

NINE ADDITIONAL CULTIVATED SPECIES OF ASTERACEAE FROM JAVA

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Abstract. *Asteraceae is one of the largest families in the Angiosperm. It comprises of 24,000–30,000 species which are grouped into 1,600–1,700 genera and distributed in a cosmopolitan range. Based on Backer and Bakhuizen van den Brink's 1965 works, they identified 227 species of Asteraceae in Java. Many of them are introduced species, both cultivated or naturalized. However, the cultivated species have not been recorded. The aim of this study was to provide information about new records of cultivated Asteraceae in Java. The observations were carried out in Bandung, Bogor and Sumedang, from January to March 2019. Nine additional species were discovered; species belonging to genera *Caputia* (two species), *Curio* (two species), *Kleinia* (one species), *Gymnanthemum* (one species), *Senecio* (two species) and *Tarlmounia* (one species). These species were grouped into two tribes: *Vernonieae* and *Senecioneae*. This study indicates that information on Asteraceae of Java needs to be updated.*

Keywords: *additional species, asteraceae, cultivated, Java*

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INTRODUCTION

The sunflower family or Asteraceae consists of 24,000–30,000 species that are distributed around the globe, except for Antarctica. The Asteraceae family is one of the largest families in the Angiosperm (Funk et al., 2009). As many as 227 species of Asteraceae were discovered in the Java island, with 92 species among them introduced as ornamental plants. This includes *Coreopsis grandiflora* Hogg ex Sweet, *Gerbera jamesonii* Bolus ex Hook. f., *Tagetes erecta* L. and *Zinnia elegans* L. (Backer & Bakhuizen v/d Brink, 1965). The cultivated species of Asteraceae contributes to

a high number of Asteraceae diversity in Java.

Flora of Java Vol 2 (Backer & Bakhuizen v/d Brink, 1965) is still used as the main reference to the study on Asteraceae in Java during the present time. However, updating this book is strongly needed, due to some newly discovered species that have not been added yet. Furthermore, the classifications of some genera in this book have already been changed. For example, *Eupatorium* has been separated into *Ageratina*, *Austroeupatorium*, *Ayapana*, *Bartlettina* and *Chromolaena* (King & Robinson, 1970a, 1970b, 1970c, 1970d; King & Robinson, 1971). Besides, some newly recorded species were reported from

Java in the last three years, such as *Eupatorium capillifolium* (Lam.) Small ex Porter & Britton (Irsyam & Hariri, 2016) and *Praxelis clematidea* (Griseb.) R.M.King & H.Rob. (Tjitrosoedirdjo & Wahyuni, 2018). Hence, the study aimed to provide information on other additional species of Asteraceae from Java Island.

MATERIALS AND METHODS

All of the plant materials used in this study were collected from nine urban localities in Bandung, Bogor and Sumedang, i.e. campus areas, traditional gardens, home gardens, and agritourism places. The field survey was conducted from January to March 2019. Plant materials were collected based on the exploration method (Rugayah et al., 2004). Data recorded includes collector name, collection number, morphological characters, vernacu-

lar name, plant uses and location. Information on the use of species was obtained through a personal interview during the field survey. Plant materials were preserved and observed in Herbarium Bandungense (FIPIA), School of Life Sciences and Technology (SITH), Institut Teknologi Bandung (ITB).

RESULTS AND DISCUSSION

We found nine cultivated species of Asteraceae as new records in Java (Table 1). They were grouped into 6 genera, i.e. *Caputia* (2 species), *Curio* (2 species), *Gymnanthemum* (1 species), *Kleinia* (1 species), *Senecio* (2 species), and *Tarlmounia* (1 species). The species have not been recorded within the Flora of Java Vol. 2 (Backer & Bakhuizen v/d Brink, 1965). The updated keys to the tribes and a key to the additional species are presented below:

An updated key to the Senecioneae of Java (modified from Backer & Bakhuizen v/d Brink (1965))

