

The International Aloe Science Council

Presents an

# **Aloe Scientific Primer**



## **Commonly Traded Aloe Species**

The plant *Aloe* spp. has long been utilized in a variety of ways throughout history, which has been well documented elsewhere and need not be recounted in detail here, particularly as the purpose of this document is to discuss current and commonly traded aloe species. *Aloe*, in its various species, can presently and in the recent past be found in use as a decorative element in homes and gardens, in the creation of pharmaceuticals, in wound care products such as burn ointment, sunburn protectant and similar applications, in cosmetics, and as a food, dietary supplements and other health and nutrition related items. Recently, various species of the plant have even been used to weave into clothing and in mattresses.

Those species of *Aloe* commonly used in commerce today can be divided into three primary categories: those used primarily in the production of crude drugs, those used primarily for decorative purposes, and those used in health, nutritional and related products. For reference purposes, this paper will outline the primary species and their uses, but will focus on the species most widely used in commerce for health, nutritional, cosmetic and supplement products, such as aloe vera.

## **Components of aloe vera currently used in commerce**

The *Aloe* plant, and in particular aloe vera, has three distinct raw material components that are processed and found in manufactured goods: leaf juice; inner leaf juice; and aloe latex. A great deal of confusion regarding the terminology of this botanical and its components has been identified, mostly because of a lack of clear definitions, marketing, and other factors. Therefore, they are defined below for clarity:

**Leaf Juice:** is obtained by using the entire leaf of the plant as the starting point, whereby the entire leaf is ground or macerated, typically by machine process, into a sort of “guacamole” and is then further processed and filtered to remove the insoluble components and contaminants, most often by activated charcoal or a similar means, to produce a viscous, juice-like substance. In the case of the vast majority of products in the nutritional, health and related products, this filtration process includes the removal of the majority of the aloe latex contaminants, typically down to 10ppm or less in orally-ingested finished products and 50ppm or less in cosmetic applications.

**Inner Leaf Juice:** is manufactured by first stripping off the outer rind of the plant, either by hand (often called “hand filleting”) or machine, washing off or otherwise removing the aloe latex, and then conducting further processing (which may or may not include filtration) of the inner leaf which is sometimes called the “gel” or “gel fillet”. Inner leaf juice can be “pulp-free” or contain “pulp”, and manufacturers sometimes may or may not add thickening agents, such as carrageenan or

similar additives, and call finished products “aloe vera gel”. Sometimes, inner leaf juice and leaf juice are combined in products.

**Aloe Latex:** is the bitter, yellow-brownish (or sometimes reddish), sap-like material that is found in between the inner parenchymous tissue of the plant (the inner leaf “gel-like” substance) and the rind. Aloe latex “bleeds” from the plant when the rind is cut, and is used primarily in the manufacture of crude drugs. Aloe latex contains anthraquinone and related constituents, known primarily for their laxative effects. Most pharmacopeia describes aloe latex simply as “aloe” or “aloe (juice)”. It is not difficult to understand why so much confusion can be seen, amongst regulators in particular, due to the names used in some of these documents.

### **Species primarily used in the health, nutrition, supplement & related industries**

The two most widely cultivated *Aloe* species for commercial purposes in the health, food & nutrition & related industries are aloe vera (*aloe barbadensis*, or Aloe vera (L.) Burm. f.) and *aloe arborescens*. In the United States, aloe vera is the most widely used species, and very little *aloe arborescens* is used in the manufacturing of products for any usage.

#### **Aloe vera**

Aloe vera, the common name for the species Aloe vera (L.) Burm. f. (or *aloe barbadensis* as it's often called), and which translates as “true aloe” in Latin, is grown primarily in sub-tropical climates, prefers solid sun, and as a succulent from the Lily family (Liliaceae), can withstand being watered infrequently. Like nearly all aloe plants, they are not capable of withstanding frost and related temperatures. This species tends to be larger with shorter stems, and can be identified further by its thick, fleshy, leaves shaped somewhat like tentacles, being heavy or more thick at the base and tapering to a point, and its bright green color. Younger plants tend to have off-white “spots” on them, and only the larger plants tend to produce yellow flowers. Aloe vera will grow, slowly, with the leaves forming a circular pattern of usually the same height (rosette), in a clumping fashion.

Aloe vera is the primary species used in the majority of products manufactured and sold today in much of the world, particularly in the U.S., and can be readily found in cosmetics, foods, dietary supplements and other products.

As mentioned prior, there is often confusion regarding synonyms, particularly of aloe vera, for which the correct taxonomic nomenclature is *Aloe vera* (L.) Burm. f. It's no wonder, in part due to the large number of aloe species, currently over 360 (see table 1), that this might be the case irrespective of the array of terms used in marketing, pharmacopeia's and research publications. For example, “Curaçao Aloe” is often mistakenly understood as a synonym for aloe vera juice, which

actually refers only to the aloe latex component of the plant (Ref: USP 32 monograph: Aloe).

