

Processing methods for *Aloe vera* leaf

Two methods of processing *Aloe vera* (aloe vera) leaf are utilized to obtain the juice ingredient commonly used in commercially available products.

1. Leaf processing method: aloe vera leaf juice¹ is obtained by grinding or macerating the entire aloe vera leaf followed by purification to remove the phenolic compounds found in the latex. This purification step is usually accomplished via activated carbon filtration in a process known as decolorization.
2. Inner leaf processing method: aloe vera leaf juice is obtained by stripping away the outer leaf rind, rinsing or washing away the latex, and processing the remaining inner leaf material. Decolorization is also sometimes employed with this method.

Leaf juice purification

Aloe vera leaf processing using the entire leaf (see [Figure 1](#)) was first developed in the 1980's in the USA (Ramachandra & Rao, 2008) and has been improved over time (Homcare Iberica, 1983; Coats, 1994). It usually involves an activated carbon purification step, a process known as decolorization, to remove pigments and anthraquinoid constituents, in particular aloin A and B that are phenolic constituents from the leaf latex (Upton et al., 2012).

Activated carbon in the form of carbonised wood charcoal has been used since antiquity; the Egyptians used it as a purifying agent in about 1500 BC. Its first industrial use started around 1900 in the sugar refining industry. Currently this process is used extensively by various other industries, including for the purification of many chemical, pharmaceutical and food products, for the removal of undesirable odor, color, taste, and organic and inorganic impurities (Bansal & Goyal, 2005).

Application of the decolorization via activated carbon purification process has been a common practice in the manufacture of aloe vera leaf juice since the 1980s. The end product is a juice virtually free of the latex constituents known to have a laxative effect (Ramachandra & Rao, 2008; Ahlawat & Khatkar, 2011; Upton et al., 2012).

The content of aloin in non-decolorized aloe leaf juice made from the entire leaf is on the order of 10,000 – 20,000 ppm. The International Aloe Science Council has established a quality standard for their certification program of not more than 10 ppm aloin A and B for all aloe vera leaf juice ingredients for use in products intended for oral consumption (www.iasc.org), while the aloin limit specification established by European Council Directive 88.388.EEC is not more than 0.1 ppm in flavourings for beverages.

Aloe vera leaf processing

¹ The term “juice” is used here consistent with its definition in the IASC Labeling Guidance and Definitions document (IASC, 2009).

Aloe vera leaf processing begins with removal of the aloe vera leaf and tip after which the remaining leaf is cut into sections and ground into slurry, producing a soup-like consistency colloquially known as “guacamole.” This in-process material may be treated with the enzyme cellulase in order to obtain a less viscous product (Upton et al., 2012). Afterwards the resulting liquid is subjected to a series of filtration steps to remove remaining rind particles and the undesirable phenolic constituents.

Typically a series of coarse screening filters or passage through a juice press removes the large pieces of rind. The resulting liquid is pumped into sanitized stainless steel holding tanks, before advancing to a depulping extractor that removes the remaining pulp and rind particles generated by the initial grinding process. The liquid is then passed through a series of press filters with carbon coated plates that remove the phenolic constituents, including aloin, and any microscopic pieces of leaf, sand or other particles. The aloe vera juice is continually passed through the filter press until 99.9% or more of the aloin is removed.

Filtration is performed as a final purification step before the liquid is ready for stabilization. The result is a clear fluid that is similar in organoleptic characteristics to inner leaf juice, but generally containing three times more bio-active constituents than juice produced by hand filleting as discussed in the next section of this document (Ramachandra & Rao, 2008; Ahlawat & Khatkar, 2011).