- 1 A. Involucral bracts ecalyculate..... *Emilia*
B. Involucral bracts calyculate..... 2
- 2 A. Style-arms appendaged..... 3
B. Style-arms unappendaged..... 6
- 3 A. Capitula homogamous..... 4
B. Capitula heterogamous..... *Erectites*
- 4 A. Leaves entire, glabrous..... *Kleinia*
B. Leaves lobed to parted, pubescens to glabrous..... 5
- 5 A. Corolla at the base rather abruptly widened, style arms tapering to the apex, hairy..... *Gynura*
B. Corolla gradually widened into the limb, style arms with a truncate and subpenicillate apex..... *Crassocephalum*
- 6 A. Leaves fusiform..... *Curio*
B. Leaves otherwise..... 7
- 7 A. Capitula arranged in paniculate cyme, corymbiform cyme, or a simple panicle..... *Roldana*
B. Capitula arranged in corymbs or thyrses..... 8
- 8 A. Capitula large, phyllaries 8–13, achenes ellipsoid-oblong to fusiform-ellipsoid..... *Caputia*
B. Capitula small, phyllaries 5–22, achenes cylindric..... *Senecio*

An updated key to the Vernoniaceae of Java (modified from Backer & Bakhuizen v/d Brink (1965) and Ghafoor (2015))

- 1 A. Plants scrambling, capitula arranged in thyrsoid..... *Tarlmounia*
B. Plants erect or suberect, capitula solitary, or arranged in clustered, spike, or corymb...
..... 2
- 2 A. Pappus consisting of scales, or cup-shaped or wanting..... 3
B. Pappus consisting of numerous bristles..... 5
- 3 A. Capitula large, c. 4 cm wide, outer involucre bracts foliaceous..... *Stokesia*
B. Capitula rather or very small, outer involucre bracts not foliaceous..... 4
- 4 A. Capitula sessile, achenes curved, pappus cup-shape..... *Struchium*
B. Capitula shortly pedunculate, achenes obpyramidal, pappus wanting..... *Ethulia*
- 5 A. Capitula consists of 4 flowers..... 6
B. Capitula consists of many flowers..... 7
- 6 A. Leaves usually basal, rosulate, capitula fascicled on the apices of shoot.....
..... *Elephantopus*
B. Leaves mostly cauline, alternate, capitula fascicled in racemose-spicate in the axil of
small cauline leaves..... *Pseudelephantopus*
- 7 A. Capitula with foliaceous bracts at the base..... *Centratherum*
B. Capitula without foliaceous bracts at the base..... 8
- 8 A. Anthers glandular..... *Vernonia*
B. Anthers eglandular..... 9
- 9 A. Involucre bracts 3–4-seriate, ovate, anthers without appendages, achenes obovoid-
terete, mostly 5-ribbed..... *Cyanthillium*
B. Involucre bracts 4–5-seriate, ovate to oblong, anthers with appendages, achenes ob-
long-obovoid, 5–10-ribbed..... *Gymnanthemum*

A key to the additional cultivated species of Asteraceae from Java

- 1 A. Woody plant..... 2
B. Succulent plant..... 3
- 2 A. Shrub to small tree, branches whitish, petiole straight, lamina elliptic-lanceolate.....
..... *Gymnanthemum amygdalinum*
B. Shrub, branches goldish brown, petiole curved, lamina oblong.... *Tarlmounia elliptica*
- 3 A. Plant with erect to ascending habit 4
B. Plant with climbing or trailing habit 6
- 4 A. Leaves cylindric, whitish to grey, leaves apex acute..... 5
B. Leaves spatulate, green to blueish green, leaves apex 3–5 lobed... *Curio kleiniiformis*
- 5 A. Leaves rosette, covered by arachnoid hairs, leaf width < 1 cm..... *Caputia scaposa*
B. Leaves alternate, covered by tomentose hairs, leaf width > 1 cm.... *Caputia tomentosa*
- 6 A. Leaves without hyaline line, veins prominent..... 8
B. Leaves with hyaline line, veins inconspicuous..... 7
- 7 A. Stem filiform, leaves globose, green..... *Curio rowleyanus*
B. Stem terete, leaves obovate, pale green or purplish..... *Kleinia petraea*
- 8 A. Leaves hastate, inflorescence solitary, ray florets 8 on each head, pale yellow.....
..... *Senecio macroglossus*
B. Leaves deltoid, inflorescence corymb, ray florets 5 on each head, bright yellow
..... *Senecio tamoides*

