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NOTE

Processing of *Aloe barbadensis* Miller

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In the present communication, processing the leaves of both field grown and *in vitro* cultured *Aloe barbadensis* Miller plants to produce aloe water and aloe powder are presented. The analysis of aloe powder is also reported.

Key Words: Aloe, Aloe water, Aloe powder.

Aloe barbadensis Miller plant is rendered as one of the most important and useful medicinal plants[1-3]. It has the medicinal properties and also plant's extracts also useful in the cosmetic industry[4]. Aloin and the aloe glycoprotein which is believed to have a cell proliferation promoting activity[5]. The most useful part of the plant is its gel. Annually tones of aloe vera are processed in the country. Processing of *Aloe barbadensis* Miller plant to aloe water and aloe powder along with the analysis of aloe powder is also reported.

All the materials were procured from Biomax Life Sciences, Hyderabad. Raw plant processing involves the following steps:

Washing: Fresh leaves are harvested and transported to the laboratory within 8 h of harvesting. The leaves in the field are washed using water containing 5-10 ppm chlorine to assure that the water is free from any pathogens. This surface sterilization ensures initial aseptic conditions. Soon after cutting, the leaves are brought to the washing pond (within 8 h) and are further cleaned manually, first with water, then with a solution containing 0.001 to 0.005 ppm of formalin and finally with sterile distilled water. The leaves are stacked vertically and cut at the bottom to drain off.

Aloe extractor (leaf crushing): The leaves are next cut once again at the bottom (*ca.* 15% of the leaf's length) to remove the yellow aloin spot. The leaves are then fed into the crusher (juicing machine), thus, leaves are continuously squeezed and extracted. Squeezed liquor and extracted leaves are collected at different ends of the collector. The residual juice from the squeezed leaves is also drained and collected.

Gyro filtration and homogenization: The viscous mixture is then subjected to gyro filtration to separate the rind and the gel. The raw gel is again passed through a filtration cum homogenization unit to get clear water which is a white and transparent gel/liquid. Adequate preservatives like sodium benzoate and potassium sorbate are added for stabilization.

Sparkler filter: The clear/transparent substance is passed through a sparkler filter which contains 23 different sized filter plates. The sparkler horizontal plate filter is designed for polishing and for security filtration of liquids with limited solid contents. Design features include: Maximum cake stability due to horizontal position of filter plates, ability for intermittent operation, complete recovery of product by the scavenger plate, no unfiltered hold-over and perfect sealing of filter media by tie rod compression at center and periphery of all filter plates. Filter plate materials include carbon steel, most stainless steels, many metals and polypropylene. A resin column which is connected to the sparkler filter helps in the treatment of resins, crude aloin is also collected in this resin column. Maximum aloin is removed as crude in this stage to eliminate the bitter taste and to avoid any diarrhea or cramping due to the laxative properties from aloin.

High flow bed: The liquid obtained after undergoing sparkler filtration is subjected to an automized activated high flow bed for decolourizing trace colours.

Reverse osmosis: The obtained product after decolourizing has to undergo reverse osmosis to obtain both concentrated gel and the permeate water. Two products are obtained after RO concentrate (TDS value 13-14) permeate water (used for manufacturing aloe drinks) contains polysaccharides of small molecular weight. The clear liquid has 0.5 to 1 % dissolved solids. It is concentrated to 5 % or more dissolved solids, as per requirement under reduced pressure and stabilized.

Spray drying: Spray drying is done in aseptic conditions. The concentrate obtained after reverse osmosis is placed in the spray dryer and heat showers ranging over 150 ºC. Powder collected after this spray drying has wide commercial applications and is known as commonly called as aloe powder.

Analysis of aloe powder

pH of 1 % solution: 1 g of *Aloe barbadensis* Miller powder is taken in 100 mL distilled water and shaken in electric shaker for 5 min to get a clear solution. This is filtered and the pH is measured using a digital pH meter.

