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RESPONSE POMEGRANATE(*PUNICA GRANATUM* CT. SALAKHAN) CUTTING OF FOLIAR SPRAYING WITH ALGA 600 AND GROWTH MEDIA

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ABSTRACT

This experiment was conducted during the growing season (2021) in Bakrajo Nursery Station/ Sulaimani, Kurdistan Region-Iraq. Uniform and healthy pomegranate (*Punica granatum* L..) cv. Salakhani cutting was used. Cutting pomegranate were planted in polyethylene black plastic pots each one of the with apromixlity (1L) volume, filled with different growth media to investigate the effect of three seaweed extract (Alga600) concentrations (0,2 and 4 mg. L^{-1}) and three different growth media (Sand, Peat Moss and Mix), and their interactions on the rooting and shooting system characters of Pomegranate cv. Salakhani cutting. The results are summerized as follows: growth media significantly increase all shooting and rooting system characters. Peatmoss media is significantly superior to overall Mix and sand media except for chlorophyll and fresh leave weight parameters. The foliar spray with Alga 600 concentrations was non-significantly different in the most studied parameters except for shoot numbers. The interaction between foliar spray Alga 600 and Peatmoss as growth media was recorded as a significant difference in some parameters such as leaf area, number of shoots, number of leaves, number of roots and root length.

KEYWORDS*: *POMEGRANATE, SALAKHANI CV. , GROWTH MEDIA, ALGA 600

1. INTRODUCTION

Pomegranate is a shrub one of the most significant trees grown in the arid and semi-arid regions of the world, belonging to the family Punicaceae. The genus *Punica* is the only genus of this family that has two species, *Punica granatum* (cultivated pomegranate) and *Punica protopunica* (wild pomegranate)(Zareian Baghdad Abadi et al., 2020).

Pomegranate could be propagated sexually suing seed and asexual methods using stem cutting, hardwood cutting, layering and grafting(Manila et al., 2017). Generally accepted methods for propagated pomegranate are stem cutting with 12-20 cm in length with pencil size diameter. It is almost certain the rooting capability changes among cultivars , locations, seasones and the age of branches. The success rate of pomegranate cuttings counts on many factors such as the conditions of the mother plant, the part of the tree from where the cuttings are made, the time of the process, rainfall, temperature fluctuation, aftercare, etc. expecting, Growth regulators also play important role in rooting and growth of pomegranate cutting (Singh, 2017). For better rotting of cutting media is one most significant factor for survival plants, could be using different media such as soil, perlite, sand, peat moss, vermicompost, etc., which play influential role in the success of rooting of cutting, Several media have higher moister holding capacity, which increase root formation, for this reasons different media promote rooting of cutting.(Rathwa et al., 2017). Agricultural researchers have long considered root stimulation of cuttings to be an interesting subject for investigation. Growing media directly influences how well pomegranates root (Manila et al., 2017).Pomegranate root can be promoted by using different growth media, which directly affects the development and later maintenance of a functional rooting system, selection of medium for cutting establishment should have holding moisture and good aeration(Hartmann, 1990).

A concentrated organic material called seaweed extract is available as a liquid or soluble powder. It is added to seeds, transplants, and plants as fertilizer after being diluted with water (Al-Shatri et al., 2020).The amount of seaweed extract is likely to increase uses as

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organic fertilizer and natural growth promote to enhance vegetable growth and increase the yield of horticulture plants, on the other hand these organic products are very cheap and safe for ecology and human, whereas chemical fertilizer and plant growth regulator, over rising are recommended to be used the safety and environmental and economic aspects (Yousif, 2018). Seaweed extract has proved a catalyst for plant growth and productivity in a variety of forms and application techniques. As a result of enhancing photosynthesis, activating flowers and leaves, promoting shoots, leaf minerals and carbohydrates, and vegetative weights, seaweed has been shown in various studies to contribute to the active development of plants (Al-Shatri et al., 2020).The plant extracts wieldy used such as seaweed extract (Alga 600) which is contain micro and macro elements, plant hormones like Auxin, Gibberellins and Cytokinin which encourage cell division and promote cell enlargement and increase photosynthesis processes and ameliorative growth characters(Z. Sarhan, 2011). The plant sprayed with seaweed extract (Alga600) absorbs the most important micro elements (Co, B, Mo, Zn, Cu) and hormones like Auxin, Gibberellins and Cytokinin lead to increase nutrient absorption and root growth ability and increasing stem thickness (Z. Sarhan, 2011).

