

Species (Family)

- (i) *Aloe barbadensis* Mill. (Liliaceae)
(ii) *Aloe ferox* Mill. and its hybrids with *Aloe africana* Mill. and *Aloe spicata* Baker

Synonym(s)

Aloe vera Tourn. ex L., *A. vera* (L.) Webb, *A. vera* (L.) Burm. f.

Part(s) Used

Dried leaf juice

Pharmacopoeial and Other Monographs

BHC 1992^(G6)
BHP 1996^(G9)
BP 2001^(G15)
Complete German Commission E^(G3)
ESCOP 1997 (Cape Aloes)^(G52)
Martindale 32nd edition^(G43)
PDR for Herbal Medicines 2nd edition^(G36)
Ph Eur 2002^(G28)
USP24/NF19^(G61)
WHO volume 1 1999^(G63)

Legal Category (Licensed Products)

GSL^(G37)

Constituents^(G2,G20,G22,G41,G52,G64)

Anthranoids^(1-6,G20,G52) Cape aloes anthranoids are qualitatively identical to leaf exudate of *A. ferox*.⁽⁴⁾ Anthrones (up to 30%), mainly the C-glycosides aloins A and B (= barbaloin, isobarbaloin, stereoisomers of 10-glucosyl-aloe-emodin anthrone); other glycosides include 8-O-methyl-7-hydroxy aloins A and B, aloinosides A and B (aloin-11-O- α -L-rhamnosides). Small quantities of 1,8-dihydroxyanthraquinoid aglycones, including aloe-emodin and chrysophanol are also present.

Chromones^(1,2,7,G20,G52) Major constituents are aloesin (2-acetyl-5-methyl-8-glucosyl chromone) and aloeresin E. Lesser quantities of isoaloeresin D, 8-C-glucosyl-7-O-methyl-aloesol and related glycosides which may be esterified at the glucose moiety by

either cinnamic, *p*-coumaric or ferulic acids, are also present. Non-glycosylated chromones include 7-hydroxy-2,5-dimethylchromone, furoaloesone, 2-acetyl-7-hydroxy-8-(3-hydroxyacetyl)-5-methylchromone and 2-acetyl-8-(2-furoylmethyl)-7-hydroxy-5-methylchromone.^(8,9)

Phenyl pyrones^(1,2) Glycosides include aloenin and aloenin B.

Other constituents^(G52) Cinnamic acid and 1-methyl-tetralin.

Food Use

Aloes is listed by the Council of Europe as a natural source of food flavouring (category N3).^(G16) This category indicates that aloes can be added to food-stuffs in the traditionally accepted manner, although there is insufficient information available for an adequate assessment of potential toxicity. The concentration of aloin present in the final product is limited to 0.1 mg/kg; 50 mg/kg in alcoholic beverages.^(G16) In the USA, aloes is listed as GRAS (Generally Recognised As Safe).^(G41)

Herbal Use

Aloes is recommended for the treatment of atonic constipation and suppressed menstruation.^(G2,G49,G64)

Dosage

Dried juice 50–200 mg or equivalent three times daily.^(G6,G49)

In view of potential adverse effects, the dose recommended for adults and children aged over 10 years is 10–30 mg of hydroxyanthracene derivatives (calculated as barbaloin) once daily at night.^(G52) Use of aloes as a laxative in self-treatment of constipation for more than two weeks is not recommended.^(G52)

Pharmacological Actions

The activity of aloes can be attributed to the anthranoid glycoside content. The glycosides are metabolised by glycosidases in the intestinal flora to form active anthrones. The laxative action is due to an

increase in motility of the large intestine by inhibition of the Na^+/K^+ pump and chloride ion channels; enhanced fluid secretion occurs due to stimulation of mucus and chloride ion secretion.^(G52)

***In vitro* and animal studies**

Nine hours after oral administration, aloes produced diarrhoea at doses of 5 g/kg (in 20% of rats) and 20 g/kg (in 100% of rats).⁽¹⁰⁾ Pretreatment of rats with the nitric oxide (NO) synthase inhibitor *N*-nitro-L-arginine methyl ester given intraperitoneally reduced diarrhoea induced by aloes (20 g/kg) 9 hours after oral administration. The results suggest that endogenous NO modulates the diarrhoeal effects of Cape aloes.⁽¹⁰⁾

Inhibitory effects of aqueous extracts of five genera of *Aloe*, including *A. ferox* and *A. barbadensis*, and aloes powder (Japanese Pharmacopoeia) on histamine release from rat peritoneal mast cells induced by antigen were investigated *in vitro*.⁽¹¹⁾ All extracts tested inhibited histamine release in a concentration-dependent manner under the test conditions. *Aloe ferox* extract, Japanese Pharmacopoeia aloes and barbaloin strongly inhibited histamine release (IC_{50} 0.16, 0.07 and 0.02 $\mu\text{g}/\text{mL}$, respectively).⁽¹¹⁾

