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SPECTROSCOPIC AND MICROSCOPIC STUDY OF NATURAL ALOE VERA LEAF AND ITS EXTRACT

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ABSTRACT

The objective of the present study is to evaluate the effect of pasteurization on Ultraviolet light (UV-light) absorption of aloe vera juice (AV juice) and microstructure analysis of dry aloe vera leaf by Scanning Electron Microscopy (SEM). The result showed that unpasteurized aloe vera leaf extract sample (S-1) has higher value of absorbance(0.537) as compare to absorbance(0.248) of pasteurized sample (S-2). SEM images revels that intermolecular cross-linking reduces in drying process which causes low rehydration capacity due to decrease in size and flaccidity of cells and stomata on leaf surface.

Key words: *Pasteurized Aloe Vera juice,Aloin-A, Aloin-B, UV-Spectroscopy (Ultra Violet), SEM of aloe vera leaf.*

I. INTRODUCTION

Plants and trees have been an important and unique source of medicine for thousands of years. People still rely mainly on traditional remedies such as herbs for their medicines. They have ability to cure infectious and non infectious diseases. According to World Health Organization (WHO), about 80% of world population use medicinal plants to treat human diseases [1]. For centuries Aloe Vera has been used for an array of ailment such as wounds, mild fever, sun burn, skin diseases, minor cuts. It gives a youthful glow to skin. It has anti microbial, anti bacterial, anti inflammatory, anti oxidant, anti fungal, anthelmintic and antiseptic values. Aloe vera and their active constituents are now being increasingly used to treat various diseases. Aloe products have long been used in health drinks, food industries, medical field and in cosmetic industries. These products range from aloe drink to aloe gels, powders, capsules, creams etc. for both internal and external uses for a wide variety of indications. Aloevera which is skin care herb with multiple benefits was selected to evaluate its photo projective affect on different asian hair types through amino acid degradation studies [2]. An aqueous extract of aloe vera (L) has been used as a corrosion inhibitor in controlling corrosion of carbon steel immerse in sea water [3]. The Scanning Electron Micrograph (SEM) on the surface of fresh and dry samples can be used to analyse the microstructure changes during drying or dehydration process.Thermal and moister gradients leading to microstructure changes can cause cell wall disruption, deformation and folding during drying process. The application of SEM is to study the microstructure change in the field of agricultural products drying[4,5,6,7].Pasteurization is a process used to extend shelf-life of packaged and non-packaged foods. In this fruit juice is heated at temperature below 100 ^{o}C.Effect of pasteurization is also studied by some researches. They found that pasteurization reduced vitamin C 16% and antioxidant activity 57% [8,9,10,11,]. Solvent effect in UV-spectra is also studied by some research scholars [12].

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Fig 1: AV leaf


Fig 2: AV flower


Fig 3: AV fruit

Chemical Constituents of Aloe Vera:

- **Acemannan:** This mucopolysacharide deals with the damaging processes of the body by acting as an immune stimulant.
- **Anthraquinones:** The typical bitter taste of Aloe is due to anthraquinones.
- **Aloin- A or Barbaloin:** Its therapeutic effects are summed up as purging, detoxifying and markedly antibiotic.
- **Aloin- B or Isobarbaloin:** It possesses a marked analgesic effect and acts as a natural antibiotic.
- **Aloe-emodin:** It possesses bactericidal and laxative properties and can boast a marked anti-tumoral effect.
- **Vitamins:** It is rich in vitamins A,C, E and contains a trace of vitamin B12.
- **Enymes:** It contains Bradykinase (reduce inflammation when applied to the skin), Lipases and proteases(break down food and aid digestion).
- **Minerals:** Minerals such as Ca, Na, K, Mn, Mg,Cu,Zn, Cr,Se are found in Aloe Vera.

II. MATERIALS AND METHODS

Chemicals: Double deionised distilled water used in washing of leaf was prepared in our laboratory. Ethanol used in extraction of Aloe vera leaf was of analytic grade.

Plant material: Aloe vera plant was identified by Prof. Manoj saxena, Head of the department, Botany, Shri Ambika Adarsh College Badnawar. The aloe vera leaves were collected from 24 ± 1month old aloe vera plant in winter session (Jan-Feb). Fresh aloe vera leaves having length of 30-40 cm were harvested between 2:00 PM–2:30 PM and transferred to the laboratory. Leaves were washed thoroughly with distilled water. Spikes were removed and the leaves were cut into pieces transversely and air dried for 15 days.

Preparation of ethanol extract: Dry leaves of aloe vera were soaked in 100ml of 99.9% ethanol for 15 days and filtered with whatman filter paper no.1. The solution so obtained was centrifuged at 4000 rpm for 10 minutes. Unpasteurized aloe vera leaf extract sample waslabledas S-1 and pasteurized samplelabled as S-2.

Pasteurization of extract: 25 ml of the brown leaf extract was pasteurized at 70^0C for 2 minute and stored at 0^0C for 24 hours.

UV- Spectroscopy: The UV- spectra of 10% aqueous solution of S-1 and S-2were obtained by using Shimadju UV-1800 spectrophotometer (Japan) for the wave length 200nm-400nm.

Scanning Electron Microscopy (SEM): Scanning Electron Microscopy is carried out to obtain the microstructure of air dried aloe vera leaf. The aloe vera leaf was dried and sent for scanning electron microscopy to Punjab University, Chandigarh. The SEM characterization was carried out using JSM 6100 and gold coating unit JFC 1100.