Given that the fruits of Salakhani pomegranates are in demand for exports in Kurdistan region of Iraq, since their arils are juicy and their fruits have a good quality, also the propagation by cuttings (cloning) produces plants having characteristics of their own parent (Al-Jabary, 2007). Wherefore, this study was carried out to determine the response of (Salakhani) pomegranate cutting to different growth media and spraying with three Alga600 concentrations (0, 2 and 4 g/L).

2. MATERIALS AND METHODS

This study was carried out at the Nursery of Bakrejo/Sulaimani, Kurdistan Region-Iraq, during the growing season of 2021. Hardwood "Salakhani" cuttings were planted on 15/March/2021, with 23-25cm length and (5-10) mm diameter, in the commercial polythylen black plastics with approximately dimension10 cm 25 cm high, when filled with soil. To study the impact of different media growing (Sand, Patmos, and Mix (1:1)) and spraying with three Alga600 concentrations (0, 2 and 4 g/L), which were sprayed on 3 July and repeated at the same concentrations on 23 July. Also, all agricultural service processes were conducted during the growing season, and irrigated with a sprinkler was used which was repeated when needed.

The following parameters were taken after seven months (October) of the seedlings as the fresh weight of leaf (g) were measured according to Horwitz (William Horwitz, 2000). Leaf area (cm^2) was measured as mentioned by Dvornic (Dvornic, 1965). Chlorophyll content in leaves (spad) were measured by using (SPAD) instrument. Shoot and root number was measured by calculating the number of shoots and roots formed on pomegranate cutting. Length (cm) of shoot and root were measured by using Length Measurement.

STATISTICAL ANALYSIS

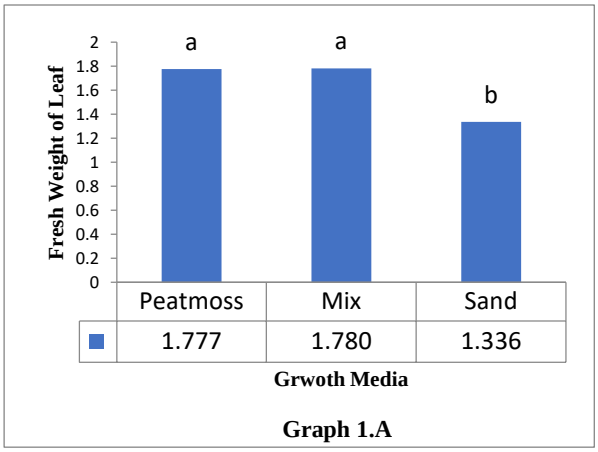
The experiment was layout in a factorial randomized complete blocks design (3(growing media)*3(Alga 600) with three replicates. Data was analyzed statically according to (SAS, 2017) program. The means were compared by using DMRT at 0.05 level.

3. RESULTS AND DISCUSSION

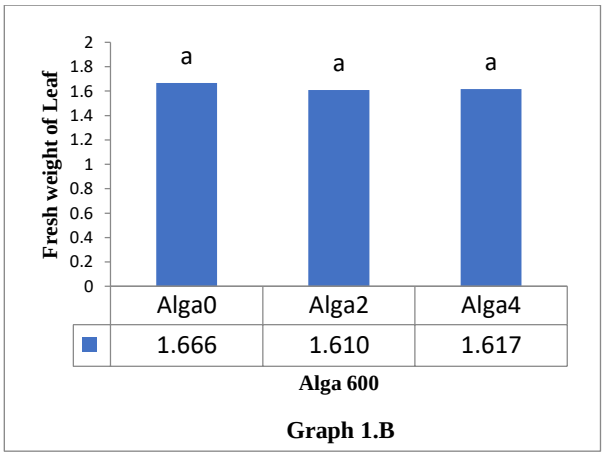
3.1. RESULTS

3.1 Fresh weight of Leaf (g):

Graph1. A. results showed that mix (sand+petmose) media recorded higher(1.780g) followed by Peatmoss (1.777g) and Sand (1.336g), and the graph 1. B. shows that concentrations of Alga 600 did not affect fresh weight leaves. On other hand the interaction between growth media and foliar Alga 600 presented in Table 1 showed that significant influence in fresh weight leaves content were observed due to different type of rooting media as treated by Alga600, However the maximum fresh weight content (2.3g) was recorded in (T4) and minimum was recorded in (T7).



