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Study of Comparative Nutritional Values of *Aloe Barbadensis* Miller in Different Regions of Gwalior, Madhya Pradesh, India

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ABSTRACT
Aloe barbadensis miller is a natural product having medicinal and commercial value. Various properties along with nutritional values are studied in this paper. Aloe barbadensis miller, commonly known as Aloe vera (English), is an extremely valuable plant, enriched with phytochemicals and valuable nutrients. Aloe vera is an excellent source of Vitamins. Aloe vera has a wide use in folk medicine. Samples of the plant have been collected from 3 regions in and around Gwalior, Madhya Pradesh. Proper scientific methodologies have been followed towards determination and comparative study of various vitamins, essential and non-essential amino acids. Aloe barbadensis miller Linn. has several medicinal values and cosmetic utilities and mostly grown in arid, semi-tropical and tropical climatic regions throughout the world. The present study concluded the importance of the plant and significance of further research and experiments.
***Key Words**: Aloe vera, Vitamin, Amino Acid, Nutrients, Medicinal*

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INTRODUCTION

Aloe vera is high in mineral content. Flora and fauna need minerals in small quantity for their growth and development. Main objective of the present study is to explore the nutritional value in the leaves of *Aloe vera Liliaceae*, which were obtained from various sites of Gwalior, Madhya Pradesh. *Aloe vera* is full of antioxidants, vitamins A, C, and E, folic acid, and choline. Presence of minerals like calcium, copper, selenium, chromium, manganese, magnesium, potassium, sodium, and zinc. Previous work of nutritional value analysis showed protein, 1.2%; moisture, 93.4%; mineral matter,1.7%; fiber,0.6%; fat,0.5%; oxalic acid 568 (mg/100g) and carbohydrate, 2.5%. *Aloe vera* is an excellent source of Vitamins. In this paper, analysis has been done on vitamin and amino acid compositions of *Aloe vera* plant collected from Morar (Site 1), Shivpuri Road (Site 2) and Malanpur (Site 3) located in and around Gwalior, Madhya Pradesh.22 local *Aloe vera* samples were collected from various locations and were analyzed for vitamins and amino acid. *Aloe vera L.* (*Aloe barbadensis Miller*) plant absorbs good amount of metals from the soil during its growth and it is one of the important plants that is used as herbal drug and direct application as a remedy of various diseases. In leaves, Mg, Mn, N, and B decreased with salinity, while Cu increased. The increase in protein, proline and PEP-case activity, as well as the absorption and accumulation of cations under moderate NaCl stress caused osmotic adjustment which kept the plant healthy. Results suggest that *Aloe* may be a viable crop for soil irrigated with hard water or affected by salinity in low concentrations. The main purpose of present study is to develop nutritional value-oriented analysis especially in accordance with vitamins and amino acid quantities in *Aloe vera* [1].

In *Aloe* many studies have been carried out evaluating parameters such as growth, biomass, tissue water level, gel content under different geo-ecological conditions, such as pH and irradiance intensities. A few recent studies are those of evaluated growth, biomass, ions, as well as water, gel content. More recently, Zapata *et al* [19] evaluated the gel from different Aloe species as an antifungal treatment. In *Aloe vera* the innermost part of the leaf is clear, soft, moist and is a slippery tissue that consists of large thin-walled parenchyma cells in which water is held in the form of a viscous mucilage [20], while the shallowest part of the leaf is called the chlorenchyma, which contain the main photosynthetic cells of the plant and manufacture carbohydrates during photosynthesis and form the basic green tissue of plant leaves. Information about the influence of salinity on the properties of these individual tissues in Aloe plants is still lacking.