### ***Aloe arborescens***

*Aloe arborescens*, a member of the *asphodelacea* family, is likely the most widely cultivated aloe species in the world, being used in health & related products as well as for decorative purposes, though not often seen in the majority of the former categories outside of Japan. *Arborescens* is the Latin word for “tree-like” or “tree-forming”, and refers more to the plants stem-forming habit than to its direct likeness to a tree. In cultivation, the plant thrives in full sun and well-drained, compost-rich soil, and can tolerate moderate frost (but is sensitive to severe frost). A fast-growing plant, it tolerates drought and neglect once established.

The plants natural habitat tends to be rocky ledges or cliffs, and is likely why its common name is Krantz aloe (krantz in old dutch means “rocky ledge”). This species can be found primarily in the eastern area of Africa, and has the third widest distribution of any aloe species, being found from the Cape Peninsula on the East coast to Mozambique, Zimbabwe and Malawi in the North.

It grows green-grey leaves, typically arranged in aesthetically pleasing rosettes, with off-white, relatively inhospitable looking, though harmless, teeth along the leaf margins. The plant flowers in the winter months, putting off colorful flower spikes typically in a dark orange-to-red hue and sometimes even yellow. The plant typically grows into a multi-pronged shrub approximately 2-3 meters in height.

The species formerly known as *aloe mutabilis* (*sn: aloe mutabilis* Pillans) is now regarded as a synonym of *aloe arborescens*, though this species is not typically utilized for any purpose other than decorative. *Aloe arborescens* var. *natalensis* is another variation of the species used mainly in Japan as a traditional treatment for conditions such as athlete’s foot, burns, bites, and so on.

### **Species primarily used in the creation of crude drugs**

#### ***Aloe ferox***

*Aloe ferox*, also from the Liliaceae family, is a Palm-like succulent with a single 6-10 ft (1.8-3.1 m) upright, un-branched, woody stem crowned with a dense rosette of 50-60 3ft (0.9 m) long thick and fleshy leaves. Old leaves typically adorn the stem, covering it with a dense brown skirt or petticoat.

“Ferox” in Latin means “fierce” or “war-like”, and the plants name is likely attributed to its many sharp reddish-brown spines on the margins of the leaves, as well as the smaller spines on their top and bottom surfaces. Leaves are dull green, usually with a reddish tinge. This species flowers from May to August (and into September in colder parts of the country) in its natural habitat of the Cape

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Region of South Africa, with red and orange hues typically, and occasionally in yellow or even white, with stalks standing 2-4 ft (0.6 -1.2 m). Common names include cape aloe, bitter aloe, and tap aloe.

This species thrives in well-drained, infertile soil and should not be fertilized more than 1x per year. Best growth is achieved in full sun with moderate water during the growing season, allowing the soil to dry out between liberal waterings. Less water should be used during the plants dormant period. *Aloe ferox* is relatively tolerant of drought and is typically more frost-hardy than other species.

*Aloe ferox* is one of the primary sources of the purgative “bitter aloes”, a strong laxative found in the yellow-brown sap, or aloe latex, and has been harvested as a renewable resource in South Africa for over two hundred years. The latex from the plant is typically collected, dried and processed for medicinal purposes, including manufacturing into crude drugs. It is listed on Appendix II of the Convention on International Trade in Endangered Species (CITES), so that any international trade of wild harvested plants should be carefully monitored to ensure it is compatible with the species survival.

*A. candelabrum*, a form of aloe ferox, has an elegant shape with the leaf tips curving slightly downwards. The spines along the leaf edge also tend to be reddish in color, and may be present on the upper and lower leaf surfaces, with younger plants tending to be very spiny. The flowers are carried in a large candelabra-like flower-head, typically with five to eight branches, each carrying a spike-like head of many flowers. Colors vary from yellow-orange to bright red.

Aloe Africana, another species, is often hybridized with aloe ferox and is another source of cape aloe. Though primarily used for its latex, there are some companies who use this species of aloe (as well as others) for other products. However, these are limited in scope.

### ***Aloe spicata***

*Aloe spicata*, like *Aloe arborescens*, is also a member of the *asphodelacea* family. Typically growing to about three (3) feet in height overall, it is a single, short stemmed plant with a rosette solid green leaves with reddish margins that grown in a horizontal fashion, and are typically around 2 feet (60cm) in overall length. Growth season is in the summer, and it flowers, somewhat unusually for aloe species, in the winter months with yellow blossoms. The species natural habitat is South Africa (Mozambique; Zimbabwe), where it grows mostly in full sun on steep rock slopes and cliffs.

