

Study Case: Correlational Analysis of pH and Weekly Aloe Growth

D. García¹, M. E. Perdomo¹, and I. Magomedov^{2,*}

¹FI, Universidad Tecnológica Centroamericana (UNITEC), Altia Business Park, Colle hacia Armenta, contiguo a, 21102, San Pedro Sula, Honduras

²Kadyrov Chechen State University, Sheripova Street, 32, 364024, Grozny, Russia

Abstract. The present project has been elaborated with the purpose of analyzing the development of Aloe vera in three types of soil that are the most common in Honduras, such as: sand, clay, and fertilized soil. The Aloe vera plant has the characteristic of being very versatile, which facilitates its growth in different types of soil. The objective of this research is to know the best type of soil for the plant to develop and to know if the pH of the plant is affected by the type of soil in which it is found. Three Aloe vera plants were taken, each one was transplanted to its respective soil and during five weeks pH samples were taken from each plant and it was identified if there were changes or not. Similarly, growth samples were taken from each plant to help us determine which one has a faster growth, which is an indication of a good development. It was also considered to take the pH of each soil since this indicates the availability of nutrients in the soil so that this data helps us to know if the plant will have a good development, considering that for this to be so it is recommended that Aloe vera is planted in soils with a pH between 6.5 to 6.8, that is, an acid soil. Statistically it can be concluded that the pH of the three types of soil has no significant differences. Therefore, pH is not a determining factor in the growth of savila plants.

1 Introduction

The most used part of the aloe vera are the crystals found inside its leaves, these contain vitamins A, B1, B2, B6, C, E and folic acid, besides containing essential amino acids, minerals and polysaccharides that promote the regeneration and growth of tissues [1]. Proteolytic enzymes, biogenetic stimulants, saponins, hormones, proteins, amino acids, vitamins, phosphorus, iron, calcium, magnesium, silicon, zinc, copper, oxalates and phosphate esters can also be found. But most of the compounds present in the plant crystal are monosaccharides such as sucrose and mannose.

It is attributed healing, moisturizing, coagulant, regenerative, astringent, laxative, anti-inflammatory properties [2]. Aloe is found emodin and aloin being that these function as antibacterial, analgesic and antiviral, while its polysaccharides and monosaccharides improve heart health, reduce stress and improve immunity [3].

*Corresponding author: ismwork@mail.ru

The acid hydrolysis of Aloe vera bagasse, the obtaining of pectin which is a thickening component that acts to form gels by binding with acids of a fruit and sugar. It should be noted that many companies choose to discard the Aloe vera bagasse, but this study indicates that with the correct treatment, even this can be used from the plant and has its benefits for the industry [4].

Refer through their research Aloe vera extract potentiates growth, protein content and gastroscopic index (GaSI) of common carp, that aloe vera extract is useful for fish growth by improving protein content in liver tissues [5].

The benefits of Aloe Vera mucilage being that mucilage is characterized as a thick solution used to increase viscosity. It was observed that the Aloe mucilage behaves as a non-Newtonian fluid entering the classification of pseudopolymers so that the viscosity decreases as the shear rate increases until it remains constant [6].

Weeds should be cut when the soil is dry and not wet; if the soil has a slope, it is recommended to start from the lowest part. Aloe vera should be cultivated in a somewhat humid place and where it receives sunlight, as a suggestion for its optimal development it should be exposed to 8 to 10 hours of sunlight. Aloe vera should be watered every 15 to 20 days, since it is a plant that does not need much water, if it is added in excess it tends to rot [7].

Texture influences soil properties [8]: If it is in sandy soils, it shows good physical and chemical fertility; in clay soils it shows that they are chemically active; in loamy soils, it shows good physical conditions. Each soil presents different types of properties. The clay soil is characterized by not draining very well, however, this type of soil has a good availability of nutrients [9]. The properties of the fertilized soil being is characterized by having a good amount of nutrients for plants being this type of soil the propitious for agriculture, it tends to retain enough water [10]. When referring to plant nutrients it is very important to consider what each plant requires for optimal development, Aloe vera is characterized by being a plant that does not require a large amount of available nutrients so that it can grow [11]. Within what can be referred to the sandy soil is known to be characterized by good drainage, it is not a land that has many nutrients [12].

