ORIGINAL ARTICLE

The Effect of Super Absorbent Polyter and Growing Media on Growth and Medicinal Active Substance for Aloe Vera Plants

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ABSTRACT

Introduction: The research experiment was carried out in a plastic house designated for this purpose in order to study the effect of different concentrations of super absorbent polyter (20 and 40 gm) in association with different cultural media (Compost and Peatmoss) mixing with the river loam in a 2: 1 ratio for growth and medicinally effective compounds of the aloe vera plant. **Methods:** The experiment was carried out according R.C.B.D design with three replicates, the experimental unit consist of three pots with one plant per pot. **Results:** The results showed significant differences in the studied traits, as the treatment (40 + Compost) exceeded all growth traits and gave the highest rate of increase achieved for the number of leaves (3.78 leaves), leaf length (7.97 cm), leaf area (1232 cm^2) and the chlorophyll content of leaves (47.7 SPAD). The leaf content of Aloe-emodin and Aloetitic acids 356.9 micromol. gm and 122.09 micromol. Gm respectively. While the experiment treatments did not show significant differences in the rate of the achieved increase in the width of the leaf. Whereas, the control treatment recorded the lowest rate for all the studied traits. **Conclusion:** The present study showed that the treatment of 40P+ compost significantly outperformed most of the treatment in this experiment. It achieved the highest average number of leaves.

Keywords: Super Absorbent Polyter, cultural Media, Aloe-emodin, Aloetitic, High-performance liquid chromatography (HPLC)

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INTRODUCTION

Aloe vera is a succulent plant species of the genus Aloe, which belongs to the family of Asphodelaceae (Liliacea), is one of the plants that has increased interest since the 1970s, because it can be used in the treatment of many diseases, as well as being an important element in the cosmetics industry, it is among the most important medicinal plants because its leaves contain medicinally effective substances (1). It is among the most important medicinal plants because its leaves contain medicinally active substances, as it is found as a yellowish liquid form (Jyotsana et al. 2009 and Samuelsson, 2004) (2).

It was used in folk medicine to treat many diseases in different countries of the world, such as India, Mexico and Canada. (3) It was used in folk medicine to treat many diseases in different countries of the world, such as India, Mexico and Canada, It is also used to treat intestinal diseases, as well as a treatment for arthritis, diabetes, asthma, burns and febrile illnesses (Rodriguez et al., 2007 and Kadhim & Al-Myali, 2020). The medicinally used parts of aloe vera are the thick, and fleshy leaves from which a gel containing anthraquinons is extracted. The non-sugar part consists of the anthraquinone compound, as it or one of its derivatives binds to sugars to form glycosides (Figure 1) which is characterized by its laxative effect (Klein and Penneys, 1988) (3-5).

Polyter is an effective molecular organic material derived from the cellulose material of tissue culture palm leaves. It contributes to maintaining the water levels necessary to meet the needs of plants growing in agricultural soils suffering from water shortage, i.e. act as role of a water stabilizer. It is a water reservoir and permanent storage for this source (Moyen, 2017). The culture media is also one of the factors necessary for plant survival and increasing its productivity, as it is considered the place or part in which plants grow and provide them with water

and nutrients that they need (Mehwish et al., 2007), In addition to its role in providing plants with good ventilation, which depends on the particle diameter of the agricultural medium (Stern et al., 2005). In addition to its role in providing plants with good ventilation, which depends on the particle diameter of the culture media (Stern et al., 2005) (6,7).

In view of the medicinal importance of the glycoside compounds in aloe vera leaves, and with the aim of increasing it, the effect of adding different concentrations of superabsorbent polyter was studied with different cultural media, on plant growth and the amount of active compounds produced (8).

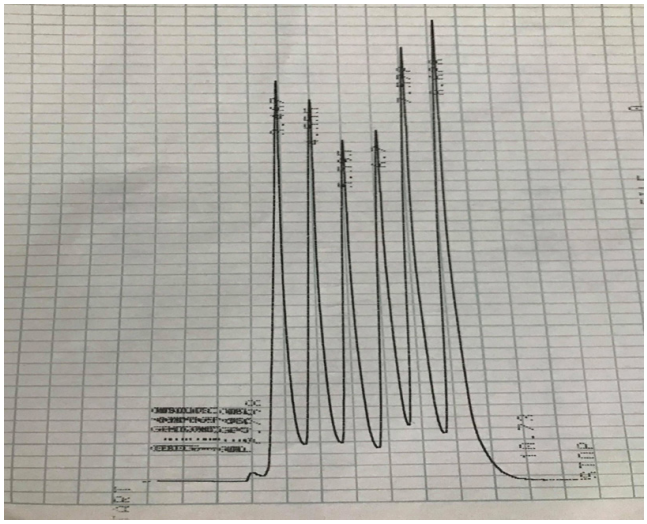

Figure 1: The non-sugar part consists of the anthraquinone compound, as it or one of its derivatives binds to sugars to form glycosides

MATERIALS AND METHODS

This experiment was conducted during the period from September 15, 2019 to June 30, 2020 in a plastic house designated for this purpose in order to study the effect of different concentrations of superabsorbent polyter, associate with the cultural media (Compost and Peatmoss), on the growth and concentration of the medicinal active substance of aloe vera plants. Seedlings were brought at the age of two years from one of the private nurseries, and they were transferred to plastic pots of 40 cm diameter and filled with the river loamy soil, all crop managements operations were performed as needed (9,10).