The common name of the species is Bullocks Bottle Brush Aloe. Synonyms include aloe sessiflora and aloe tauri.

## **Species primarily cultivated for decorative purposes**

*Aloe brevifolia*

*Aloe descoingsii*

*Aloe marlothii*

*Aloe perryi*

*Aloe saponaria* (Ait.) Haw (African or Soap aloe)

*Aloe variegata* (tiger aloe)

## **Table of known *Aloe* species (Appendix I)**

There are reportedly over 400 known species of *Aloe*, and an unverified list of is presented for informational purposes in Appendix I. As new species of *Aloe* are discovered and examined, this may lead to other advances in science, biology and related areas.

## **Growing aloe vera for a profit**

### **Cultivation of aloe vera**

*Aloe vera* species can be grown in a variety of different locales, from indoor pots to desert land and rocky ledges or fields. For the purposes of this paper, the scope of this section will focus on commercial cultivation of the plant and in particular the species most widely used in commercial products in the U.S. and abroad in health, nutrition and related products, aloe vera.

### **Acreage & general cultivation considerations**

In the US, the suggested row spacing is a standard, forty-two (42) inch wide row. Growers plant the aloe pups (the larger the better) at ~60 cm spacing. One could use checkered double-plant rows in each bed. One acre may have 5,000-6,000 plants, which is equivalent to about 12,000-15,000 plants per hectare. If the entire field is planted in a 60 cm x 60 cm spacing many more may be planted. Consideration for the ease of frequent hoeing to remove weeds and hand harvesting should be made as well as the need to have some space for trucks to access the fields to carry the harvested leaves out. Do not make the mistake of planting these large plants too densely.

Pesticide use is discouraged. The use of pesticides, herbicides and germicides will prevent the fields from attaining organic certification thru the United States Department of Agriculture's (USDA) National Organic Program (NOP), among others. A USDA NOP fact sheet is available in Appendix II for more information on attaining certification through the NOP. In Europe, different regulations exist regarding organic certification. More information on the legislation can be found at the following link: [http://ec.europa.eu/agriculture/organic/eu-policy/legislation\\_en](http://ec.europa.eu/agriculture/organic/eu-policy/legislation_en)

Animals such as goats and other, similar grazing animals have commonly been used for weed control as well as to provide fertilizer for the soil. *Aloe vera*'s thick

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rind prevents many insects from attacking the plant and spoiling or destroying the inner gel. Irrigation also helps to maintain a natural predator resistance.

### **Climate**

Aloe vera tends to grow most heartily in areas with higher heat and less rainfall, with sub-tropical climates being ideal. Like nearly all species of *Aloe*, it is not frost hardy, and a frost will typically kill the plant or crop.

### **Soil & fertilization**

Aloe vera grows most readily in fast-draining soil that is less dense and more sand-like. Since aloe is a 6- to 8-year crop, building up organic matters in the soil as much as possible before planting is recommended. Apply about 50 kg of nitrogen per hectare four times a year (after each quarterly harvest). If the availability of fertilizer is a problem, then try to apply chemical fertilizer at least twice a year and use abundant manure, if available. There is no need to apply any fertilizer during the first 4 months immediately following planting. Weeding and related activities should be performed at regularly scheduled intervals.

### **Propagation**

Unlike some other species of *Aloe*, aloe vera does not produce seeds, and the most common method of propagation is by planting offshoots, or pups, from a “mother” plant. Though true that aloe vera can often be grown from cuttings, for the purposes of commercial cultivation, it is considered much too slow of a process.

Aloe vera pups are typically hardy and can be pulled or carefully cut away from the parent plant, roots included, and re-planted – but as stated in a prior section, the larger the pup the better. Although aloe pups can withstand 5° C for some time, there is no need to store them at low temperatures before planting.

In the past, aloe vera pups were planted on top of the rows. However, with machine cultivation, and even hand hoeing, the furrows get narrower and narrower as time passes. This causes severe root exposure, restricts root growth and often damages the root system enough to make plants unhealthy and wobbly. It is recommended to aloe growers to plant pups in prepared flat land or in the furrow. By doing such, more extensive root systems can be maintained, resulting in better plant growth and much higher yields.

Aloe vera pups can be planted anytime of the year, but it is recommended to avoid the cold months or weeks. Immediately after planting, the plants may turn brown and leaves flat, but this is not unexpected. With some irrigation, they should start turning green in 2-3 months when the roots have started to grow into the surrounding soil. Pups should be removed from mother plants at least twice a year to maintain larger mother plants for maximizing leaf size.