2 Method

Aloe Vera is a plant that adapts to different types of soil, to determine in which has a better development will be measured the pH of each land in which each Aloe is located, the pH of the soil allows us to know if it has the necessary nutrients and minerals that favour the development of plants. A physical evaluation of the state of each plant will be made and in the same way the pH of each Aloe will be measured to verify the impact on the plant as shown in Figure 1. It is known that Aloe vera is mostly used for aesthetic purposes, so it is intended to evaluate if the pH is favourable or unfavourable for these purposes, and to verify if the soil has an impact on the plant.

To know if the Aloe planted in each soil is suitable for the skin will be purchased with the pH corresponding to the skin with the pH of each plant, the skin is a very sensitive organ that requires care, it is recommended an application of products that are with a pH similar or equal to the skin.

A total of one sample per week will be taken of the pH of the plant, soil and growth measurements. Samples will be taken for 5 weeks; each sample will be compared through line graphs with three variables.



Fig. 1. Savila plants for the study.

3 Results

The results obtained in relation to the development of the Aloe Vera plants are analyzed. Samples of the pH of the clay, fertilized and sandy soil were obtained, as well as the pH samples of each Aloe vera plant and the weekly growth of each of these plants as shown in Figure 2..

In Aloe vera plants the optimum pH for cultivation is between 6.5 to 6.8, being that, if grown in an acid soil, this will affect its development.

It can be observed according to the pH samples obtained that the fertilized soil is more acidic than the other soils, which means that it is outside the optimal range for growing Aloe vera because nutrients such as iron, manganese, zinc and aluminium will predominate more and cause the plant to not develop well. Sandy soil is closer to the optimal pH range for growing Aloe vera, while clay soil happens to be slightly alkaline.

Table I shows the results of the samples taken for each Aloe vera plant in the five weeks of the study. There were changes in the pH of each plant, which makes the hypothesis regarding pH changes due to the type of soil in which the plant is grown to be true.

The final row shows the average pH and the total growth of the plant in cm.



Fig. 2. PH test for the three types of soils.

It can be seen the changes and evolution of the pH in each plant according to the type of soil in which it is grown, the tendency for each plant is to become less acidic, but without much variation within its pH, always staying within a range.

Table 1. PH and growth results.

Fertilized soil		Clayey soil		Sandy soil	
pH	cm	pH	cm	pH	cm
3.8	0	4	0	4.2	0
3.8	1	4.4	2	4.5	2
3.9	1	4.2	1	4.6	1
4	1	4.5	1	4.4	1
4	1	4.4	1	4.5	2
3.9	4	4.3	5	4.44	6

The pH of aloe vera helps us to identify how suitable it is for human use. Many people use the plant for aesthetic purposes, applying it to the skin. It is known that for a product not to have negative repercussions on the skin, it must be in a similar pH (4.7 and 5.75), which is why knowing the pH in aloe vera is very important. In the case of the plants under study, they were not in this range, but close to it. With the samples obtained each week we were able to obtain a growth result for each plant, giving a growth of 6 mm with the sandy soil, demonstrating that it grows faster in this type of soil compared to the others.

Table II shows the results of a t paired test applied to the pH of the different soils. The three pairs of data has a normal distribution applying Shapiro-wilk test. Since the p value

was not less than 0.05, statistically it can be observed that the pH of the three types of soil has no significant differences. Therefore, pH is not a determining factor in the growth of savila plants.

Table 2. t paired comparison.

	N	Correlation	Sig.
FS & CS (pH)	5.000	0.625	0.260
FS & SS (pH)	5.000	0.330	0.588
CS & SS (pH)	5.000	0.495	0.397

4 Conclusion

The Aloe vera cultivated in the sandy soil grew more in comparison to the other plants, being that in the five weeks it grew 6 mm in size, the Aloe vera cultivated in the clay soil grew 5 mm and the Aloe vera cultivated in the fertilized soil grew 4 mm.

The pH of each Aloe vera plant was measured and it could be determined that there were changes in its pH remaining in a range with a tendency to become less acidic. The sandy soil turned out to be the most optimal for the development of Aloe vera, since its characteristics and properties include better drainage and an ideal pH for the development of the plant. Statistically it can be concluded that the pH of the three types of soil has no significant differences. Therefore, pH is not a determining factor in the growth of savila plants.

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