Flowering Plants of Africa

Volume 63

June 2013

Flowering Plants of Africa

Since its inception in 1921, this serial, modelled on the former *Curtis's Botanical Magazine*, has published well over 2 000 colour plates of African plants prepared by some 80 artists.

The object of the serial is to convey to the reader the beauty and variety of form of the African flora, to stimulate an interest in the study, conservation and cultivation of African plants and to advance the science of botany as well as botanical art.

The illustrations are mostly prepared by artists on the staff of the South African National Biodiversity Institute, but we welcome other contributions of suitable artistic and scientific merit. Please see *Guide for authors and artists* on page 145.

A list of available back issues is given in the current *Publications Catalogue* of the Institute and on the website www.sanbi.org. Copies of this serial and of the *Catalogue* are obtainable from the SANBI Bookshop, South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

History of this series
(note Afrikaans translation and changes in title)

Volume 1 (1921) to Volume 24 (1944):
The Flowering Plants of South Africa

Volume 25 (1945–1946) to Volume 26 (1947):
The Flowering Plants of Africa

Volume 27 (1948–1949) to Volume 52 (1992–1993):
The Flowering Plants of Africa
Die Blomplante van Afrika

Volume 53 (1994) to Volume 63 (2013):
Flowering Plants of Africa

Cover illustration: *Erica verticillata* (Plate 2296)

Flowering Plants of Africa

A magazine containing colour plates with descriptions of flowering plants of Africa and neighbouring islands

Edited by

A. Grobler

with assistance of

G.S. Condy

Volume 63

SANBI
Biodiversity for Life

Pretoria
2013

Referees and other co-workers on this volume

C. Archer, South African National Biodiversity Institute, Pretoria, RSA
R.H. Archer, South African National Biodiversity Institute, Pretoria, RSA
S.P. Bester, South African National Biodiversity Institute, Pretoria, RSA
J.S. Boatwright, University of the Western Cape, Cape Town, RSA
R. Boon, eThekwini Municipality, Durban, RSA
P.M. Burgoyne, South African National Biodiversity Institute, Pretoria, RSA
J. Burrows, Buffelskloof Nature Reserve & Herbarium, Lydenburg, RSA
B. Bytebier, Bews Herbarium, University of KwaZulu-Natal, RSA
C. Cupido, South African National Biodiversity Institute, Cape Town, RSA
G.D. Duncan, South African National Biodiversity Institute, Cape Town, RSA
G. Germishuizen, *ex* South African National Biodiversity Institute, Pretoria, RSA
H.F. Glen, South African National Biodiversity Institute, Durban, RSA
P. Goldblatt, Missouri Botanical Garden, St Louis, Missouri, USA
D. Goyder, Royal Botanic Gardens, Kew, UK
S. Hammer, Sphaeroid Institute, Vista, California, USA
P.O. Karis, University of Stockholm, Stockholm, Sweden
E.S. Klaassen, National Herbarium of Namibia, Windhoek, Namibia
R.R. Klopper, South African National Biodiversity Institute, Pretoria, RSA
J. Lavranos, Loulé, Portugal
J.J. Meyer, South African National Biodiversity Institute, Pretoria, RSA
T.H.C. Mostert, University of Zululand, KwaDlangezwa, RSA
A.N. Moteetee, University of Johannesburg, Johannesburg, RSA
H. Schaefer, Technische Universitaet Muenchen, Freising, Germany
S.J. Siebert, North-West University, Potchefstroom, RSA
Y. Singh, South African National Biodiversity Institute, Durban, RSA
G.F. Smith, South African National Biodiversity Institute, Pretoria, RSA
D.A. Snijman, South African National Biodiversity Institute, Cape Town, RSA
Y. Steenkamp, South African National Biodiversity Institute, Pretoria, RSA
H.M. Steyn, South African National Biodiversity Institute, Pretoria, RSA
M. Struwig, North-West University, Potchefstroom, RSA
W. Swanepoel, H.G.W.J. Schweickerdt Herbarium, University of Pretoria, Pretoria, RSA
D. Tribble, 15A Highgate West Hill, London, UK
E.J. van Jaarsveld, South African National Biodiversity Institute, Cape Town, RSA
H.J.T. Venter, University of the Free State, Bloemfontein, RSA
J.E. Victor, South African National Biodiversity Institute, Pretoria, RSA
W.G. Welman, *ex* South African National Biodiversity Institute, Pretoria, RSA

Date of publication of Volume 62

Plates 2261–2280 . . . . . 1 June 2011

Next volume
Volume 64 is likely to appear in 2015.—The Editor
ISSN 0015-4504
ISBN 978-1-919976-82-2

Contents

Volume 63

Crotalaria agatiflora subsp. *agatiflora* Leguminosae

East and northeast Africa

Crotalaria agatiflora *Schweinf.* subsp. **agatiflora**, Schweinfurth: 13 (1892); Taubert: 206 (1895); Baker: 315 (1914); Brenan: 414 (1949); Polhill: 205 (1968). Polhill: 72-74 (1982).