MATERIAL AND METHODS

Sample collection

The following steps were executed –

Collection of *Aloe barbadensis miller* leaves from 3 different regions of Gwalior, Madhya Pradesh have been done. After proper collection all the specimen were preserved in herbarium. In due course, the leaves were washed in a rigorous manner with water. After the application of this technique, the leaves were air dried at a temperature of around 40^0C. This process of leave drying continue to last for 3 days. At the end of this process, moisture content of the dried leaves was calculated by air-oven methodology. After air-oven techniques, incineration of the leaves was done at a temperature of around 410-440^0C. At the end of this process, ash content was determined at a constant weight [2].

Preparation of standard solution

Ascorbic Acid of quantity of 50mg was dissolved in 0.3 (M) meta-phosphoric acid and 1.4 (M) Acetic acid solution to prepare the standard solution [3]. Concentration of the solution was made up to 1mg/ml. 50 mg of riboflavin was dissolved in double distilled water to make the standard solution of riboflavin. The solution is further heated up to 85^0Cafter adding 3-4 drops of glacial acetic acid to the solution and riboflavin concentration was made up to 100 µg/ml. Thiamine hydrochloride of 26 mg was added to double distilled water of 25 ml and standard solution of thiamine was prepared [4].

Preparation of sample for vitamin analysis

Extraction of Riboflavin and thiamine have been done and 1 gm of *Aloe barbadensis miller* leaves powder was transferred. As the next step, 50 ml graduated polypropylene centrifuge tube was taken and into it 20.0 ml of 0.1 Sulphuric Acid added. The tube containing the mixture was shaken vigorously for 60 sec. and as the next step the tube was placed in boiling water for half an hr. During the technique, the tube has been shaken at an interval of 5 mins. After the previous technique, the mixture was cooled in an ice bath and 2% a- amylase of volume 2.5 ml added [5].

Proper mixing of solution has been done through the process of incubation for 60mins at 50°C temperature by placing the sample on water bath with regular shaking. After this process, the mixture was diluted to 25 ml using de-ionized water after proper cooling. The mixture was then centrifuged and supernatant was filtered by using 0.45 µm nylon filter disc. At the end, high performance liquid chromatography was done and finally the samples were carried out in triplicate.

Extraction of Vitamin C was done by taking 1 gm of *Aloe barbadensis miller.* The sample was homogenized with an extracting solution [meta-phosphoric acid (0.3 M) + acetic acid (1.4 M)]. After this the mixture was kept in conical flask (wrapped with aluminum foil). The mixture was agitated at 100 rpm with the aid of an orbital shaker for 15 min at room temperature. After this process, the mixture filtered through a Whatman filter paper No. 4 and finally a transparent extract was obtained [6].

Preparation of sample for amino acid analysis

Protein content and nitrogen (total) were determined following the Kjeldahl method and applying 6.25 conversion factor. These determinations were executed based on Association of Official Analytical Chemists (1990) method [15].6N HCL was used at a temperature of 110 degree centigrade for preparing triplets of the sample after hydrolyzation [13]. This method took a time period of 1 day. AccQ•Tag method was applied which serves as an analysis technique for peptide and protein hydrolysate amino acid determination [7].

RESULTS AND DISCUSSION

Vitamin

Presence of vitamins like Vitamin C, riboflavin etc. was analyzed through a comparative nutritional analysis of *Aloe barbadensis miller* leaves. These samples were collected from different locations in and around Gwalior, Madhya Pradesh. Table-1 shows various location specific concentrations of Thiamine, Riboflavin and Ascorbic acid.

Table 1: Vitamin concentration (mg/100g) in *Aloevera* at different sampling locations

Aloe vera (mg/100g)									
Vitamins	Morar			Shivpuri Road			Malanpur		
	a	b	c	a	b	c	a	b	C
Thiamine	00.10	00.12	00.14	00.14	00.15	00.14	00.16	00.17	00.17
Vitamin C	38.60	35.6	38.00	36.80	36.50	37.00	31.70	39.60	37.60
Riboflavin	00.40	00.45	00.50	00.50	00.45	00.47	00.45	00.48	00.50

Table 2: Amino acid concentration (mg/100g) in *Aloe vera* at different sampling locations