## **Species ID**

Due to the wide variety of species and their practical purposes and uses, it is important to ensure the identity of plants prior to cultivation. This is obviously of greater importance to non-established or newer farms. Hybridizing is also an issue and should be a consideration if planting multiple species in relative locales. Retained samples should be kept and provided, if needed, in order to provide evidence of species identification.

Reputable providers of pups should be asked for, and able to provide, Certificates of Analysis (C of A's) along with other similar documentation to potential farmers. Other methods of identification including organoleptic, HPLC, and other analytical methods should be considered and records maintained when provided.

## **Harvesting & yields**

Cuttings from a single plant can typically be made between 3-5 times per year. Cuttings are typically made from plants of only the outermost 3-4 leaves by pulling the leaf away from the plant stalk and cutting at the white base – any exposure of the inner leaf material should be avoided, as any opening within or at the base of the leaf will immediately cause oxidation to begin. Aloe vera is qualified thru its freshness, and oxidation is a part of the degradation process.

After the first 1.5 years, you can expect to harvest 10-12 kg of leaves per plant per year. It's suggested 22-24 leaves could be harvested per plant annually. If no fertilizer is applied, the lower, older leaves will have premature desiccation and leaves must be harvested every two months, with leaves likely being small and brownish.

## **Processing after harvest**

Once the leaves are collected from the fields, they are gathered for transport to a processing facility. If the leaves must remain outside before processing, they should be stored in a cool, dry place away from the sun. In order to maximize aloe vera freshness and polysaccharide content, leaves must be processed within 24 hours.

## **Entire Leaf vs. Inner-Leaf processing**

Once the leaves arrive at the processing area they are washed and prepared for further processing. For inner-leaf material, after washing of the leaves the aloe is filleted, meaning the outer rind is stripped off either by hand using a knife or by machine, and any remaining aloe latex is then rinsed away. Processing for retail purposes usually takes place thereafter.



## **Aloe vera as a market commodity**

### **General info on the aloe vera market**

IASC staff regularly receives queries on the aloe vera market, including general questions such as information on the overall size of the market to the more specific queries on growing the crop, harvesting, processing and then how to go about selling it. Though the IASC as a trade organization, comprised of manufacturers and other companies in the industry, and represents the *Aloe* industry at-large in the capacity of science, representation, education and other areas, the organization is not a broker for raw materials/suppliers and does not actively maintain data on the market price, nor is it mandated to directly assist in the sale of products or raw materials. In fact, it would be something of a conflict of interest to do so.

However, the organization does see the opportunity to provide basic information on these topics in order to assist individuals and companies, potentially or currently active in the trade, in understanding the aloe vera market and to provide educational information that may be deemed useful to growers or those interested in considering becoming so. The following sections will discuss issues related to the sale of aloe vera raw materials, but should not be considered all-inclusive or complete, and should not be viewed as the only information available on the topic.

### **General pricing info**

Like soybeans, corn or other similar agricultural products, aloe vera is considered by the industry to be a commodity, though it is not traded in any futures or related market. As such, the price as a raw ingredient is constantly in flux, dependent on a variety of factors that affect the overall market. These factors include items one would expect for many agricultural commodities, such as supply, demand, and quality. But it also includes such considerations as climate (for example: frosts/freezes), which can contribute to the overall supply and potentially demand.

Freezing or frosts is a phenomenon that has historically happened once every twenty years or so to the aloe vera industry, the last occurrence having been about six years ago. The freeze, though short lived, decimated many aloe vera crops, particularly in Mexico and Central America. The result was a shortage in the global market. Fortunately, Aloe vera cultivation is not confined to one area of the globe. However, due to the shortage in Mexico, raw leaves were placed at a premium during that time.

Also, similarly to many other agricultural commodities, aloe vera is sold by the ton. As a general range, the market price has typically been (for 2008-2009) anywhere from \$6-\$16 per ton. However, this information is provided only for reference to this particular timeframe, and should not be considered a permanent

price structure, particularly based on prior comments made regarding those factors that affect pricing.

### **Typical methods of selling aloe vera crop**

The purchase or sale of commercially grown aloe vera is affected by weather conditions, farmer/buyer relationship, transportation, and the quantity and quality of aloe vera being purchased.

Traditionally, aloe vera is grown on family-owned farms and is not traded via the futures market. When looking to sell aloe vera, many farmers seek out manufacturers who purchase the ingredient in bulk or manufacturers will seek out farmers who commercially grow aloe vera in needed amounts. How does one find aloe manufacturers and/or aloe growers? Typical methods include trade shows, the internet, and word of mouth. The IASC maintains a list of its members their website ([www.iasc.org/Members.html](http://www.iasc.org/Members.html)) and offers a good starting resource.