Aqueous extracts of aloes are said to elevate the rate of ethanol oxidation *in vivo*.⁽¹²⁾ Oral administration of aloin (300 mg/kg) to rats 12 hours prior to administration of alcohol (3 g/kg) resulted in a significant decrease (40%) in blood alcohol concentration.⁽¹²⁾ Pretreatment with intraperitoneal aloemodin 2 hours prior to alcohol administration significantly reduced blood alcohol concentrations; it was hypothesised that aloin is metabolised to aloemodin which exerts its effect on alcohol metabolism.⁽¹²⁾ Activity-guided fractionation of the leaves of *A. aborescens* resulted in the isolation and characterisation of elgonica-dimers A and B (dimeric C-glycosides of anthrone emodin-10'-C- β -D-glucopyranoside and aloemodin) as potent inhibitors of cytosolic alcohol dehydrogenase and aldehyde dehydrogenase activities *in vitro*.⁽¹³⁾

Aloemodin and an alcoholic extract of aloes have been reported to possess antitumour activity.^(G41)

Hypoglycaemic activity has been shown in alloxan-diabetic mice for aloes⁽¹⁴⁾ and in diabetic rats for an aloes gum extract.^(15,16)

Barbaloin is active *in vitro* against *Mycobacterium tuberculosis* and *Bacillus subtilis* (minimum inhibitory concentration 0.125 mg/mL and 0.25 mg/mL, respectively).^(G18)

Clinical studies

The purgative action of the anthraquinone glycosides is well recognised (*see* Senna), although aloes is reported to be more potent than both senna and cascara.^(G41,G45) Orally ingested anthranoid glycosides are not metabolised until they reach the colon. In humans, the intestinal flora break down O-glycosides readily and C-glycosides to some extent. The main active metabolite is aloemodin-9-anthrone.^(G52)

An aloes extract in doses too small to cause abdominal cramps or diarrhoea had a significant hypoglycaemic effect in five patients with non-insulin-dependent diabetes.⁽¹⁴⁾

Side-effects, Toxicity

Aloes is a potent purgative that may cause abdominal pains, gastrointestinal irritation leading to pelvic congestion and, in large doses, may result in nephritis, bloody diarrhoea and haemorrhagic gastritis.^(G41,G44) Like all stimulant purgatives, prolonged use of aloes may produce watery diarrhoea with excessive loss of water and electrolytes (particularly potassium), muscular weakness and weight loss.^(G44)

Tests of the possible carcinogenicity of hydroxyanthraquinones and their glycosides showed that exposure to certain aglycones and glycosides may represent a human cancer risk.⁽¹⁷⁾ Most of the aglycones tested were found to be mutagenic and some, such as emodin and aloemodin, were genotoxic in mammalian cells.

Administration of dried aloes extract 50 mg/kg per day for 12 weeks to mice did not result in the development of severe pathological symptoms, although a raised sorbitol dehydrogenase concentration was suggested to be indicative of liver damage.^(G20) No mutagenic effects in *Salmonella typhimurium* and Va7 cells, or DNA repair induction in rat hepatocytes, were observed. These negative results are due to the inability of the test systems to release mutagenic anthranoids from the C-glycosides.^(G20) Retrospective and prospective studies have shown no causal relationship between anthranoid laxative use and colorectal cancer.^(G20)

Contra-indications, Warnings

Aloes has been superseded by less toxic laxatives.^(G45) The drastic purgative action of aloes contra-indicates its use in individuals with haemorrhoids and existing kidney disease. Hypokalaemia resulting from laxative abuse potentiates the action of cardiac glycosides, interacts with anti-arrhythmic drugs, and with

drugs which induce reversion to sinus rhythm, e.g. quinidine. Concomitant use with thiazide diuretics, adrenocorticosteroids and liquorice may aggregate electrolyte imbalance. In common with all purgatives, aloes should not be given to patients with inflammatory disease of the colon (e.g. Crohn's disease, ulcerative colitis), appendicitis, intestinal obstruction, abdominal pain, nausea or vomiting. Aloes colours alkaline urine red. Long-term use should be avoided and a doctor should be consulted within two weeks of treatment initiation if symptoms persist.

Pregnancy and lactation In view of the irritant and cathartic properties documented for aloes, its use is contra-indicated during pregnancy.^(G44) Anthraquinones may be secreted into breast milk and, therefore, aloes should be avoided during lactation (see Senna).

Aloes is reputed to be an abortifacient and to affect the menstrual cycle.^(G22)

Pharmaceutical Comment

Aloes and aloe gel are often confused with each other. Aloes is obtained by evaporation of water from the bitter yellow juice drained from the leaves of *A. vera*. Commercial 'aloin' is a concentrated form of aloes.^(G41) Aloe gel is prepared by many methods, but is obtained from the mucilaginous tissue in the centre of the leaf and does not contain anthraquinones (see Aloe Vera). Aloes is a potent purgative which has been superseded by less toxic drugs such as senna and cascara. Generally, the use of unstandardised preparations containing anthraquinone glycosides should be avoided, since their pharmacological effect is unpredictable and they may cause abdominal cramp and diarrhoea. In particular, the use of products containing combinations of anthraquinone laxatives should be avoided.

References

See also General References G2, G3, G6, G9, G15, G16, G20, G22, G25, G29, G31, G32, G36, G37, G41, G43, G49, G52, G56, G61, G63 and G64.

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