Graph 1.A

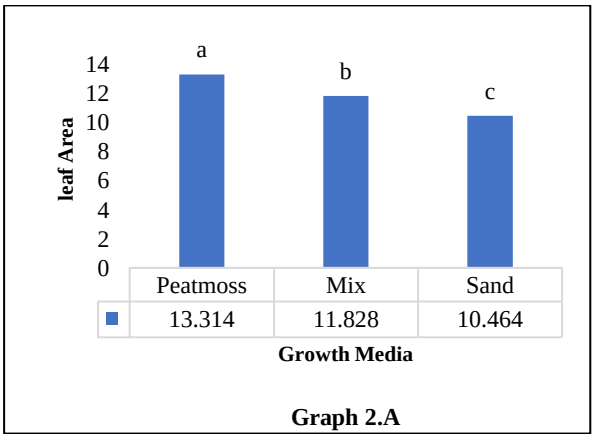


Graph 1.B

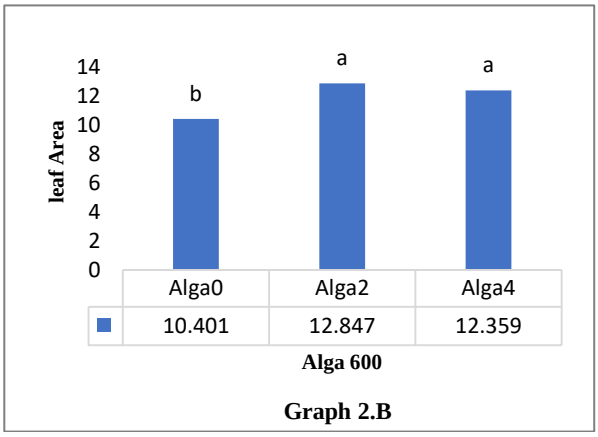
Graph1: The effect of growth media (graph A) and foliar spry with Alga 600(graph B) on fresh weight of leaf (the same letters do not statistically differ from each other at 0.05 significance level based on the Duncan multiple range test).

3.2 leaf Area (cm^2):

The graph 2.A shows that the highest leaf area was conserve in peat moss media (13.314 cm^2) followed by mix (11.828 cm^2) and sand (10.464 cm^2) respectively. However, the concentration of foliar Alga 600 (Graph 2.B) effect on leaf area in both level (Alga2, Alga 4) recorded (12.847 and 12.359 cm^2) respectively. The interaction between growth media and foliar Alga 600 presented in Table 1 conducted that significant influence in leaf area were observed due to different type of rooting media as treated by Alga600, However the maximum leaf area content (14.88 and 14.71 cm^2) was recorded in (T3 and T2) and minimum was recorded in (T7) (8.08 cm^2).



Graph 2.A

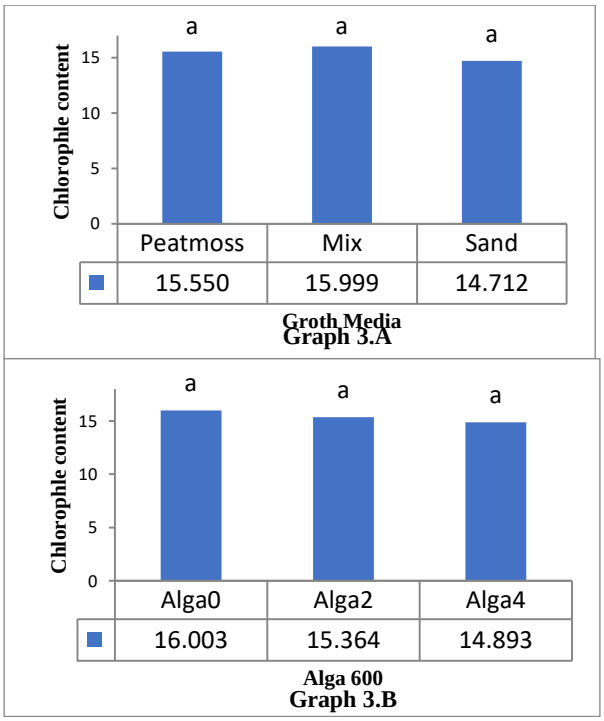


Graph 2.B

Graph 2: The effect of growth media (graph A) and foliar spry with Alga 600 (graph B) on leaf area (the same letters do not statistically differ from each other at 0.05 significance level based on the Duncan multiple range test).