Crotalaria L. is a large genus in the Leguminosae family with approximately 690 species (Lewis *et. al.* 2005; Le Roux & Van Wyk 2012). The genus is distributed in the tropical and subtropical areas of the world with the majority of species found in Africa and Madagascar (Polhill 1968; Polhill 1982; Lewis *et al.* 2005). Polhill (1968) studied the genus extensively after Milne-Redhead (1961) and recognised 432 species for the African continent. About 54 indigenous species are found in southern Africa (Nkonki & Swelankomo 2003) of which four are exotic species and declared invasive alien species or weeds (Germishuizen *et al.* 2006). Other species in the genus are also known to occur in India, America and China (Lewis *et al.* 2005; Le Roux *et al*. 2011). The genus shows a remarkable diversity in its mophology, which greatly facilitates the differentiation of individual species, but variation between the species is of a markedly reticulate nature precluding any simple division of the genus into sections (Polhill 1968). *Crotalaria agatiflora* has five subspecies and subsp. *agatiflora* differs from the other four by its bracteoles which are less than 2.0(–3.5) mm long and its ovate-elliptic leaflets that are less than twice as long as broad, usually glabrous beneath. There are various common names for *C. agatiflora* subsp. *agatiflora* including bird flower, canary bird bush, rattlebox, Queensland bird flower and *voëltjiebos*. The common name, rattlebox, is derived from the fact that the seeds become loose in the pod as they mature and rattle when the pod is shaken.

The plant illustrated here is indigenous to tropical East Africa and northeast Africa (Tanzania and Kenya). In southern Africa it occurs in Namibia, South Africa (Gauteng, North West, Limpopo, Mpumalanga, KwaZulu-Natal and the Western and Eastern Cape) and has become naturalised in Australia (Queensland), New Zealand and South America. Distribution of *Crotalaria agatiflora* subsp. *agatiflora* in Africa, based on the PRE Computerised Information System (PRECIS), Southern African Plant Invaders Atlas (SAPIA 2011) and Global Biodiversity Information Facility (GBIF 2013) databases, is presented in Figure 1. Canary bird bush was first introduced into South Africa as an ornamental plant. The earliest known record in the Pretoria National Herbarium is from the Johannesburg Railway Horticulture Garden dated 1921 in the Johannesburg area. According to SAPIA, the earliest record of its establishment in the wild is from the Rustenburg and Brits area in North West. It has escaped from cultivation into natural areas and has been recorded in conservation areas and reserves in Pretoria such as the Colbyn conservancy area, and Faerie Glen, Groenkloof and Wonderboom Nature Reserves (Henderson & Musil 1987; SAPIA 2011).

PLATE 2287.—1, flowering stem × 1. Voucher specimen: *Condy 251* in National Herbarium, Pretoria. 2, fruiting branch × 1. Voucher specimen: *Condy 253* in National Herbarium, Pretoria. Artist: Gillian Condy.

PLATE 2287 *Crotalaria agatiflora* subsp. *agatiflora*

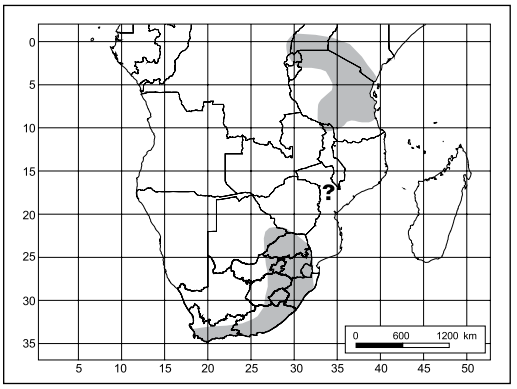

FIGURE 1.—Distribution range of *Crotalaria agatiflora* subsp. *agatiflora* based on herbarium records in the National Herbarium, Pretoria, and SAPIA and GBIF databases. The question mark (?) indicates regions of possible occurrence where records were not found.

