associated with this continent.

#### ACKNOWLEDGEMENTS

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APPENDIX 1 CURRENT LIVE PLANT ACCESSIONS WITH COLLECTORS  
AND ORIGINS

Collector code	Collectors	No. of live accessions	Country/Island
ABEG	G. Argent, S. Barber, A. Ensoll & L. Galloway	2	Irian Jaya – New Guinea
ARG	G. Argent	16	Papua New Guinea, Philippines, Seram
LAE	Dept. of Botany, Papua New Guinea National Herbarium	3	Papua New Guinea
MSM	D. Mitchell & P. Smith	0	Irian Jaya – New Guinea
SDM	J. Sandham	4	Papua New Guinea
WOO	P. Woods	27	Papua New Guinea

APPENDIX 2 ALL TAXA AND PLANTS EVER GROWN OR REPRESENTED  
IN THE HERBARIUM AT RBGE

(N/A = not applicable)

Plant name	Living accessions	Herbarium specimens	Country/island of origin
<i>Dimorphanthera</i> sp.	Y	Y	New Guinea, Moluccas
<i>D. alpina</i>	N	Y	New Guinea
<i>D. alpina</i> var. <i>alpina</i>	N	Y	New Guinea
<i>D. amblyornidis</i>	N	Y	New Guinea
<i>D. amblyornidis</i> var. <i>amblyornidis</i>	N	Y	New Guinea
<i>D. amblyornidis</i> var. <i>moorhousiana</i>	Y	Y	Moluccas
<i>D. aff. amblyornidis</i>	N	Y	New Guinea
<i>D. amoena</i>	Y	Y	New Guinea
<i>D. cf. amoena</i>	N	Y	New Guinea
<i>D. amplifolia</i>	Y	Y	New Guinea
<i>D. aff. amplifolia</i>	Y	N	New Guinea
<i>D. amplifolia</i> var. <i>gigantea</i>	Y	Y	New Guinea
<i>D. amplifolia</i> var. <i>oblonga</i>	Y	Y	New Guinea
<i>D. amplifolia</i> var. <i>stabilipes</i>	Y	Y	New Guinea
<i>D. anchorifera</i>	N	Y	New Guinea
<i>D. aff. anchorifera</i>	N	Y	New Ireland

Plant name	Living accessions	Herbarium specimens	Country/island of origin
<i>D. apoana</i>	Y	Y	Philippines
<i>D. bracteata</i>	Y	Y	New Guinea
<i>D. brassii</i>	Y	Y	New Guinea
<i>D. brevipes</i>	N	Y	New Guinea
<i>D. calodon</i>	N	Y	New Guinea
<i>D. clemensiae</i>	N	Y	New Guinea
<i>D. collinsii</i> var. <i>collinsii</i>	N	Y	New Guinea
<i>D. collinsii</i> var. <i>montis-wilhelmi</i>	Y	Y	New Guinea
<i>D. cornuta</i> var. <i>cornuta</i>	N	Y	New Guinea
<i>D. cornuta</i> var. <i>tenuiflora</i>	N	Y	New Guinea
<i>D. decockii</i>	N	Y	New Guinea
<i>D. decockii</i> var. <i>chlorocarpa</i>	Y	Y	New Guinea
<i>D. decockii</i> var. <i>decockii</i>	N	Y	New Guinea
<i>D. decockii</i> var. <i>pubiflora</i>	N	Y	New Guinea
<i>D. denticulifera</i>	N	Y	New Guinea
<i>D. denticulifera</i> var. <i>pubens</i>	N	Y	New Guinea
<i>D. doctersii</i>	N	Y	New Guinea
<i>D. dryophila</i>	N	Y	New Guinea
<i>D. dryophila</i> var. <i>trichoclada</i>	N	Y	New Guinea
<i>D. elegantissima</i>	Y	Y	New Guinea
<i>D. elegantissima</i> var. <i>splendens</i>	N	Y	New Guinea
<i>D. fissiflora</i>	N	Y	New Guinea
<i>D. forbesii</i>	N	Y	New Guinea
<i>D. gracilis</i>	N	Y	New Guinea
<i>D. ingens</i>	Y	Y	New Guinea
<i>D. intermedia</i>	N	Y	New Guinea
<i>D. kempteriana</i>	Y	Y	New Guinea
<i>D. keysseri</i>	Y	Y	New Guinea
<i>D. lancifolia</i>	N	Y	New Guinea
<i>D. leucostoma</i>	N	Y	New Guinea
<i>D. macbainii</i>	N	Y	New Guinea
<i>D. megacalyx</i>	Y	Y	New Guinea
<i>D. microphylla</i>	Y	Y	New Guinea

Plant name	Living accessions	Herbarium specimens	Country/island of origin
<i>D. militaris</i>	N	Y	New Guinea
<i>D. pulchra</i>	N	Y	Moluccas
<i>D. robbinsii</i>	Y	Y	New Guinea
<i>D. sect. pachyantha</i>	N	Y	New Guinea
<i>D. seramica</i>	N	Y	Moluccas
<i>D. splendens</i>	N	Y	New Guinea
<i>D. vestita</i>	N	Y	New Guinea
<i>D. womersleyi</i>	Y	Y	New Guinea
<i>D. wrightiana</i>	N	Y	New Guinea
<i>D. cf. wrightiana</i>	N	Y	New Guinea