Once the relationship is established several types of deals can be put in place to ensure a healthy business relationship. Some arrangements include advanced sale/pre-sale prior to planting, contracts, and sales after planting or prior to harvest.

### **Aloe vera samples and Certificates of Analysis (C of A's)**

When relationships are being established buyers may request samples of leaves, but will very seldom get a Certificate of Analysis (C of A) with specifications, though buyers should be able to determine the species via any necessary government inspection paperwork. Aloe vera is a hands-on product and should be seen in its natural state to determine its value in the market. When not possible, leaves are shipped, typically overnight, to potential buyers. However it is common for prospective buyers to go to the fields to inspect crops.

### **Advanced sale/pre-sale prior to cultivation**

This type of relationship normally involves investments in the fields which yield aloe vera crops, or may involve a manufacturer or supplier requesting a farmer plant their fields with aloe vera crop. The investment can vary depending on the farmer/buyer relationship. Some typical business models under this arrangement include purchasing the aloe vera pups for harvesting, investing in workers for harvesting or investing in equipment/supplies needed for a healthy crop. Investments such as this ensure first rights to the new crops.

### **Contracts**

Contracts vary with each farmer/buyer relationship. Standardized contracts ensuring first right to harvest can be a precarious situation due to weather conditions and other varying factors, and it is not uncommon for contracts to become null and void if the yield is shorted due to such unforeseen forces. Contracts are made between farmers and buyers with the underlying knowledge

that weather does play a part in productivity and yield. Legal advice is recommended when engaging in any contractual arrangement.

### **Sale after harvest**

This is one of the more common ways of doing business when one is new to the industry and requires establishing a relationship with many prospective buyers/knowning a farmer prior to harvesting, if the objective is to move the material relatively quickly. Growers/processors are recommended to create business connections during the growth period in order to maximize returns on harvests.

### **“One-off” sales vs. sustainable harvesting**

When demand is high in the aloe vera retail market it is not uncommon for a manufacturer to seek out new relationships to meet the high demand. These relationships may be a one-time purchase which suits both farmer and manufacturer. These so called “one-off” sales can be quite lucrative for the farmer for a short period of time, though not necessarily sustainable.

Solid business relationships are needed to maintain a healthy, year-round, sustainable harvest. Such relationships help the farmer maintain quality soil, steady labor, and financial stability. In return the manufacturer is ensured quality crops. Sustainable harvesting is ultimately the reason behind developing the buyer/grower relationship. Financial stability on both ends ensures established harvests and renewed planting.



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### Appendix I – Aloe Species

Aloe aageodonta	Aloe boiteani	Aloe classenii	Aloe dorothea
Aloe abyssicola	Aloe boscawenii	Aloe claviflora	Aloe duckeri
Aloe abyssinica	Aloe bowiea	Aloe commixta	Aloe dumetorum
Aloe aculeata	Aloe boylei	Aloe compacta	Aloe dyeri
Aloe acutissima	Aloe brachystachys	Aloe compressa	Aloe ecklonis
Aloe adigratana	Aloe branddraaiensis	Aloe compressa var. rugosquamosa	Aloe elata
Aloe affinis	Aloe brandhamii	Aloe comptonii	Aloe elegans
Aloe africana	Aloe breviscapa	Aloe confusa	Aloe elgonica
Aloe ahmarenensis	Aloe broomii	Aloe congdonii	Aloe ellenbeckii
Aloe albida	Aloe brunneostriata	Aloe congolensis	Aloe eminens
Aloe albiflora	Aloe buchananii	Aloe conifera	Aloe enotata
Aloe albovestita	Aloe buchlohii	Aloe constricta	Aloe eremophila
Aloe alfredii	Aloe buettneri	Aloe cooperi	Aloe erensii
Aloe alooides	Aloe buhrii	Aloe corallina	Aloe ericetorum
Aloe ambigens	Aloe bukobana	Aloe crassipes	Aloe erinacea
Aloe amicorum	Aloe bulbicaulis	Aloe cremersii	Aloe eru
Aloe ammophila	Aloe bulbilifera	Aloe cremnophila	Aloe erythrophylla
Aloe amudatensis	Aloe bullockii	Aloe cryptoflora	Aloe esculenta
Aloe andongensis	Aloe burgersfortensis	Aloe cryptopoda	Aloe excelsa
Aloe andringritrensis	Aloe bussei	Aloe dabenorisana	Aloe falcata
Aloe angiensis	Aloe chabaudii var. mlanjeana	Aloe davyana	Aloe ferox
Aloe angolensis	Aloe calcairophila	Aloe dawei	Aloe fibrosa
Aloe ankoberensis	Aloe calidophila	Aloe debrana	Aloe fievetii
Aloe antandroi	Aloe cameronii	Aloe decaryi	Aloe fleurentinorum
Aloe archeri	Aloe camperi	Aloe decorsei	Aloe flexilifolia
Aloe arenicola	Aloe canarina	Aloe decurva	Aloe forbesii
Aloe argenticauda	Aloe candelabrum	Aloe decurvidens	Aloe fosteri
Aloe asperifolia	Aloe cannellii	Aloe defalcata	Aloe fouriei
Aloe audhalica	Aloe capitata	Aloe delphinensis	Aloe fragilis
Aloe ausana	Aloe capitata var capitata	Aloe deltoideodonta	Aloe framesii
Aloe babatiensis	Aloe capitata var cipolinicola	Aloe descoingsii	Aloe francombei
Aloe bainesii	Aloe capitata var gniessicola	Aloe deserti	Aloe fulleri
Aloe bakeri	Aloe capitata var quartziticola	Aloe dewetii	Aloe gariopensis
Aloe ballii	Aloe caricina	Aloe dewinteri	Aloe gerstneri
Aloe barbadensis	Aloe castellorum	Aloe dhalensis	Aloe gigas
Aloe barbertoniae	Aloe catengiana	Aloe dhufarensis	Aloe gilbertii
Aloe bargalensis	Aloe chabaudii	Aloe dichotoma	Aloe gillilandii
Aloe bella	Aloe cheranganiensis	Aloe dinteri	Aloe glabrescens
Aloe bellatula	Aloe chlorantha	Aloe dispar	Aloe globuligemma
Aloe betsileensis	Aloe chortolirioides	Aloe divaricata	Aloe gloveri
Aloe bicomitum	Aloe christianii	Aloe doeii	Aloe gossweileri
Aloe boehmii	Aloe chrysostachys	Aloe dolomitica	Aloe gradicaulis
Aloe boiteau	Aloe citrina	Aloe dominella	Aloe graciflora

