

AGATHOSMA CRENULATA HERBA

Definition

Agathosma Crenulata Herba consists of the fresh or dried leaves and smaller stems of *Agathosma crenulata* (L.) Pillans (Rutaceae)

Synonyms

Barosma crenulata Hook.
Barosma serratifolia (Vent.) Willd.

Vernacular names

Buchu, long leaf buchu, oval buchu

Description

Macroscopical ^{1, 2}

Single-stemmed aromatic shrub to 2.5m or more in height, with glabrous or sparsely pubescent branches, the latter light green when young to dark brown when older; **leaves** opposite, erect-spreading, glabrous, 15-30 × 7.5-13.0mm; length: breadth ratio 2-3 (Av: 2.34); ovate-lanceolate to obovate, with apex rounded but not recurved and serrate margin; scattered schizo-lysigenous oil glands clearly visible on lower surface and at leaf margins; **flowers** (Jun-Nov) white to mauve, axillary, 1-3 on short stalks, petals 7-9mm long, ovate, obtuse.



Figure 1: Live plant



Figure 2: line drawing

Microscopical

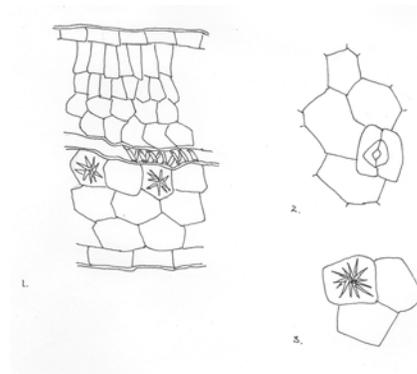


Figure 3: microscopical features

This species is similar to *A. betulina* in having anomocytic stomata on the lower leaf surface only and in the presence of a distinct crystal layer of calcium oxalate rosette aggregates in the mesophyll parenchyma; it differs from the former in the absence of diosmin sphaerocrystals in cells of the leaf lamina; spherical oil glands are visible at the base of each tooth of the serrate leaf margin.

¹ Pillans, N. (1950). A revision of the genus *Agathosma* (Rutaceae). *Journal of South African Botany* **16**: 55-117.

² Spreeth, A.D. (1976). 'n Hersiening van die *Agathosma*-species van kommersiële belang (A revision of the commercially important *Agathosma* species). *Journal of South African Botany* **42**(2): 109-119.

1. T/S of leaf lamina showing single palisade layer and calcium oxalate rosette aggregates in cells of the mesophyll.
2. Epidermal cells of lower leaf surface with anomocytic stomata.
3. Mesophyll cells with calcium oxalate cluster crystals.

Crude drug

Collected when required or available in the marketplace as bundles of leafy twigs; colour light yellow-green, odour highly aromatic, texture soft when fresh, leathery when dry; leaf surface gland dotted.

Geographical distribution

Cool sheltered ravines of middle mountain slopes and valleys of the Western Cape Province, from Ceres and Tulbagh southwards to Wolseley, Paarl, Wellington, Stellenbosch, Betty's Bay, Caledon and east as far as Worcester. The distribution range of this species overlaps with that of *A. betulina* in the Ceres/Tulbagh district, but *A. crenulata* generally occurs in heavier soils, often near streams.

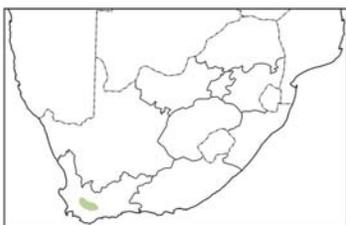


Figure 4: distribution map

Quality standards

Identity tests

Thin layer chromatography on silica gel using as solvent a mixture of toluene:diethyl ether:1.75M acetic acid (1:1:1). Reference compound cineole (0,1% in chloroform). Method according to Appendix 2a. R_f values of major compounds: 0,34 (orange); 0,39 (orange-yellow); 0,43 (light blue); 0,47 (light green); rutin marker:0,34 (orange)

HPLC on C_{18} column, method according to Appendix 2b.

Major compounds:

Methanol extract:

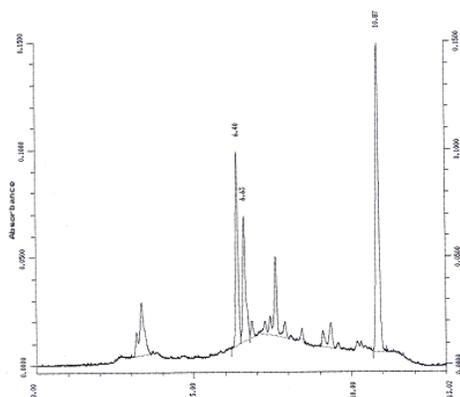


Figure 5: HPLC structure

Retention times (mins): 6.46, 6.65, 10.87

Essential oil content: not less than 1.5% (range: 1.32-2.19-4.0%^{GR1})

Purity tests

Assay

None available. Assay methods for buchu oil have been published.^{3, 4, 5}

Major chemical constituents

Little is known of leaf secondary chemistry other than the essential oil, of which the major constituents are limonene (9.0-1.8%), menthone/isomenthone (6.49-28.0%), pulegone/isopulegone (51.4-60.0%) and both *cis*- and *trans*- 8-acetylthio-*p*-menthane-3-one (7.03%). Neither diosphenol/ ψ -diosphenol ("buchu camphor") nor the 8-mercapto-*p*-menthane-3-ones, characteristic of *A. betulina*, have been detected in the oil of this species.^{3,4,5}

³ Kaiser, R., Lamparsky, D. and Schudel, P. (1975). Analysis of buchu leaf oil. *Journal of Agricultural and Food Chemistry* **23(5)**: 943-950.