Aloe vera (mg/100g)									
Essential Amino Acids	Morar			Shivpuri Road			Malanpur		
	A	b	c	a	b	c	a	b	C
Leucine	190	170	180	160	150	155	140	130	145
Valine	160	160	170	140	135	145	130	120	120
Lysine	50	60	50	40	30	40	60	60	65
Threonine	130	130	120	110	120	115	115	120	120
Phenylalanine	190	180	190	160	150	160	150	140	140
Isoleucine	100	110	110	130	120	125	125	130	126
Methionine	60	50	60	40	45	50	30	30	25
Histidine	90	90	90	85	80	80	75	70	65
Non- Essential Amino Acids	Morar			Shivpuri Road			Malanpur		
	a	b	c	a	b	c	a	b	C
Alanine	190	180	190	140	150	145	200	190	205
Arginine	120	120	130	120	110	115	138	130	135
Aspartic acid	200	210	210	210	220	210	215	210	220
Cystine	30	40	40	30	35	30	45	50	50
Glutamic acid	270	260	260	220	215	220	235	240	240
Glycine	220	230	220	215	230	225	240	240	245
Proline	140	150	140	115	120	125	130	140	145
Serine	120	130	130	100	110	115	110	120	115
Tyrosine	110	110	120	130	140	145	95	90	100

Major variation was found quantity of Ascorbic acid in *Aloe barbadensis miller* leaves. Earlier also similar values were reported[14]. Vitamin C functions as antioxidants and potentially perform as anti-malignant agent and metabolic processes generate free radicals [8].
Thiamine of 0.10 to 0.17 mg/100g and Riboflavin of 0.40 to 0.50 mg/100g were the results obtained at different sampling locations. Figure -1 below gives a graphical representation of various vitamins according to their sampling sites.

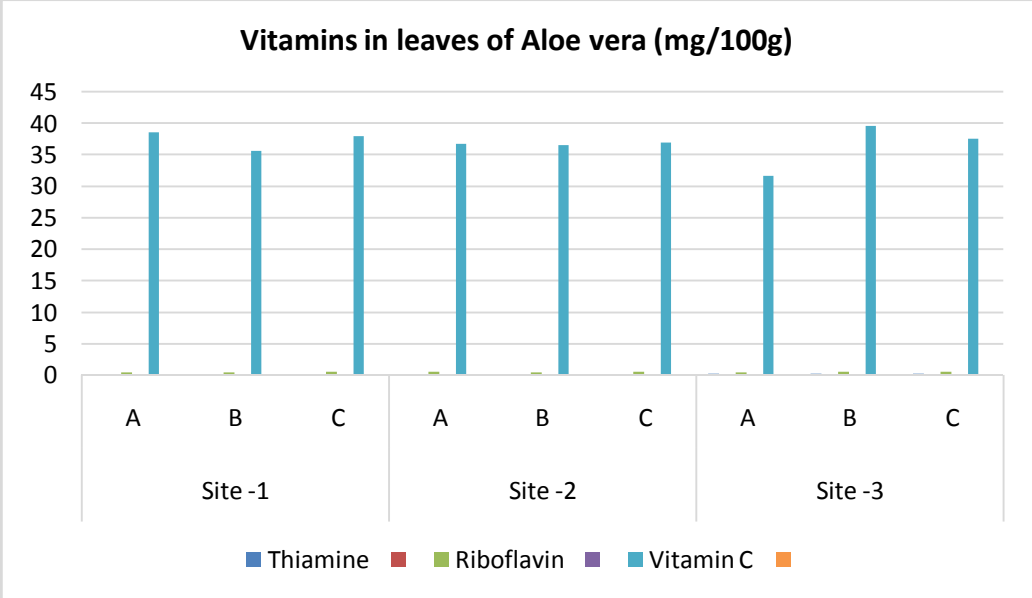

Figure 1: Concentration of Vitamins (mg/100g) in *Aloe vera* at different sampling sites.