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Aloe gracilis	Aloe karasbergensis	Aloe marlothii	Aloe nyeriensis
Aloe graminifolia	Aloe keayi	Aloe marsabitensis	Aloe obscura
Aloe grandidentata	Aloe kedongensis	Aloe massawana	Aloe officinalis
Aloe grata	Aloe keithii	Aloe mawii	Aloe ortholopha
Aloe greatheadii	Aloe ketabrowniorum	Aloe mayottensis	Aloe otallensis
Aloe greatheadii davyana	Aloe kilifiensis	Aloe medishiana	Aloe pachygaster
Aloe greenii	Aloe kirkii	Aloe megalacantha	Aloe palmiformis
Aloe greenwayi	Aloe kniphofioides	Aloe melanacantha	Aloe parellifolia
Aloe grisea	Aloe komaggasensis	Aloe menachensis	Aloe parvibracteata
Aloe guerrai	Aloe komatiensis	Aloe mendesii	Aloe parvidens
Aloe guillaumetii	Aloe krapohlana	Aloe menyhartii	Aloe parviflora
Aloe humilis	Aloe krausii	Aloe meruana	Aloe parvula
Aloe haemanthifolia	Aloe kulalensis	Aloe metallica	Aloe patersonii
Aloe hardyi	Aloe laeta	Aloe meyeri	Aloe pearsonii
Aloe harlana	Aloe labworana	Aloe microcantha	Aloe peckii
Aloe harmsii	Aloe lateritia graminicola	Aloe microdonta	Aloe peglerae
Aloe haworthioides	Aloe lastii	Aloe microstigma	Aloe pendens
Aloe haworthioides albiflora	Aloe lareritia	Aloe millotii	Aloe penduliflora
Aloe hazeliana	Aloe latifolia	Aloe milne-redheadii	Aloe percrassa
Aloe helenae	Aloe lavranosii	Aloe minima	Aloe perfoliata
Aloe heliderana	Aloe leachii	Aloe modesta	Aloe perrieri
Aloe hemmingii	Aloe leandrii	Aloe moledarana	Aloe petricola
Aloe hendrickxii	Aloe leedalii	Aloe monotropa	Aloe petrophila
Aloe hereroensis	Aloe lensayuensis	Aloe monteiroi	Aloe peyrierasii
Aloe hildebrandtii	Aloe lepida	Aloe monticola	Aloe pirottae
Aloe hlangapies	Aloe leptophylla	Aloe morijensis	Aloe plowesii
Aloe howmanii	Aloe leptosyphon	Aloe morogoroensis	Aloe pluridens
Aloe humbertii	Aloe lettyae	Aloe mubendiensis	Aloe pole-evansii
Aloe humilis (L.) Mill.	Aloe leucantha	Aloe mudenensis	Aloe polyphylla
Aloe ibitiensis	Aloe linearifolia	Aloe multicolor	Aloe powysiorum
Aloe imalotensis	Aloe lineata	Aloe munchii	Aloe pretoriensis
Aloe immaculata	Aloe littoralis	Aloe murina	Aloe princeae
Aloe inamara	Aloe longibracteata	Aloe musapana	Aloe x principis
Aloe inconspicua	Aloe luapulana	Aloe mutabilis	Aloe prinslooii
Aloe inermis	Aloe lutescens	Aloe mutans	Aloe procera
Aloe integra	Aloe macleayi	Aloe myriacantha	Aloe pruinosa
Aloe intermedia	Aloe macloughinii	Aloe mzinbana	Aloe pubescens
Aloe inyangensis	Aloe macrantha	Aloe namibensis	Aloe purpurascens
Aloe isaloensis	Aloe macrocarpa	Aloe ngongensis	Aloe pustuligemma
Aloe itremensis	Aloe macroclada	Aloe niebuhriana	Aloe rabaiensis
Aloe jacksonii	Aloe macrosiphon	Aloe nobilis	Aloe rauhii
Aloe jucunda	Aloe maculata	Aloe nubigena	Aloe reitzii
Aloe juvenna	Aloe madecassa	Aloe nuttii	Aloe retrospectiens