⁴ Blommaert, K.L.J. and Bartel, E. (1976). Chemotaxonomic aspects of the buchu series *Agathosma betulina* Pillans and *A. crenulata* Pillans from local plantings. *Journal of South African Botany* **42(2)**: 121-126.

⁵ Posthumus, M.A. van Beek, T.A., Collins, N.F. and Graven, E.H. (1996). Chemical composition of the essential oils of *Agathosma betulina*, *A. crenulata* and an *A. betulina* × *crenulata* hybrid (Buchu). *Journal of Essential Oil Research* **8**: 223-228.

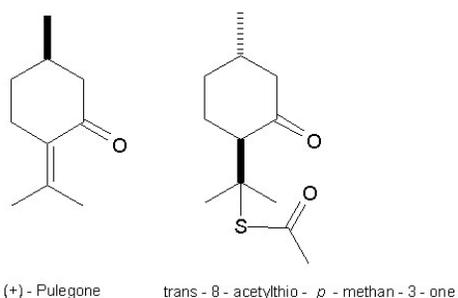


Figure 6: chemical structures

Dosage forms

Agathosma crenulata is used in traditional practice in the same manner as (and interchangeably with) *A. betulina*. For details regarding dosage forms, see monograph on latter species.

Medicinal uses

In South Africa, *A. crenulata* is used for the same purpose as *A. betulina* i.e. for the treatment of urinary and respiratory tract infections, rheumatism, sprains and bruising, fever and as a diuretic^{GR1, 19, 20, 23}. Although allowed by the British Pharmacopoeia (1963) as a suitable substitute for *A. betulina*, this herb has never featured prominently in other pharmacopoeias of Europe. The reason for this may be historical rather than scientific and efficacy/toxicity profiles of both species are necessary. In the food industry, the essential oil of *A. betulina* is preferred to that of *A. crenulata* as a flavourant; this has to do with the blackcurrant “note” imparted to the former by traces of mercapto-*p*-menthane-ones.

Pharmacology/bioactivity

Only one scientific study appears to have been made of whole plant bioactivity⁴. The results showed that aqueous extracts of *Agathosma crenulata* were not cytotoxic to HeLa, Vero, Jurkat E6.1, AA-2 or CEM-SS

⁴ Treurnicht, F. T. (1997). An evaluation of the toxic and potential antiviral effects of some plants used by South Africans for medicinal purposes. MSc thesis, University of Stellenbosch.

cells. Similar extracts exhibited no direct inhibitory effect on either HSV-1 at dilutions higher than 1/333, or Coxsackie B2 virus replication.

An *in vitro* study of antimicrobial activity found the essential oil (10µl/well) to possess weak activity against *Escherichia coli*, *Staphylococcus aureus* and *Saccharomyces cerevisiae* but none against *Enterococcus hirae* or *Pseudomonas aeruginosa*⁵. In the same study, initial smooth muscle spasmogenic activity (guinea pig ileum), followed by spasmolysis, was demonstrated for the essential oil (concentration range 4×10⁻⁶ to 8×10⁻⁵ v/v in methanol). Spasmolytic action was dose related, with an IC50 of 8×10⁻⁶.

Contraindications

See monograph on *Agathosma Betulina* Herba.

Adverse reactions

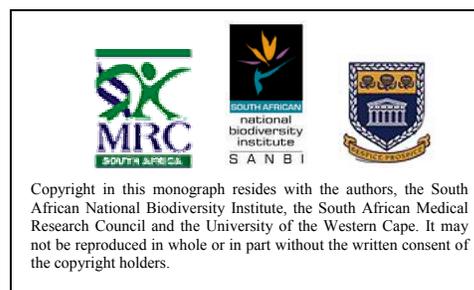
See monograph on *Agathosma Betulina* Herba.

Precautions

See monograph on *Agathosma Betulina* Herba. In view of the higher concentrations of pulegone/isopulegone in the essential oil of *A. crenulata* as compared with that of *A. betulina*, long term use of *Agathosma crenulata* preparations is not recommended.

Dosage

See monograph on *Agathosma Betulina* Herba.



⁵ Lis-Balchin, M. and Simpson, S.H. (2001). Buchu (*Agathosma betulina* and *A. crenulata*, Rutaceae) essential oils: their pharmacological action on guinea pig ileum and antimicrobial activity on micro-organisms. *Journal of Pharmacy and Pharmacology* **53**(4):579-582.