COTYLEDON ORBICULATA FOLIA

Definition

Cotyledon Orbiculata Folia consists of the fresh leaf of *Cotyledon orbiculata* L. (Crassulaceae).

Synonyms

Vernacular names

Pig's ear, plakkies, kouterie, pê-pê bos (A), serelile (S), iphewula (Xh)

Description

Macroscopical [1]

Perennial branched succulent shrublet to 1m in height when in flower; 5 varieties are recognised, distinguished mainly on the basis of geographical distribution, leaf arrangement and corolla lobe/tube length:
var. *orbiculata*
var. *flanaganii* (Schonl. & Bak. f.) Tölken
var. *spuria* (L.) Tölken
var. *oblonga* (Haw.) DC
var. *dactylopsis* Tölken
Leaves opposite except in var. *flanaganii* (leaves in whorls of 3), obovate to narrowly linear, glabrous to hairy, bright green to velvety with a grey bloom, often with a deep red cuticularised margin, the latter undulate in some populations, 30-160 × 10-90mm; **flowers** (Sept-Jan) in cymose inflorescences of up to 10 blooms, borne on a stout peduncle 20-80cm long, corolla pentamerous, campanulate, with lobes up to twice as long as the tube, pink to orange-red, occasionally yellow, 8-30mm long.

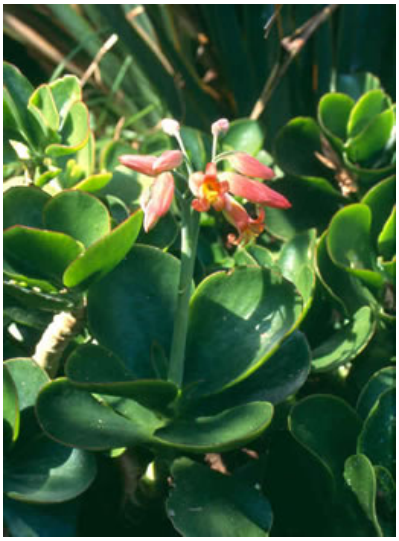

Figure1: Live plant

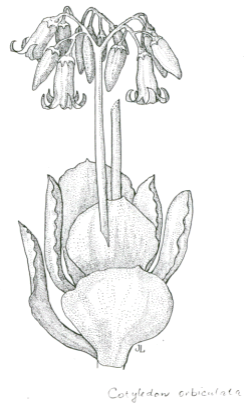

Figure2: line drawing

Microscopical

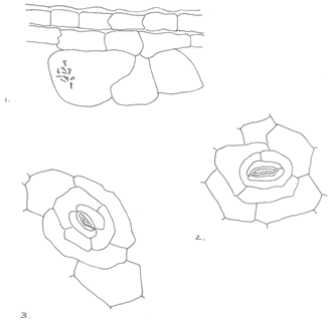

Figure 3: microscopical features

Characteristic features are: the non-chlorophyllous cells of the epidermis with cuticle staining deep red in Soudan IV; the absence of palisade tissue; the layer of

[1] Tölken, H.R. (1985). The genus *Cotyledon*. *Flora of Southern Africa* **14**: 3-17.

colourless parenchyma cells below the epidermis; the large thin-walled cells of the mesophyll containing calcium oxalate crystal sand (1); the actinocytic stomata of the leaf epidermis (2+3); the absence of lignified tissue; the cells of the mesophyll staining bright yellow-green with KOH solution.

Crude drug

Collected as needed or available in the marketplace as fresh leaf, bright green to grey-green in colour, often with characteristic red margin; odour faint, texture fleshy,

Geographical distribution

var. *orbiculata*: widespread in the Western, Eastern and Northern Cape Provinces and Namibia, usually on rocky slopes in open vegetation.
var. *spuria*: restricted to the Western Cape Province, on lower mountain slopes, in depressions or on river banks.
var. *flanaganii*: restricted to the hills around the lower Kei River in the Eastern Cape Province, on gravel slopes in scrub.
var. *dactylopsis*: Kimberley, Hopetown, Smithfield, Bloemfontein area of the Northern Cape and Free State Province, among dolerite boulders, often on hilltops.
var. *oblonga*: widespread but rarely common in Gauteng, Mpumalanga, Northern Province, eastern Free State Province, Kwazulu/Natal, Eastern Cape Province, eastern Swaziland, Lesotho, Mozambique, in grassland or open bushveld, often associated with rock outcrops.

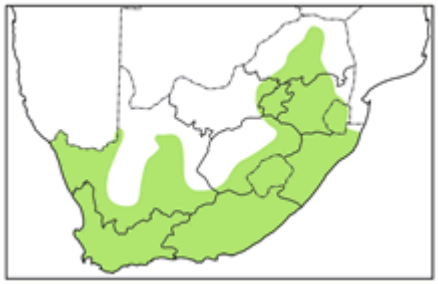

Figure 4: distribution map

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: cineole: (blue-purple)

Note The method used for most monographs yielded poor TLC results for this species. Further work is required.