Appendix I – Aloe Species

Aloe reynoldsii	Aloe spicata	Aloe veseyi
Aloe rhodesiana	Aloe splendens	Aloe viguieri
Aloe richardiae	Aloe squarrosa	Aloe viridiflora
Aloe richtersveldensis	Aloe steudneri	Aloe vituensis
Aloe rigens	Aloe striatula	Aloe vogtsii
Aloe rivae	Aloe stuhlmannii	Aloe volkensis
Aloe rivieri	Aloe suarezensis	Aloe vossii
Aloe rubriflora	Aloe subacutissima	Aloe vryheidensis
Aloe rubroviolacea	Aloe succotrina	Aloe vulgaris
Aloe rugosifolia	Aloe suffulta	Aloe whitcombei
Aloe runcinata	Aloe suprafoliata	Aloe wickensii
Aloe rupestris	Aloe suzannae	Aloe wildii
Aloe rupicola	Aloe swynnertonii	Aloe wilsonii
Aloe ruspoliana	Aloe tenuior	Aloe wollastonii
Aloe sabaea	Aloe thompsoniae	Aloe woolliana
Aloe salm-dyckiana	Aloe thorncroftii	Aloe wrefordii
Aloe saponaria	Aloe thraskii	Aloe yavellana
Aloe saundersiae	Aloe tidmarshii	Aloe yemenica
Aloe scabrifolia	Aloe tomentosa	Aloe zanzibarica
Aloe schelpei	Aloe tororoana	
Aloe schliebenii	Aloe torrei	
Aloe schoellerii	Aloe trachyticola	
Aloe schomeri	Aloe transvaalensis	
Aloe schweinfurthii	Aloe trigonantha	
Aloe scobinifolia	Aloe trothae	
Aloe scorpioides	Aloe tugenensis	
Aloe secundiflora	Aloe turkanensis	
Aloe sereti	Aloe tweediae	
Aloe serriyensis	Aloe ukambensis	
Aloe sessiliflora	Aloe umbellata	
Aloe sessiliflora vryheidensis	Aloe umfuloziensis	
Aloe sheilae	Aloe vacillans	
Aloe silicola	Aloe vallaris	
Aloe simii	Aloe vanbalenii	
Aloe sinana	Aloe vandermerwei	
Aloe sinkatana	Aloe vaombe	
Aloe sladeniana	Aloe vaotsanda	
Aloe somaliensis	Aloe venenosa	
Aloe somaliensis marmorata	Aloe venusta	
Aloe somliensis somaliensis	Aloe vera	
Aloe sophie	Aloe verdoorniae	
Aloe soutpansbergensis	Aloe verecunda	
Aloe speciosa	Aloe versicolor	

## Certification

The U.S. Department of Agriculture (USDA) accredits State, private, and foreign organizations or persons to become "certifying agents." Certifying agents certify that organic production and handling practices meet the national standards.

### Who needs to be certified?

Operations or portions of operations that produce or handle agricultural products that are intended to be sold, labeled, or represented as "100 percent organic," "organic," or "made with organic ingredients" or food group(s).

### Who does NOT need to be certified?

Producers and handling (processing) operations that sell less than \$5,000 a year in organic agricultural products. Although exempt from certification, these producers and handlers must abide by the national standards for organic products and may label their products as organic.