3.3 Chlorophyll Content(SPAD):

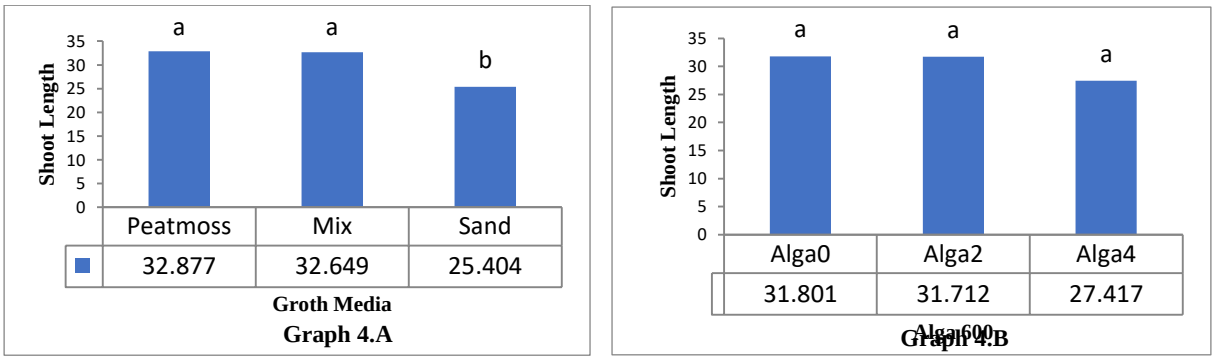
According to Graph3. A. the obtained results recorded higher but no significan value (15.999) at mix media followed by Peat moss and sand whoever the graph 3.B. shows that concentrations of Alga 600 did not affect in Chlorophyll content in leave. The interaction between growth media and foliar Alga 600 in Table 1 showed that non-significant influence in chlorophyll content in leaves were observed due to different type of rooting media as treated by Alga600, However the maximum chlorophyll content (18.19) was recorded in (T1 and T5).



Graph 3: The effect of growth media (graph A) and foliar spry with Alga 600 (graph B) on Chlorophyll content (the same letters do not statistically differ from each other at 0.05 significance level based on the Duncan multiple range test).

3.4 Shoot Length(cm):

The stem cutting grown in Peat moss and Mix media significantly increased the mean of shoot length (32.877 and 32.649 cm) respectivily compared to those which are grown in Sand media (6.6 cm) during the investigation (graph 4.A). A maximum of shoot length increase in mean shoot length was recorded with Alga 4 (15.88 cm) followed by Alga 0 (13.43 cm) and Alga 2 (10.13 cm) see graph 5.B. the interaction showed in the (Table 1) between growth media and foliar spry by Alga 600 was recorded significant different, T4 recorded higher in mean (34.67 cm) and T9 least in mean (17.69 cm).



Graph 4: The effect of growth media (graph A) and foliar spry with Alga 600 (graph B) on shoot length (the same letters do not statistically differ from each other at 0.05 significance level based on the Duncan multiple range test).

3.5 Number of Shoot:

While examining the performance of different rooting media on shoot production in stem cutting, it was resulted that stem cuttings planted in Peatmoss rooting media significantly increased the number of shoot (19.3) compared to other rooting media (graph5.A). The Sand containing rooting medium recorded minimum number of shoots (6.6) as shown in (graph 4.B). The Alga 4 had the highest number of shoots (15.88) and the Alga 2 had the lowest number of shoots (10.57). The results of interaction between growth media and Foliar Alga600 shows the in (Table 1) which had significant difference. The T3 recorded the highest number

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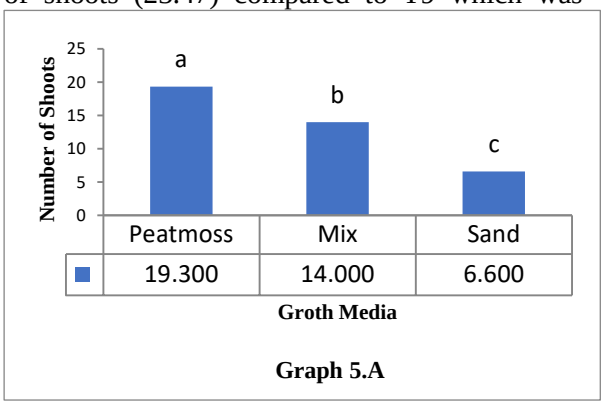
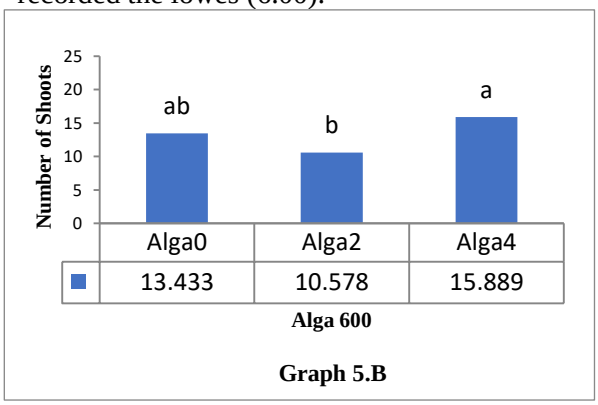
of shoots (23.47) compared to T9 which was recorded the lowes (6.00).