III. RESULTS AND DISCUSSIONS

The UV-Spectrum study of Aloe vera extract in fig 4 and fig 5 showed significant differences between unpasteurized (S-1) and pasteurized (S-2)sample with colour and absorbance.It has been documented that in

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ketones, absorption at 275 nm is n→π* transition but not π→π* transition. In present investigation for S-1, pick at 213 nm is due to π→π* and at 284 is due to n→π* transition which proves the presence of carbonyl group (>c=o) present in aloin. As compare to S-1, S-2 has lower value of absorbance for both transitions. It may be mainly associated with presence of hydrogen bond (H-bond) in ethanol. During pasteurization this H-bond is affected by subsequent heating and cooling. There for unpasteurized sample has lower value of maximum absorption.

Structural characterization of air dried aloe vera leaf by Scanning Electron Microscopy (SEM) was carried out for perceptible visualization. The SEM was conducted at magnification of 50X and 700X. The microstructure difference observed between external part images (fig 6, 7) and internal part images (fig 8, 9) of dry leaf. Images revels that air dried leaf surface resembled broken glass and flakes like structure. During drying process intermolecular cross-linking reduces which causes low rehydration capacity due to decrease in size and number of pores on leaf surface.

TABLE-01

Sample	pH	Colour	Λ_{max} (in nm)		Reference value		Aloin
			π→π*	n→π*	π→π*	n→π*	
S-1	6.7	Brown	213	284	195	294	Present
S-2	6.7	Dark brown	208	281	Not available	Not available	Present

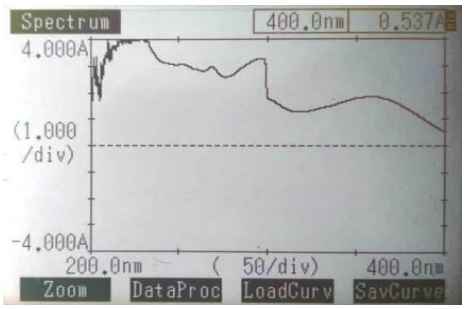

Fig 4: UVspectra of unpasteurized AV juice

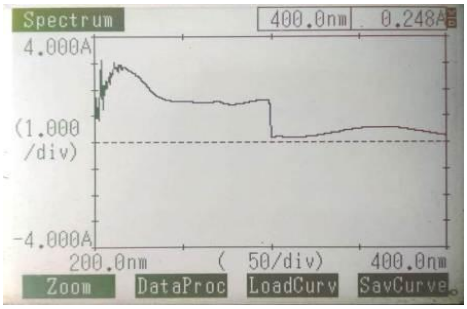

Fig 5: UV spectra of pasteurized AV juice

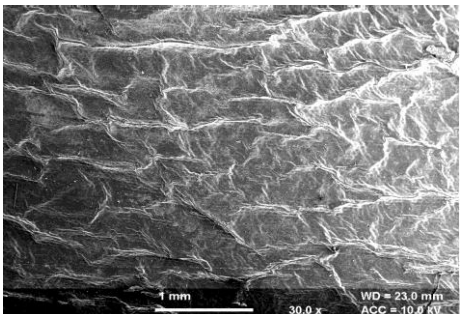

Fig 6: External image50X

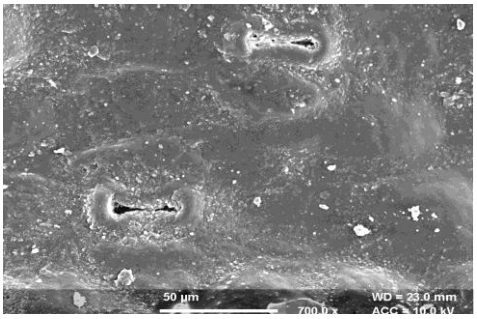

Fig 7: External image700X

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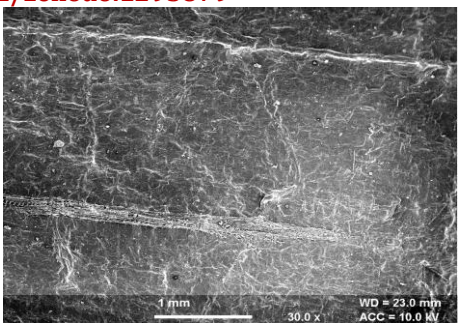

Fig 8: Internal image 50X

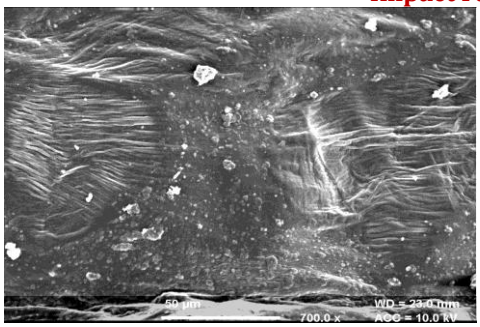

Fig 9: Internal image 700X

IV. CONCLUSION

The microstructure analysis by SEM or Cryo-SEM of fresh and dried samples can provide a powerful tool and strong evidence for analyzing the properties change of the samples during drying process. Estimation of rehydration capacity (RC) of dried samples can be assessed by taking known amount of dried aloe vera leaf sample. The information on microstructure change would be useful in predicting the quality changes such as the texture, colour and surface shape of the product.

V. ACKNOWLEDGEMENT

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