Table 1. The Additional species of Asteraceae in Java

No	Species	Vernacular name	Uses	Native range	Location of field survey
1.	<i>Caputia scaposa</i> (DC.) B. Nord. & Pelser	<i>Bunga senecio</i>	1	Southern Africa (Nordenstam & Pelser, 2012).	Langensari, Lembang (Bdg)
2.	<i>C. tomentosa</i> (Haw.) B. Nord. & Pelser	<i>Bunga senecio</i>	1	Southern Africa (Nordenstam & Pelser, 2012).	Langensari, Lembang (Bdg)
3.	<i>Curio kleiniiformis</i> (Suess.) L.V.Ozerova & A.C.Timonin	<i>Bunga senecio</i>	1	Southern Africa	Langensari, Lembang (Bdg)
4.	<i>C. rowleyanus</i> (H.Jacobsen) P.V.Heath	<i>Kaktus tasbih</i>	1	Southern Africa (Jacob- sen, 1968).	Rancasari (Bdg)
5.	<i>Kleinia petraea</i> (R.E. Fr.) C. Jeffrey	<i>Bunga senecio</i>	1	Kenya, Tanzania, and Uganda (Jeffrey, 1986).	Komp. PPR ITB, Mekarwangi (Bdg)
6.	<i>Senecio macroglossus</i> DC.	<i>Ivy daun tebal</i>	1	Southern Africa (Wood & Evans, 1912).	Komp. PPR ITB, Mekarwangi (Bdg)
7.	<i>S. tamoides</i> DC.	<i>Bunga senecio</i>	1	Southern Africa (Wood & Evans, 1899).	Komp. PPR ITB, Mekarwangi (Bdg)
8.	<i>Gymnanthemum amygdali- num</i> (Delile) Walp.	<i>Daun afrika, daun pahit, daun insulin</i>	2, 3	Tropical Africa (Swelankomo et al., 2016).	IPB Dramaga (Bgr), ITB Jatinangor (Smd), Kopo Kat- apang (Bdg), Pasir Impun (Bdg)
9.	<i>Tarlmounia elliptica</i> (DC.) H. Rob. S. C. Keeley, Skvarla & R. Chan	<i>Tanaman Lee Kwan Yew</i>	1, 3	India, Myanmar, and Thailand (Ghafoor, 2015).	Dramaga (Bgr); ITB Bandung (Bdg), ITB Jatinangor (Smd)

Note: Bdg= Bandung; Bgr= Bogor; Smd= Sumedang; 1= ornamental plant; 2= medicinal plant; 3= hedge

Taxonomically, the nine newly recorded species were grouped into two tribes, *i.e.* Senecioneae and Vernonieae. The Senecioneae was characterized by a uniseriate involucre, pyrrolizidine alkaloids and the eremophilane, polyacetylenes-lacking, and ovules containing raphids (Funk et al., 2009). The additional members of Senecioneae in Java were *Caputia scaposa*, *C. tomentosa*, *Curio kleiniiformis*, *C. rowleyanus*, *Kleinia petraea*, *Senecio macroglossus*, and *S. tamoides* (Jacobsen, 1968; Nordenstam & Pelser, 2012; Malenkova et al., 2014; Ozerova et al., 2017). These species were sold as ornamental plants in Bandung and Bogor (Figure 1). All of

the species are native to Africa, particularly Southern Africa. Most of the Southern African Senecioneae are succulent plants that have morphological characteristics as adaptations to the semi-arid environment (Timonin et al., 2014).

Most of the observed plants did not flowering in the study period. However, they can still be distinguished by their vegetative characters. Both *Senecio macroglossus* and *S. tamoides* are climbers, but their leaves differ in shapes. *Senecio macroglossus* has hastate leaves, while the leaves of *S. tamoides* are deltoid. Morphologically, *Curio rowleyanus* and *K. petraea* are trailing herbs. They can

be distinguished by the characteristic of their stem and leaf shapes. *Curio rowleyanus* has a filiform stem and globose leaves, whereas *K. petraea* has terete stem and obovate leaves. *Caputia scaposa* and *C. tomentosa* are succulent species with cylindrical leaves. But the phyllotaxis and indumentum of both species show different patterns. Leaves of *C. scaposa* are arranged in rosette and covered by arachnoid hairs, whereas *Caputia tomentosa* has alternate leaves and is covered by tomentose hairs. Based on vegetative characters, the most easily recognized species is *C. kleiniiformis*.