Crotalaria species are widely used in Chinese traditional medicine to treat several types of internal cancers. In the United States of America some species, such as *C. pumila*, are used to treat yellow fever and skin rashes. In the Siaya area, Kenya, the roots are used as a remedy for gastrointestinal discomfort (Kokwaro & Johns 1998). *Crotalaria agatiflora* subsp. *agatiflora* is used as a medicinal plant in several African countries for the treatment of bacterial infections and cancer (Le Roux *et al.* 2011). In Ecuador *C. agatiflora* subsp. *agatiflora* is also traditionally used as a decoction to treat cancer. The above ground parts of *C. agatiflora* subsp. *agatiflora* are used in its native range to treat otitis media, a bacterial infection of ears, as well as for treatment of sexually transmitted diseases (Le Roux *et al.* 2011). In India other species of *Crotalaria* has similar uses, where it is used to treat eczema and the leaves are placed on cuts or wounds to aid the healing process. Sharma *et al.* (1967) found that *C. agatiflora* subsp. *agatiflora* relieves spasms in dogs, found to be a good relaxant, and lowered blood pressure during treatment.

A few *Crotalaria* species are consumed by humans in some parts of the world, however, many species are known to be toxic to humans and livestock. Examples include (but are not limited to) *C. oridicola*, *C. barkae*, *C. berteroana* and *C. retusa*. Toxicity has been proven in the genus *Crotalaria* to be due to the presence of pyrrolizidine alkaloids in plants and seeds (Pilbeam & Bell 1979). All plant parts of *C. agatiflora* subsp. *agatiflora* have been reported not to be toxic or poisonous.

In South Africa *Crotalaria agatiflora* subsp. *agatiflora*, is a declared category 1a species according to the National Environmental Management: Biodiversity Act (2004) and listed as a proposed invader in the Conservation of Agricultural Resources Act (1983). This species was previously misidentified as *C. agatiflora* subsp. *imperialis* (Macdonald *et al.* 2003). It grows in watercourses in Grassland and Savanna biomes; potentially invasive in forest margins and also occupies cleared grassy areas in South Africa. In some parts of the world where it has been introduced, it is regarded as an agricultural, environmental and garden weed. For example in Australia it is regarded as a minor environmental weed that has escaped cultivation and invading grasslands and areas with sandy soils (Cooperative Research Center for Australian Weed Management 2013). This is also the case in South Africa where the species has escaped cultivation and has established itself in the wild. According to herbarium material in the National Herbarium, Pretoria, *C. agatiflora subsp. agatiflora* is frequently collected along roads and railways, near rivers, gardens and natural habitats. Ecological data was compiled from herbarium specimens (collected from

1921–2011) and SAPIA records. Sixty-five percent were recorded near road sides, five percent along rivers, 10 percent in natural areas (including nature reserves) and 18 percent in urban areas including gardens.

Crotalaria agatiflora subsp. *agatiflora* reproduces and spreads exclusively by seeds. The average number of pods produced per plant is 50 and number of seeds per pod is 28. Seeds germinate in early summer.

Although no studies have focused on its effects on natural ecosystems, canary bird bush may affect the ecology of invaded areas in several ways for example through the enhancement of nitrogen levels in the soil. The species threatens watercourses in Grassland and Savanna biomes where it has been introduced. Furthermore, it has the potential to invade forest margins and often occupies cleared grassy areas and disturbed sites.

Description—Perennial woody herb, 0.3–2 m high, usually much branched, glabrous. *Leaves* 3-foliolate; leaflets ovate-elliptic, 25–90 × 10–35 mm, glabrous to densely hairy; petioles 30–120 mm long, mostly longer than leaflets. *Stipules* linear and caducous or absent, 4–12 mm long. *Racemes* stoutly pedunculate, many-flowered; flowers 40–50 mm long; bracts linear to attenuate-lanceolate, up to 16–20(–24) × 1–6(–9) mm; bracteoles filiform, 0.5–3.5 mm long. *Calyx* 18–30 mm long, with upper and lateral lobes joined almost to tips on either side, ± twice as long as tube; pedicels about 15 mm long, glabrous-glaucous or villose. *Standard* ovate, lemon-yellow to greenish yellow, sometimes medially pubescent outside; wings half to two-thirds as long as keel; keel broadly rounded, with a relatively short, projecting, often greenish or purplish beak, 11–55 mm long. *Pod* oblong-clavate, narrowed to a 15–25 mm long stipe, ± 75–100 mm long, glabrous. *Seeds* tumid, 6–7(–9) mm long, ± smooth. *Flowering time*: January–December in South Africa. Plate 2287.