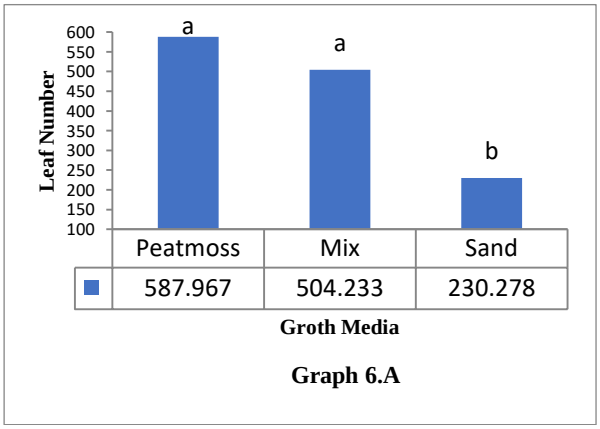


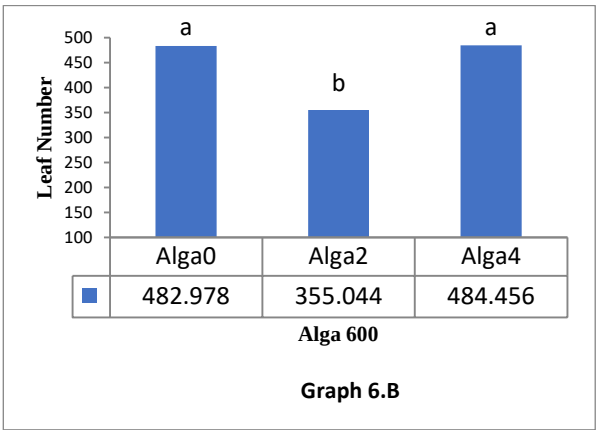


Graph (5):- The effect of growth media (graph A) and foliar spry with Alga 600 (graph B) on number of shoots (the same letters do not statistically differ from each other at 0.05 significance level based on the Duncan multiple range test).

3.6 Leaf Number:

Results showed the effect of growth media on leaf number was significant ($\rho < 0.05$) the higher and lowest number of leaves was observed in Peatmoss (587.96), and Mix (504.23) respectively (graph5.A). while, the effects of cutting sprayed by Alga 600 on leaf number were significant different (graph 5.B), the higher and lowest number of leaves was observed in Alga4 (484.456), and Alga0 (842.978) respectively. However, the effects of medium and interaction between growth media and cutting sprayed by Alga 600 on leaf number were significant different (Tables 1). The highest and lowest leaves number observed in T3 (677) and T9 (183) respectively.