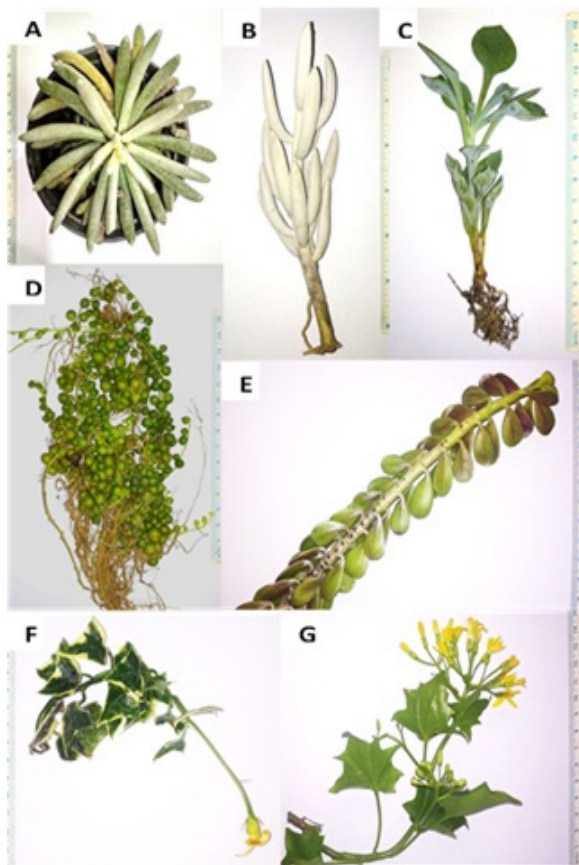


Figure 1. Additional species of Tribe Senecioneae in Java. (A) *Caputia scaposa* (DC.) B. Nord. & Pelser, (B) *Caputia tomentosa* (Haw.) B. Nord. & Pelser, (C) *Curio kleiniiformis* (Suess.) L. V. Ozerova & A. C. Timonin, (D) *Curio rowleyanus* (H. Jacobsen) P. V. Heath, (E) *Kleinia petraea* (R. E. Fr.) C. Jeffrey, (F) *Senecio macroglossus* DC., (G) *Senecio tamoides* DC.

This species has spatulate leaves with blueish green color, and 3 to 5-lobed leaf apex.

The additional members of Vernoneae only consist of two species: *Gymnanthemum amygdalinum* and *Tarlmounia elliptica* (Figure 2). Morphologically, the tribe was characterized by alternate leaves with pinnate venation, T-shaped or stellate hairs, imbricate involucre, corollas blue to reddish or purple, slender tapering style branches and achenes usually with twin hairs (Robinson, 1999; Funk et al., 2009). The characters can be observed in *G. amygdalinum* and *T. elliptica*.

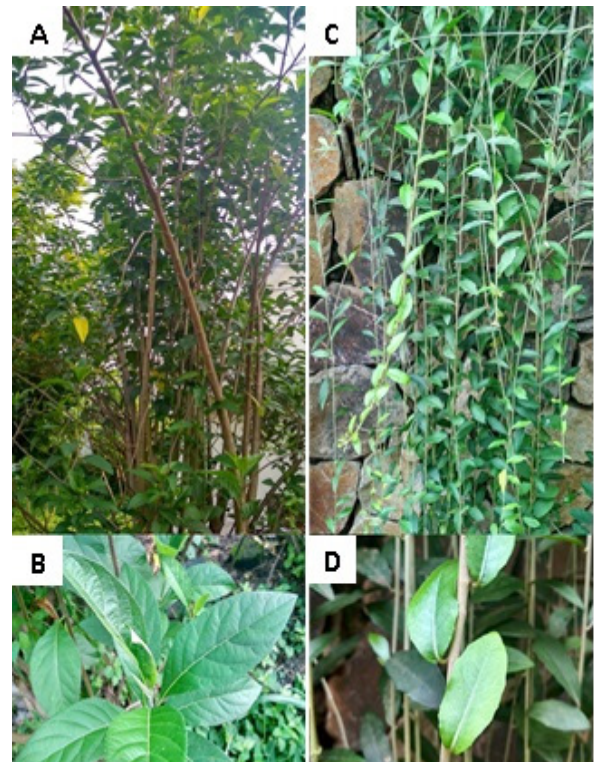


Figure 2. Additional species of Tribe Vernoneae in Java (A-B) *Gymnanthemum amygdalinum* (Delile) Walp., (C-D) *Tarlmounia elliptica* (DC.) H. Rob. S. C. Keeley, Skvarla & R. Chan.