Zheng *et al*. [21] studied the plant growth and ionic distribution in relation to osmosis in Aloe vera at different salinity levels. Sahu *et al*.[22] reported growth, biomass, gel and aloin contents in two Aloe

species *Aloe ferox* and *Aloe vera* with saline stress at different pH levels.
How well *Aloe* spp. performs in terms of absorption of minerals in saline soil conditions is unknown. There is one study that has evaluated sodicity levels in terms of growth, gel and nutrient concentration uptake, however they used units of ESP (exchangeable sodium percentage) which varies since is calculated by dividing exchangeable sodium (cmol/kg) by the total sum of all cation concentrations (cmol/kg) and then multiplying by 100. Without knowing the total cation concentration, it is not possible to isolate effect of sodium alone. However, very little is known about *Aloe vera* tolerance and performance under low NaCl stress especially its effects on mineral and biochemical content in plant tissues.

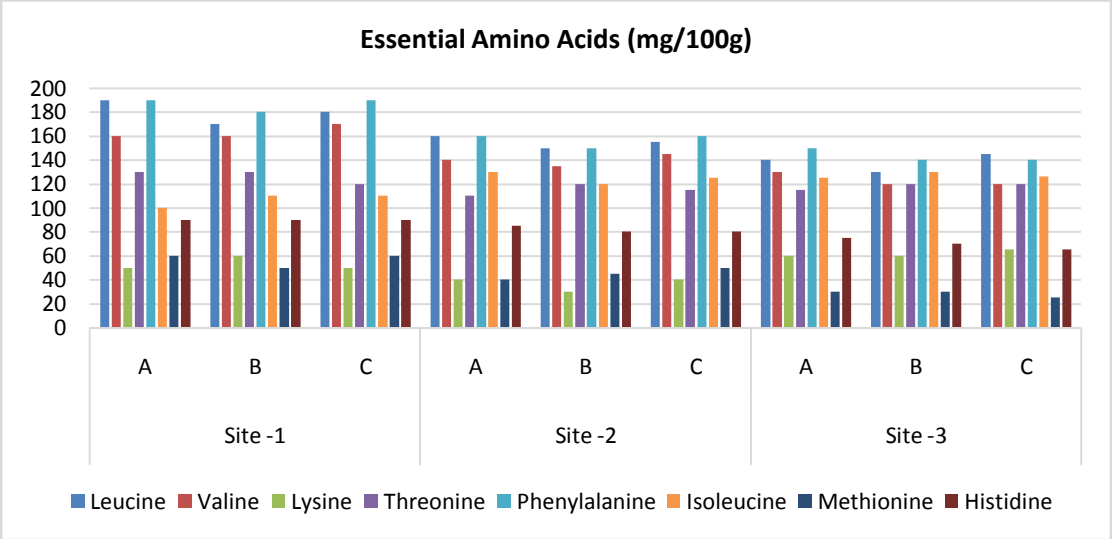

Fig: 2A

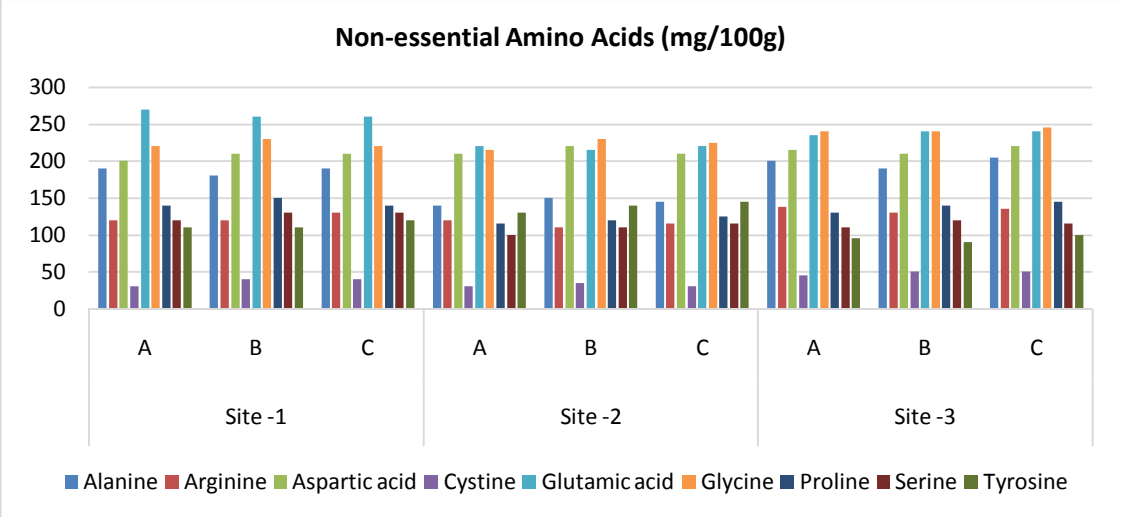

Fig: 2B

Figure –2A &2B: Amino acid concentration (mg/100g) in *Aloe vera* at different sampling sites.

Amino acid

Materials obtained from various sampling locations of Gwalior were analyzed for calculation of the impact of different factors on the chemical composition of the raw material[9].
At the end of rigorous analysis, the results were as follows—

Glutamic acid - 240 mg/100g
Glycine - 229mg/100g
Aspartic acid - 212 mg/100g
Phenylalanine – 162 mg/100g
Leucine - 158 mg/100g
Valine - 142mg/100g.

Morar site showed highest conc. of glutamic acid. Lowest concentration of the same was found at Shivpuri Road [10]. Morar site again showed highest conc. of glycine and lowest at Shivpuri Road. Similarly,Malanpur site contained highest concentration of Aspertic Acid and Leucine. Valine was found in higher concentration at Morar [11].