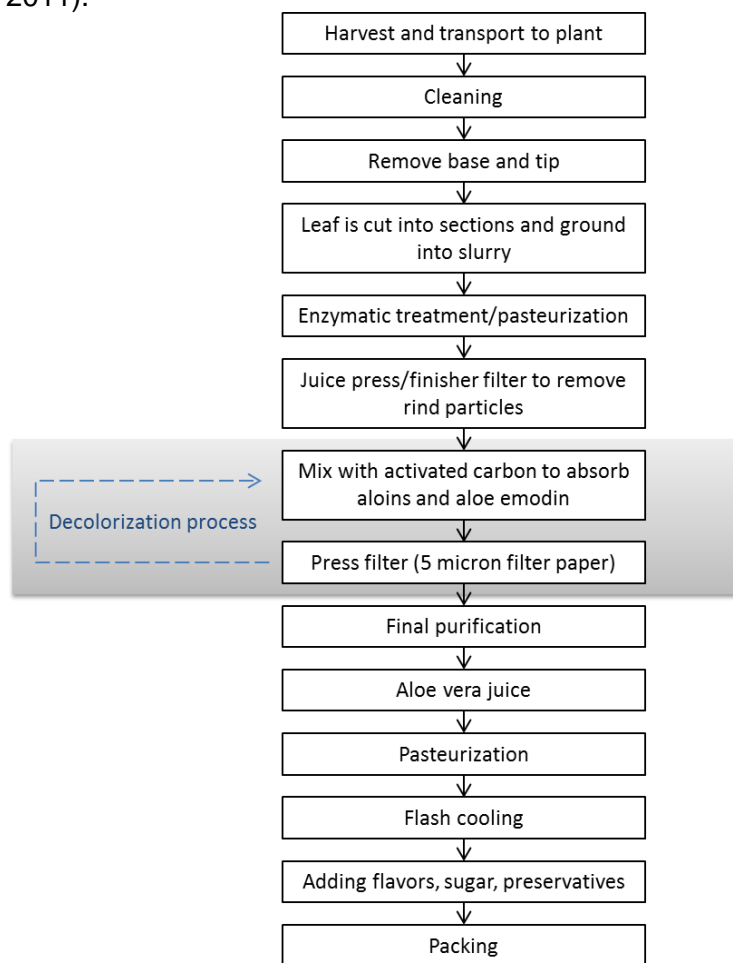


Figure 1: Example process flow diagram for aloe vera leaf processing to the finished product stage. Adapted from Ramachandra and Rao (2008).

Aloe vera inner leaf processing

Aloe vera inner leaf juice is produced by separating and discarding the leaf rind from the inner pulp before expressing the juice. By carefully removing the outer rind the presence of phenolic compounds in the finished product is minimized although it is not uncommon for this material to also undergo a decolorization step (Upton et al., 2012).

The leaves are washed with an antimicrobial agent to remove dirt and surface bacteria, followed by culling, trimming and removing the rind to obtain the leaf material known as a “fillet” due to its resemblance to a processed fish fillet. Filleting can be done either by hand or mechanically, and involves removing the lower inch of the base of the leaf, the leaf tip, the spines along the leaf margin, and the top and bottom rinds. The inner leaf fillets are then rinsed in flowing water and are sometimes subjected to depulping, usually followed by pasteurization. Subsequent processing may include enzymatic treatment, filtration deaeration, and decolorization by activated carbon (see the aloe vera leaf processing section), and addition of preservatives (Upton et al., 2012).

References

- Ahlawat, K. S., & Khatkar, B. S. (2011). Processing, food applications and safety of aloe vera products: a review. *J Food Sci Technol*, 48(5), 525-533. doi: 10.1007/s13197-011-0229-z
- Bansal, R. C., & Goyal, M. (2005). *Activated carbon adsorption*: CRC press.
- Coats, B. (1994). Methods of processing stabilized aloe vera gel obtained from the whole aloe vera leaf. US Patent 5 356 811.
- Homcare Iberica. (1983). Stabilization of a clear gel from aloe vera leaves. Span ES 502 307. *Patent of Introduction*.
- Ramachandra, C., & Rao, P. S. (2008). Processing of Aloe vera leaf gel: a review. *American Journal of Agricultural and Biological Sciences*, 3(2), 502-510.
- Upton, R., Axentiev, P., & Swisher, D. (2012). *Aloe Vera Leaf, Aloe Vera Leaf Juice, Aloe Vera Inner Leaf Juice, Aloe Vera (L.) Burm. F: Standards of Identity, Analysis, and Quality Control*. Scotts Valley, CA: American Herbal Pharmacopoeia.

Issued May 31, 2016