Gymnanthemum amygdalinum is a synonym of *Vernonia amygdalina* Delile. It is native to Tropical Africa and became exotic in other tropical areas. The species is a shrub or small tree with elliptic to lanceolate lamina, straight petioles, and white or pinkish corollas. It was introduced to Java as a medicinal plant and also cultivated as a hedge in the gardens. Traditionally, leaf decoctions were used to treat diabetes and diarrhea. The wild populations of *G. amygdalinum* were discovered at several traditional gardens in Pasir Impun Subdistrict, Bandung. This species could be considered as naturalized species due to its ability to reproduce independently in the wild. *Gymnanthemum amygdalinum* produces a large number of seeds and it widely dispersed by wind. Furthermore, the species is also able to reproduce vegetatively by stem fragmentation. Other than Indonesia, *G. amygdalinum* was also introduced to India as medicinal plants and recorded as an additional species to the Flora of India in 2015 (Bhattacharjee et al., 2013; Swamy et al., 2015).

Tarlmounia elliptica is naturally distributed from India, Myanmar to Thailand (Ghafoor, 2015). The distribution outside of its native range have been reported in Taiwan in 1998 (Peng et al., 1998). *Tarlmounia elliptica* was occasionally cultivated as ornamental plants by Taiwanese people and it was naturalized in the southern part of the island (Peng et al., 1998). The species was also recently reported as naturalized species from O'ahu, Hawaii (Imada, 2019). In Java, *T. elliptica* was commonly planted as a hanging plant for vertical gardens or natural barrier for house privacy due to its slender stems. However, the existence of *T. elliptica* in Java needs to be noticed, because of its potential to escape from cultivation and is naturalized in nature.

Nine additional cultivated species of Asteraceae were found from Bandung, Bogor, and Sumedang. These additional species were *Caputia scaposa*, *C. tomentosa*, *Curio kleiniiformis*, *C. rowleyanus*, *Kleinia petraea*, *Senecio macroglossus*, *S. tamoides*, *Gymnanthemum amygdalinum* and *Tarlmounia elliptica*. This study showed that the information on Asteraceae of Java needs to be revised. In the future, the accumulation of recent species discovery in Java will be needed to update the Flora of Java. It is also indicated that other additional species still occur in Java. Therefore, further research is required.

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REFERENCES

- Backer, C. A. & Bakhuizen v/d Brink, R. C. Jr. (1965). *Flora of Java*. Volume II. Groningen, The Netherlands: Wolters-Noordhoff N. V.
- Bhattacharjee, B., Lakshminarasimhan, P., Bhattacharjee, A., Agrawala, D. K. & Pathak, M. K. (2013). *Vernonia amygdalina* Delile (Asteraceae) – An African medicinal plant introduced in India. *Zoo's Print*, 28(5), 18-20.
- Funk, V. A, Susanna, A., Stuessy, T. & Robinson, H. (2009). Classification of Compositae. In: Funk, V. A, Susanna, A., Stuessy, T. & Bayer, R.J. *Systematics, Evolution, and Biogeography of Compositae*. Vienna: IAPT.
- Ghafoor, A. (2015). Asteraceae: Trib. 3. Vernonieae. In: Wilson, A.J.G. *Flora of Australia Volume 37—Asteraceae 1*.