REFERENCES

BAKER, E.G. 1914. The African species of *Crotalaria*. *Journal of the Linnean Society (Botany)* 42: 241–425.

BRENAN, M.A. 1949. *Checklist of the Forest Trees and Sbrubs of the British Empire* No. 5. Tanganyika Territory Part II. Forest Institute, Oxford.

CONSERVATION OF AGRICULTURAL RESOURCES ACT. 1983. Department Of Agriculture, Forestry and Fisheries. South Africa

COOPERATIVE RESEARCH CENTER FOR AUSTRALIAN WEED MANAGEMENT. 2013. Canary bird bush: *Crotalaria agatiflora*. University of Queensland. Available at: http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Crotalaria_agatiflora.htm. Accessed: 15 January 2013.

GERMISHUIZEN, G., MEYER, N.L., STEENKAMP, Y. & KEITH, M. (eds). 2006. *A checklist of South African plants.* Southern African Botanical Diversity Network Report No. 41. SABONET, Pretoria.

GLOBAL BIODIVERSITY INFORMATION FACILITY. 2013. Available at:
http://data.gbif.org/species/7067713/. Accessed: 14 January 2013.

HENDERSON, L. & MUSIL, K.J. 1987. *Plant Invaders of the Transvaal*. Department of Agriculture and Water Supply, Pretoria.

KOKWARO, J.O. & JOHNS, T. 1998. *Luo Biological Dictionary*. East African Publishers, Nairobi.

LEWIS, G.B., SCHRIRE, B., MACKINDER, B. & LOCK, M. (eds). 2005. *Legumes of the World.* Royal Botanical Gardens, Kew.

LE ROUX, K., HUSSEIN, A.A. & LALL, N. 2011. In vitro chemo-preventative activity of *Crotalaria agatiflora* subspecies *agatiflora* Schweinf. *Journal of Ethnopharmacology* 138,3: 748–55.
LE ROUX, M.M. & VAN WYK, B-E. 2012. The systematic value of flower structure in *Crotalaria* and related genera of the tribe Crotalarieae (Fabaceae). *Flora* 207: 414–426.
MACDONALD, I.A.W., REASER, J.K., BRIGHT, C., NEVILLE, L.E., HOWARD, G.W., MURPHY S.J. & PRESTON, G. (eds). 2003. *Invasive alien species in southern Africa: national reports & directory of resources*. Global Invasive Species Programme, Cape Town.
MILNE-REDHEAD, E. 1961. Miscellaneous notes on African species of *Crotalaria* L. *Kew Bulletin* 15: 157–167.
NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT. 2004. Department of Environmental Affairs and Tourism, South Africa.
NKONKI, T. & SWELANKOMO, N. 2003. *Crotalaria*. In G. Germishuizen & N.L. Meyer (eds), Plants of southern Africa: an annotated checklist. *Strelitzia* 14: 500. National Botanical Institute, Pretoria.
PILBEAM, D.J. & BELL, E.A. 1979. Free amino acids in *Crotalaria* seeds. *Phytochemistry* 18: 973–985.
POLHILL, R.M. 1968. Miscellaneous notes on African species of *Crotalaria* L. *Kew Bulletin* 22: 169–348.
POLHILL, R.M. 1982. *Crotalaria in Africa and Madagascar*. A.A. Balkema, Rotterdam.
SCHWEINFURTH, G. 1892. In Höhnel, Zum Rudolph-See und Stephanie-See, Anhang: 13.
SHARMA, M.L., SINGH, G.B., GHATAK, B.J. 1967. Pharmacological investigations on *Crotalaria agatiflora* Scwienf. *Indian Journal of Experimental Biology* 5: 149–150.
SOUTH AFRICAN PLANTS INVADERS ATLAS (SAPIA) DATABASE. 2011. ARC—Plant Protection Research Institute, Pretoria.
TAUBERT, P.H.W. 1895. In A. Engler, *Pflanzenwelt Ost-Afrikas und der Nachbargebiete*: 206.

T. JACA*§, T. NKONKI* and GILLIAN CONDY*

* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.
§ Author for correspondence: t.jaca@sanbi.org.za