Before seedlings planting, the cultural media for the experiment were prepared and mixed with the river loamy soil in a ratio of (2:1) with the addition of concentrations of polyter for each treatment at a depth of about 5-7 cm from the cultural media immediately after planting, except for the control treatment. Seven treatments were included in this experiment as follows:

1. Control treatment (loamy soil without polyter).
2. 20 gm polyter + loamy soil.
3. 20 gm polyter + loamy soil + Compost
4. 20 gm polyter + loamy soil + Peatmoss
5. 40 gm polyter + loamy soil.
6. 40 gm polyter + loamy soil + Compost
7. 40 gm polyter + loamy soil + Peatmoss

The experiment was carried out according R.C.B.D design with three replicates, the experimental unit consist of three pots with one plant per pot, and the treatments were assigned randomly in each replicate. Data were analyzed using Genstat V12.1, and means were compared using the least significant difference test (L.S.D) at the 5% probability level (El-Sahooki and Whaib, 1990) (11-13). The following characters were measured:

1. Increase in leaf length (cm)
2. Increase in leaf width (cm).
3. Increase in leaf number (leaf.plant^{-1}).
4. Leaf area (cm^2).
5. The chlorophyll content of the leaves (SPAD).
6. Aloe-emodin acid in the leaves.
7. Aloetetic acid in the leaves.

Table (I) : Retention time and peak area for medically active substances in leaves of Alonka Plants.

seq	Subject	Retention time minute	area
1	Aloe-emodin	5.59	265593
2	Aloetetic acid	6.70	277367

Estimation of Medically Active Compounds

Medically active compounds were measured in laboratories of the Ministry of Science and Technology. Where, 0.01 gm was taken from the standard substance of the high-purity measured compounds and dissolved in high-purity methanol separately and the volume of each material measured in a volumetric vial was completed to 250 ml (40 mg. Liters). One ml of the standard solution prepared for each substance placed in a 10 ml volumetric flask and complete the volume to the mark using ultra-pure methanol, the new concentration became 4 mg.liter^{-1}. Then it was transferred to a high-performance liquid chromatography (HPLC) device (Chiang et al., 2012) (13).

HPLC method for the detection of clinically active compounds

The studied samples were loaded using a high-performance liquid chromatography device (HPLC model SYKNM of German origin with a pump model 1122S and an automatic injector 5200S). The compounds were detected with the S3210 UV / VIS detector. The two compounds (Aloe-emodin and Aloetetic acid) were estimated (14).

RESULT

VEGETATIVE GROWTH

The results indicated that the treatment of 40 P + Compost significantly outperformed most of the treatment in this experiment It achieved the highest average number of leaves with the amount of 3.78 leaves, followed by the treatments (40 P + Peatmoss and 20 P + Peatmoss), which gave an average of 3.443 leaves, while the lowest rate for this characteristic was the control treatment with leaves (Figure 2).In addition, the results showed no significant differences between treatments in the increase in leaf width (Figure 3).

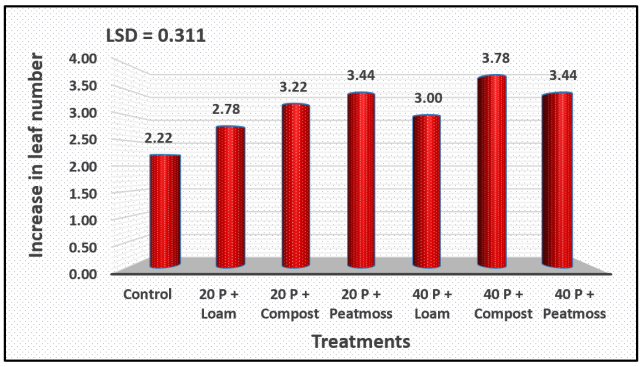

Figure 2: The results indicated that the treatment of 40 P + Compost significantly outperformed most of the treatment in this experiment

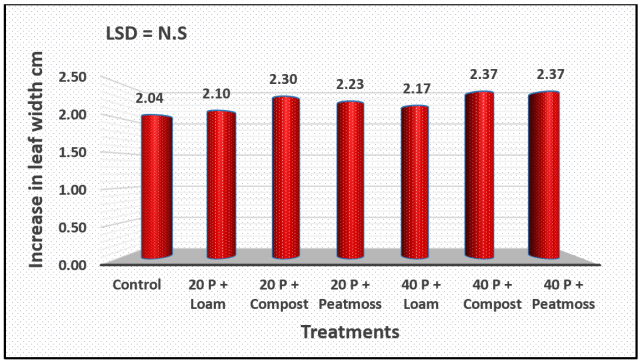

Figure 3: The results showed no significant differences between treatments in the increase in leaf width

While the results showed significant differences in the rate of increase achieved in the length of the leaf, the leaf area, and the chlorophyll content of the leaves, as the treatment (40 P + Compost) outperformed the control, 20 P+ Loam, and 40 P+ Loam treatments without significant differences with the rest of other treatments for both characteristics (Figure 4).