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

Major compounds:
Methanol extract: (figure 6)
Retention times (mins): 16,07; 17,31

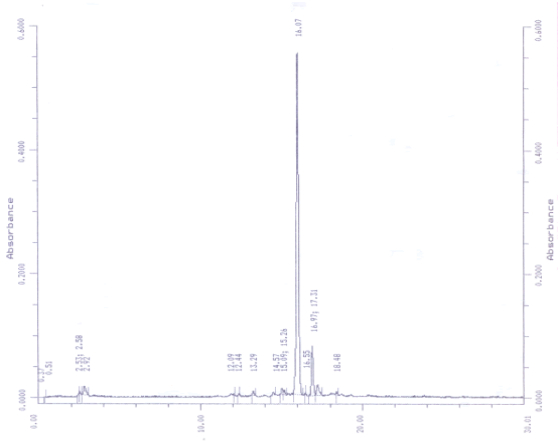

Figure 6: HPLC spectrum

Total ash: not more than 21.81% (determined according to the BHP 1996 using 1.0g dried ground material)

Purity tests

Assay

Not yet available

Major chemical constituents

Novel bufadienolide glucosides named orbicusides A-C (see a below) as well as tyledoside D, known from other members of Crassulaceae, have been isolated from the overground parts of *Cotyledon orbiculata* var. *orbiculata*[2].

[2] Steyn, P.S., van Heerden, F.R. and Vleggaar, R. and Anderson, L.A.P. (1986). Bufadienolide glucosides of the Crassulaceae. Structure and

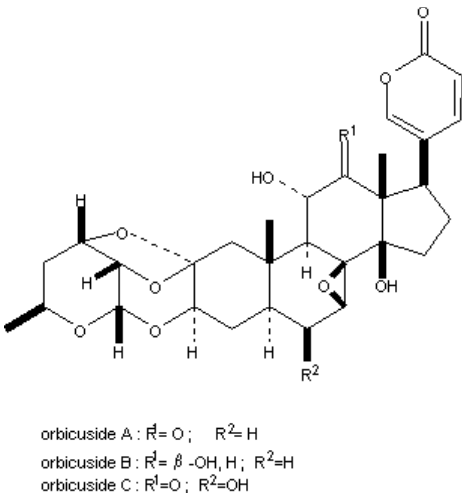

Figure 7: chemical constituents

Dosage forms

Peeled leaf is applied to warts and corns or may be used warm as a poultice. Fresh leaf juice may be instilled warm into the ear, applied to the skin or used locally on a painful tooth. Leaf juice is taken orally and a leaf decoction inserted *per rectum* as an enema.

Medicinal uses

Peeled leaf, applied to a corn, wart, or plantar wart and held in place with adhesive plaster, has the effect of softening hard tissue so that it may be removed after a few days of treatment. A similar treatment is used for boils, abscesses and skin eruptions. Leaf juice is used to treat earache and toothache and applied as a lotion for acne. Taken orally, fresh leaf juice has been used to treat epilepsy and a leaf decoction as an enema for syphilis.[GR1, 11, 20.]

Pharmacology/bioactivity

Despite the popularity of *Cotyledon orbiculata* as a traditional medicine, it has not been the subject of much *in vitro* or *in vivo* study. Owing to the incidence of *krimpsiekte*[3] in livestock feeding on this species as well as certain other members of Crassulaceae, some animal studies were undertaken[4]. These concluded that stock losses were due largely to the presence of digitalis-like principles in leaf and stem and that activity varied seasonally, geographically and according to the plant organ used (leaf or stem). The bufadienolide orbicusides[2] are probably responsible. Little local irritation of aqueous preparations was observed[4] following neutralisation of the initially acid extract and application to the conjunctival sac, tongue and skin of the rabbit.

Contraindications

Owing to potential toxicity as well as infraspecific variability in activity, the internal use (including enemata) of preparations of this species is not recommended until a suitable assay method can be found.

Adverse reactions

Cardiac effects are possible with internal use. External application appears to be unlikely to cause unwanted reactions but consideration should be given to the use of neutral preparations.

Precautions

Oral preparations of this species should not be taken by anyone with known or suspected cardiac conditions.

Dosage

External application: according to traditional methods
Internal use: to be determined.

stereochemistry of orbicusides A-C, novel toxic metabolites of *Cotyledon orbiculata*. *Journal of the Chemical Society, Perkin Transactions* **I** : 1633-1636.

[3] Vahrmeier, J. (1981). Poisonous plants in South Africa that cause stock losses. Cape Town, Tafelberg.

[4] Sapeika, N. (1936). The pharmacological action of plants of the genera *Cotyledon* and *Crassula*. N.O. Crassulaceae. *Archives Internationales de Pharmacodynamie et de Therapie* : 307-328.