Aloe vera contains less amount of histidine, methionine and cystine in comparison with. The average value Shivpuri Road sampling site contained lowest Cystine concentration whereas, it was high at Malanpur site. Concentration of histidine and methionine were observed minimum at Malanpur site. On the other hand, samples collected from Morar site contained higher amount of above-mentioned amino acids.

Previous works and reports suggested almost familiar trends of various amino acids. It has been observed that *Aloevera* leaves contained around 80 gm of amino acids [12].

Glutamic acid and aspartic acid were having the maximum concentration in investigated materials [18].

CONCLUSION

The *Aloevera* plant with high medicinal value has enough nutritional value required from medicinal point of view. Results obtained from the present study shows that *Aloe vera* can serve as a good nutritional source along with its medicinal values. The presence of essential amino acids and vitamins justifies the ability of *Aloe vera* plant towards the various ailment related cases and as a result it can serve as a source in pharmaceutical industries. The analysis gives a holistic view of nutritional values in terms of vitamins and amino acids it will not only help consumers but also in future experiments.

Extract of *Aloe vera* is commercially used for the betterment of healthy digestive systems. Further research work is needed for more exploration of the nutritional values of *Aloe vera* juice. Quantity of *Aloe vera* extract is the major factor behind its medicinal value and comparative nutritional analysis. There are requirement of more studies and experimental analysis of Aloe vera plant to explore more benefits for mankind and develop new strategies for clinical and commercial utilization worldwide. Wide range of use of the plant in treatment of skin related issues should be further enhanced with more emphasis on Vitamin and Amino Acid related values.