- Melbourne: Australian Biological Resources Study/CSIRO Publishing.
- Imada, C. T. (2019). *Hawaiian Naturalized Vascular Plants Checklist*. Honolulu, Hawai'i: Bishop Museum.
- Irsyam, A. S. D. & Hariri, M. R. (2016). *Eupatorium capillifolium* (Lam.) Small ex Porter & Britton (Asteraceae: Eupatorieae), Rekaman Baru untuk Flora Jawa. *Jurnal Al-Kauniyah*, 9(2), 80-86.
- Jacobsen, H. (1968). String-of-Beads Senecio: *Senecio rowleyanus* Jacobs nov. spec. *The National Cactus and Succulent Journal*, 23(2), 30-31.
- Jeffrey, C. (1986). The Senecioneae in East Tropical Africa: Notes on Compositae: IV. *Kew Bulletin*, 41(4), 873-943.
- King, R. M. & Robinson, H. (1970a). Studies in the Eupatorieae (Compositae) XIX. New Combinations in *Ageratina*. *Phytologia*, 19(4), 208-229.
- King, R. M. & Robinson, H. (1970b). Studies in the Eupatorieae (Compositae)---XXVI. A New Genus *Austroeupatorium*. *Phytologia*, 19(7), 433-435.
- King, R. M. & Robinson, H. (1970c). Studies in the Eupatorieae (Compositae)---XXIX. The Genus *Chromolaena*. *Phytologia*, 20(3), 196-209.
- King, R. M. & Robinson, H. (1970d). Studies in the Eupatorieae (Compositae). XXX. The Genus *Ayapana*. *Phytologia*, 20(3), 210-212.
- King, R. M. & Robinson, H. (1971). Studies in the Eupatorieae (Asteraceae)---LXI. Additions to the *Hebeclinium* Complex with *Bartlettina*, a New Generic Name. *Phytologia*, 22(3), 160-162.
- Malenkova, E. D., Ozerova, L. V., Schanzer, I. A. & Timonin, A. C. (2014). Re-considerations on *Senecio oxyriifolius* DC. and *S. tropaeolifolius* MacOwan ex F. Muell. (Asteraceae: Senecioneae). *Wulfenia*, 21, 111-118.
- Nordenstam, B. & Pelsner, P. B. (2012). *Caputtia*, a New Genus to Accommodate Four Succulent South African Senecioneae (Compositae) Species. *Compositae Newsletter*, 50, 56-69.
- Ozerova, L. V., Schanzer, I.A. & Timonin, A.C. (2017). Curio Alliance (Asteraceae: Senecioneae) Revisited. *Wulfenia*, 24, 29-52.
- Peng, C. I., Chung, K. F. & Leu, W. P. (1998). Notes on Three Newly Naturalized Plants (Asteraceae) in Taiwan. *Taiwania*, 43(4), 320-329.
- Robinson, H. (1999). Generic and Subtribal Classification of American Vernonieae. *Smithsonian Contributions to Botany*, 89, 1-116.
- Rowley, G. (1967). *Senecio haworthii* in Bloom. *The Cactus and Succulent Journal of Great Britain*, 29(2), 37.
- Rugayah, Retnowati, A., Windadri, F. I. & Hidayat, A. (2004). Pengumpulan Data Taksonomi. In: Rugayah, Widjaja, E.A. & Praptiwi. *Pedoman Pengumpulan Data Keanekaragaman Flora*. Bogor (ID): Puslit-LIPI.
- Swamy, J., Prabhakar, G., Rasingam, L. & Kamalakar, P. (2015). *Gymnanthemum amygdalinum* (Asteraceae)-A New Addition to the Flora of Peninsular India. *International Journal of Advanced Research in Science and Technology*, 4(7), 449-451.
- Swelankomo, N., Manning, J. C. & Magee, A. R. (2016). The Genus *Gymnanthemum* Cass. (Asteraceae: Vernonieae) in Southern Africa. *South African Journal of Botany*, 102, 81-101.
- Timonin, A. C., Ozerova, L. V. & Shantser, I. A. (2014). Evolution of Succulent Senecioneae (Asteraceae) of Southern Africa. *Zhurnal obshchei biologii*, 75(1), 25-37.

- Tjitrosoedirdjo, S. S. & Wahyuni, I. (2018). Rekor Baru Keberadaan *Praxelis clematidea* (Asteraceae) di Indonesia. *Prosiding Seminar Nasional XX Himpunan Ilmu Gulma Indonesia: Resistensi Gulma terhadap Herbisida dan Dampaknya terhadap Lingkungan dan Produk Pertanian*. Biotrop, 28 Nopember 2017. Hlm 212-217.
- Wood, J. M. & Evans, M. S. (1899). *Natal plants: Descriptions and figures of Natal indigenous plants, with notes on their distribution, economic value, native names, etc.* Volume 1. Durban: Bennett & Davis.
- Wood, J. M. & Evans, M. S. (1912). *Natal plants: Descriptions and figures of Natal indigenous plants, with notes on their distribution, economic value, native names, etc.* Volume 6. Durban: Bennett & Davis.