Handlers, including final retailers, that:

- Do not process or repackage products;
- Only handle products with less than 70 percent organic ingredients;
- Process or prepare, on the premises of the establishment, raw and ready-to-eat food labeled organic;
- Choose to use the word organic only on the information panel; and
- Handle products that are packaged or otherwise enclosed in a container prior to being received by the operation and remain in the same package.

### How do farmers and handlers become certified?

An applicant must submit specific information to an accredited certifying agent.

Information must include:

- The type of operation to be certified;
- A history of substances applied to land for the previous 3 years;
- The organic products being grown, raised, or processed;
- The organic system plan (OSP) – a plan describing practices and substances used in production. The OSP also must describe monitoring practices to be performed to verify that the plan is effectively implemented, a record-keeping system, and practices to prevent commingling of organic and nonorganic products and to prevent contact of products with prohibited substances.

Applicants for certification must keep accurate post-certification records for 5 years concerning the production, harvesting, and handling of agricultural products that are to be sold as organic.

These records must document that the operation is in compliance with the regulations and verify the information provided to the certifying agent. Access to these records must be provided to authorized representatives of USDA, including the certifying agent.

# Certification

## Inspection and certification process

Certifying agents review applications for certification eligibility. A qualified inspector conducts an on-site inspection of the applicant's operation. Inspections are scheduled when the inspector can observe the practices used to produce or handle organic products and talk to someone knowledgeable about the operation.

The certifying agent reviews the information submitted by the applicant and the inspector's report. If this information demonstrates that the applicant is complying with the relevant standards and requirements, the certifying agent grants certification and issues a certificate. Certification remains in effect until terminated, either voluntarily or through the enforcement process.

Annual inspections are conducted of each certified operation, and updates of information are provided annually to the certifying agent in advance of conducting these inspections. Certifying agents must be notified by a producer or handler immediately of any changes affecting an operation's compliance with the regulations, such as application of a prohibited pesticide to a field.

## Compliance review and enforcement measures

The regulations permit USDA or the certifying agent to conduct unannounced inspections at any time to adequately enforce the regulations. Certifying agents and USDA may also conduct pre- or postharvest testing if there is reason to believe that an agricultural input or product has come into contact with a prohibited substance or been produced using an excluded method.

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**USDA**

**ORGANIC**

National Organic Program  
[www.ams.usda.gov/nop](http://www.ams.usda.gov/nop)  
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### References

- Park, Y.I., Lee, S.K. 2006. *New Perspectives on Aloe*. Springer.
- Reynolds, T. 2004. *Aloes: The Genus Aloe.*, CRC Press.
- International Aloe Science Council. 2009. Definitions & Labeling Guidance. IASC.
- Aloe species list. Wikipedia. Accessed 7/29/09.
- Wang, Y. 2008. Propagation of aloe vera – email communication. IASC.
- Bornman, H & Hardy D.S. 1971. *Aloes of the South African Veld*. Voortrekkerpers, Johannesburg.
- Glen, H.F. & Hardy.D.S. 2000. Aloaceae (First Part): *Aloe*. *Flora of Southern Africa* 5(1,1). National Botanical Institute, Pretoria
- Jackson, W.P.U. 1990. *Origins and Meanings of Names of South African Plant Genera*. Ecolab, University of Cape Town.
- Jeppe, B. 1969. *South African Aloes*. Purnell, Cape Town.
- Pooley, E. 1994. *The Complete Field Guide to Trees of Natal, Zululand and Transkei*. Natal Flora Publications Trust, Durban.
- Reynolds, G.W. 1982. *The Aloes of South Africa*. A.A. Balkema, Cape Town.
- Van Wyk, B-E & Smith, G. 1996. *Guide to the Aloes of South Africa*. Briza Publications, Pretoria.
- Van Wyk, B-E, van Oudtshoorn, B & Gericke, N. 1997. *Medicinal Plants of South Africa*. Briza Publications, Pretoria.
- Hutchings, Anne. 1996. *Zulu Medicinal Plants, an inventory*. University of Natal Press, Pietermaritzburg
- Palmer, E. and Pitman, N. 1972. *Trees of Southern Africa*. A.A. Balkema, Cape Town.
- van Wyk, B.E., Gericke, N. 2000. *People's Plants*. Briza Publications, Pretoria.
- Leistner, O.A. (ed.). 2000. *Seed plants of southern Africa: families and genera*. Strelitzia 10. National Botanical Institute, Pretoria
- Goldblatt, P. and Manning, J. 2000. *Cape Plants: A Conspectus of the Cape Flora of South Africa*. National Botanical Institute of South Africa, Pretoria.
- Court, D. 2000. *Succulent Flora of Southern Africa*. A.A. Balkema, Rotterdam, Netherlands.