REFERENCES

1. Shelton MS, (1991). Aloe vera. Its chemical and therapeutic properties International Journal of dermatology. (1991), 30, 679-683
2. Lee CK; Han SS *et al*. (1999). Prevention of ultraviolet radiation-induced suppression of contact hypersensitivity by Aloe vera gel components. International Journal of Immunopharmacology, 21(5)303-310.
3. LozakAK, Solty K *et al.* (2002). Determination of selected trace elements in herbs and their infusions Science of Total Environment,289, 33-40.
4. OzcanM, (2003). Mineral contents of some plants used as condiments in Turkey Food Chemistry, 84, 437-440.
5. Coulston L; Dandona P,Dibetes, (1980), 29, 665-667. doi: 10.2337/diab.29.8.665.
6. Rajurkar N S, Damame M M, Applied Radiation and Isotopes, (1998), 49, 773-776. doi: 10.1016/s0969-8043(97)00296-0.
7. Reynolds, G. W., (1974). The aloes of South Africa, Ed. 3 (Aloe SA)
8. Wyk, B.-E., (2009). Medicinal plants of South Africa, (Med Pl SA)
9. Nriogo J O (1979). Nature 279: 409-411
10. Shehu, A., Mullaj, A., Harizaj, F., Shehu, J. (2010) Assessment of heavy metals accumulation by different spontaneous plant species grown along Lana River, Albania. BALWOIS 2010: Conference on Water Observation and Information System for Decision Support, 25–29 May 2010, Ohrid, Republic of Macedonia. www.balwois.com/2010-126.
11. Baker, A.J.M. and Brooks, R.R. (1989) Terrestrial Higher Plants which Hyperaccumulate Metallic Elements. A Review of Their Distribution, Ecology and Phytochemistry. Biorecovery, 1, 81-126.http://dx.doi.org /10.1080/01904168109362867
12. LANGILLE, W.M. and MACLEAN, K.S., (1976).Some essential nutrient elements in forest plants as related to species, plant part, season and location, Plant Soil, 45,17-26
13. Hanna, W. J. and Grant, C.L. 1962. Spectrochemical analysis of the foliage of certain trees and ornamentals for 23 elements. Bull. Torrey Bot. Club., 89: 293-302.
14. Ernst WHO, Verkleji JAC, Schat H (1992). Metal tolerance in plants. Acta Bot Neerl, 41, 229-248 .
15. MEMON, A.R., ITO, S., and YATAZAWA, M., (1979). Absorption and accumulation of iron, manganese and copper in plants in the temperate forest of central Japan, Soil Sci. Plant Nutr. 25 611-620
16. Abdul Razaque Memon , Seigo Itô & Michihiko Yatazawa (1980) Distribution of zinc and cadmium in the temperate forest taxa of Central Japan, Soil Science and Plant Nutrition, 26:2, 281-290, DOI: 10.1080/00380768.1980.10431210
17. Rai S, Mallick R and Bajpai S.P., (2019), Determination of Trace Elements in aloe Vera l. (Aloe BarbandensisMiller) from Different Locations in Gwalior, Madhya Pradesh and its Importance. Int J Recent Sci Res. 10(06), pp. 33219-33221.

18. Bernardo MurilloA, Miguel Víctor C, Jorge Arnoldo V, Luis Guillermo H, Enrique Troyo-D and José Luis G (2014), Mineral Content and Biochemical Variables of Aloe vera L. under Salt Stress; PLoS One; V9(4);
19. Zapata PJ, Nararro D, Cuillen F, Castillo S, Martinez-Romero D, Valero D, Serrano M (2013) Characterization of gel from different *Aloe* spp. as antifungal treatment: potential crop for industrial applications. Industrial Crop Products 42: 223–230
20. Newton LE (2004) Aloes in habitat. In Aloes the Genus Aloe; Reynolds T (Ed.); CRC Press: Boca Raton; USA. pp. 3–36.
21. Zheng Q, Liu L, Liu Z, Chen J, Zhao G (2009) Comparison of the response of ion distribution in the tissues and cells of the succulent plants *Aloe vera* and *Salicornia europaea* to saline stress. Journal Plant Nutrition Soil Science 172: 875–883
22. Sahu PK, Jyoti N, Atul S (2011) Comparatives performance of *Aloe vera* and *Aloe ferox* species under pH along with desiccation stresses. International Journal Drug Discovery. Herbal Research 1: 14–17.

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