Determination of malic acid: Malic acid is determined by titrating with strong base (NaOH). One gram of the aloe vera powder (accurately weighed) is taken in a conical flask and dissolved in 50 mL of recently boiled and cooled water and to it phenolphthalein indicator is added. This solutionis titrated with 0.1 N NaOH till the appearance of a faint pink colour (end point). Each mL of NaOH is equivalent to 6.704 mg of malic acid.

Estimation of calcium: About 0.1 g of aloe vera powder is accurately weighed and taken in a 100 mL conical flask, 50 mL water is added to dissolve the sample. Then it sonicated to get a clear solution. To this, 20 mL of NaOH or a volume sufficient to produce a pH of 12 is added and then stirred. Later 0.1 to 0.2 g of the indicator murexide-sodium chloride mixture is added. The solution is titrated slowly with continuous stirring to the proper end point. It produces a sharp colour change from wine red to pure blue at the end point.

Estimation of polysaccharides: 1 g of aloe vera powder in a 100 mL conical flask is dissolved in 10 mL of distilled water by sonication. To this, 40 mL of acetone is added with constant shaking. The precipitate is filtered and dried at 105 ± 2 ºC temperature to a constant weight. In another method, 1 g of sample and 10 mL of distilled water are mixed well. 50 mL methanol is added to this solution and the mixture is allowed to stand for 1 h and then it is filtered. The residue is dried at 105 ºC for 2 h.

Estimation of nitrogen: Nitrogen is estimated by Kjeldahl method. The amount of sample taken is 0.1944 g, 0.3 g of $CuSO_4$, 10 g of NaOH (to prepare 0.1 N solution) and 25 mL of H_2SO_4 were used. Sodium hydroxide solution is standardized by titrating against potassium hydrogen phthalate. Sulphuric acid of 0.1 N concentration is prepared and standardized by titration with standard sodium carbonate. To calculate the amount of nitrogen present in the given sample, the percentage of protein should be divided by the nitrogen factor which is a constant.

Total ash content: 1 g of Aloe vera powder is placed in a pre weighed silica crucible (standardized to constant weight by heating to red hot and cooling in desiccator). The sample is incinerated to a constant weight in a muffle furnace at 600 ± 25 ºC. Then the crucible is allowed to cool in a desiccator and the process is repeated until the difference in two successive weighing is less than 1 mg.

After the selective process for the preparation of aloe powder, in the final stage after the spray drying the resultant compound was white or dirty white crystalline powder.

Same is the case with both fields grown and *in vitro* cultured plants. pH when recorded with pH meter showed the values between 4.5-6.5.

The amount of malic acid in the field grown plants was found to be between 80 to 100 mg/mL. while in the *in vitro* culture plants the average amount of malic acid from a number of samples was found to be the highest ever recorded with 134 mg/mL.

Another element calcium (determined by EDTA method), in the field grown plants was found to be between 30 to 50 mg/mL and in the *in vitro* culture plants, the average amount of calcium (%) from a number of samples (produced from the same set of plants) was found to a maximum of 58 mg/mL.

The polysaccharide content in the field grown *Aloe barbadensis* Miller plants by methanol test was found to be 30 ± 2 % on an average while by acetone test, the polysaccharide content was found to be 70 ± 5 % when dried. In the *in vitro* cultured *Aloe barbadensis* Miller plant, in methanol test 34.7 % and in acetone test 70 ± 5 % was obtained.

In the soil grown plant the percentage of nitrogen was 3.728 %. Permissible amounts of nitrogen in the aloe vera plant is 3 to 4 % and in *in vitro* cultured plants the percentage of nitrogen was estimated to be 2.081 %.

Total ash content in the field grown *Aloe barbadensis* Miller plants the least value is 17.4 % and the highest value is 19.8 %. In the case of the *in vitro* culture *Aloe barbadensis* Miller plant the total ash content resulted in not more than 10 % on an average (accurately 9.408 %).

The results indicate that in the case of *in vitro* cultured plant there is rapid multiplication, better regeneration and qualitative improvement.

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