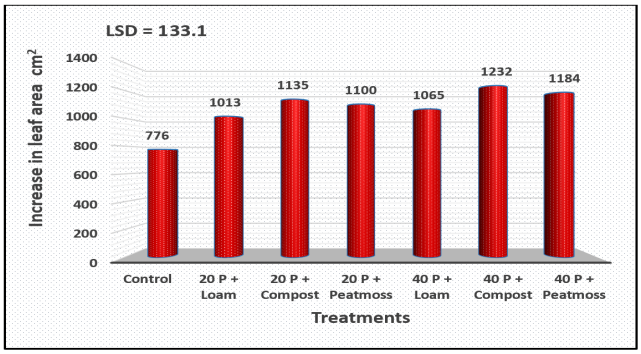

Figure 4: the rate of increase achieved in the length of the leaf, the leaf area, and the chlorophyll content of the leaves

Leaves Content of The Medicinally active

Compounds

The results indicate the superiority of the treatment (40 P+ Compost) in the content of aloe vera leaves of Aloe-emodin acid over all treatments used in the experiment except for the two treatments 20 P + Compost and 40 P+ Peatmoss (Figure 5), it achieved the highest rate for this trait, which was 356.9 micromol.gm, while the control treatment recorded the lowest rate of 171.5 micromole. gm. While the results showed that the treatment (40 P+ Compost) significantly outperformed other treatment (except 40 P + peatmoss) in the leave content of Aloetitic acid, as they achieved the highest rate of 122.09 and 119.14 micromol.gm respectively. While the control treatment recorded the lowest rate for this trait 54.13 micromole. gm (Figure 6).

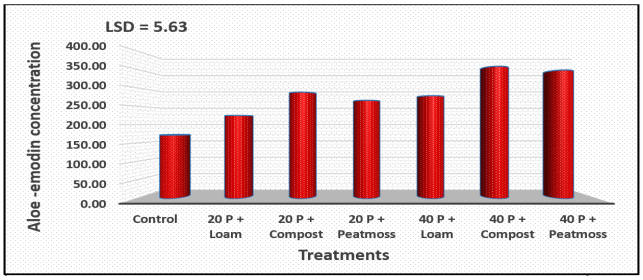

Figure 5: The superiority of the treatment (40 P+ Compost) in the content of aloe vera leaves of Aloe-emodin acid over all treatments used in the experiment except for the two treatments 20 P + Compost and 40 P+ Peatmoss

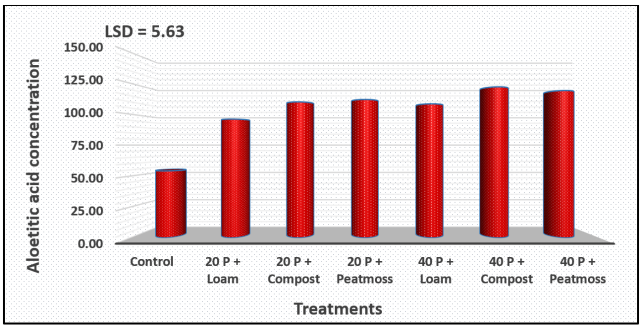

Figure 6: The control treatment recorded the lowest rate for this trait 54.13 micromole. gm

DISCUSSION

The superiority in treatments may be attributed to the role of super absorbent polyter, which interferes with the cultural media used in reducing the rate of water consumption and keeping it from depletion away from the root absorption areas, it is considered a water reservoir located in the soil, this is reflected in improved growth performance and quality, and because it can adapt to all types of cultural media, and this gives it the characteristic of distinction [(Tilly, 2016) (14)]. Its effect may also be reflected in the development of the root hairs of the plant, thus multiplying their number by approximately 3 to 5 times, thus doubling the size of the root system and the stages of plant growth and development [(Zhu et al., 2015)]. In addition, the significant increase in the studied characteristics, which was caused by the cultural media compost (the remains of fermented green plants), may be due to its important role in the formation of organic acids when decomposed naturally, such as (humic acid, folic acid and natural chelates) which may contribute to a high degree in the liberation of minerals necessary for growth [(Salman and Abdul Wahhab, 2016) (9)], or for its role in increasing the activity and effectiveness of microorganisms by increasing their numbers and the associated increase in growth regulators that are produced by them, including Auxins, which promotes the absorption of nutrient mineral elements, especially the major elements necessary for growth [(Salman et al., 2008) (8)]. Or, it may refer to the role of peat moss, which is considered a soil conditioner, as it is a decomposing organic matter derived from well-drained and ventilated algae deposits [(William, 2000) (13)]. Or, it may refer to the role of peat moss, which is considered a soil bio-fertilizer as it is a decomposing organic matter derived from well-drained and ventilated algae deposits [(William, 2000) (13)].

CONCLUSION

The present study showed that the treatment of 40P+ compost significantly outperformed most of the treatment in this experiment. It achieved the highest average number of leaves.

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