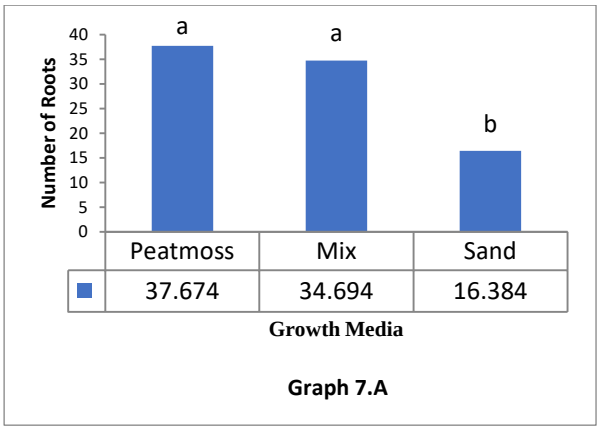


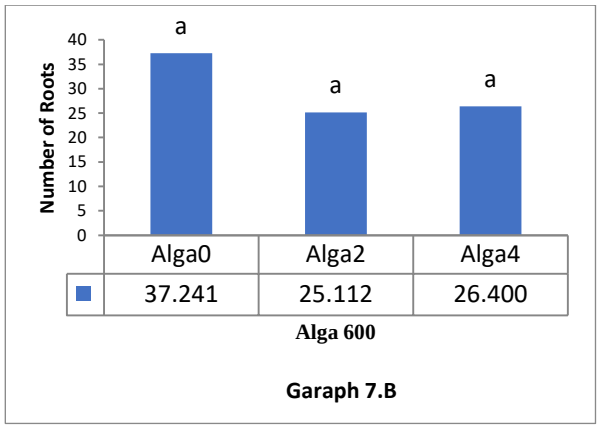


Graph (6):- The effect of growth media (graph A) and foliar spry with Alga 600 (graph B) on leaf number (the columns letters do not statistically differ from each other at 0.05 significance level based on the Duncan multiple range test).

3.7 Number of roots:

The rooting medium Peatmoss' had significantly better effect on root development in cuttings (37.674) over Mix media (34.694) and Sand (16.384) during the investigation. The foliar sprayed Alga600 were recoded non-significant different on the number of roots. On other hand, the interaction between different growth media and different Alga600 concentrations was significant different (Table 1). The highest and lowest roots number observed in T1 (52.55) and T8 (14.13) respectively.

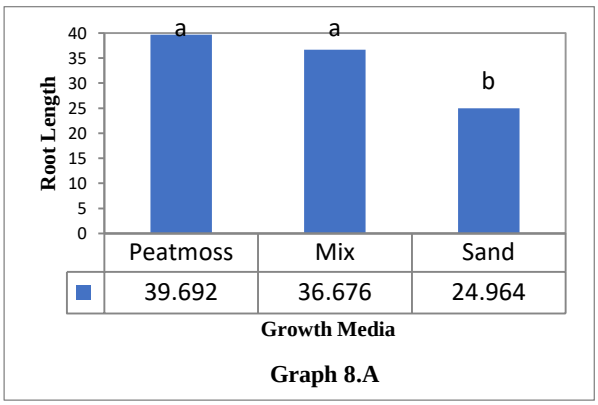


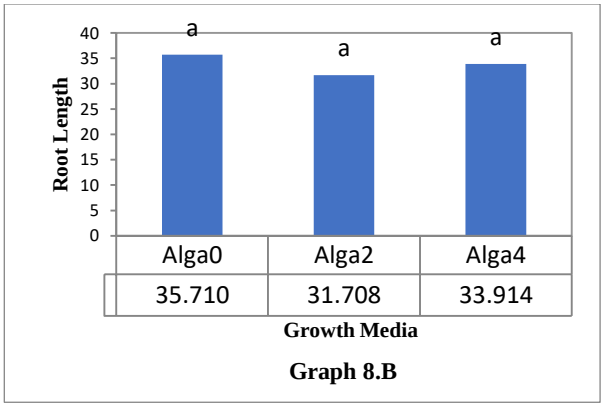


Graph (7):- The effect of growth media (graph A) and foliar spry with Alga 600 (graph B) on number of roots (the same letters do not statistically differ from each other at 0.05 significance level based on the Duncan multiple range test).

3.8 Root Length (cm):

Irrespective of treatments, different rooting media had also affected the root length of cutting. Significantly higher mean root length of cutting was recorded in cuttings grown in Peatmoss (39.692 cm) followed by Mix (36.676 cm) and Mix (24.694 cm) during the study (graph 8.A). while, different concentration of Alga600 were non-significant different on the root length (graph8.B). On other hand, the interaction between different growth media and different Alg600 concentrations was significant different (Table 1). The highest and lowest roots number observed in T3 (44) and T9 (17) respectively.





Graph (8):- The effect of growth media (graph A) and foliar spry with Alga 600 (graph B) on root length (the same letters do not statistically differ from each other at 0.05 significance level based on the Duncan multiple range test).

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Table(1):- Effect of Interaction between different growing media and foliar spray with seaweed extract (Alga 600) on following parameters.

Treatment		Fresh weight of Leaf (g)	Leaf Area (cm^2)	Chlorophyll (*SPAD*)	shoot Length (cm)	No. of Shoots	No. of leaves	No. of root	Root length (cm)
T1	Peat Moss+ Alga0	1.757ab	10.35d	18.19a	32.65a	18.70ab	620 a	52.55a	37abc
T2	Peat Moss+ Alga2	1.63abcd	14.71a	13.21a	32.94a	15.73b	467abc	27.20bc	39abc
T3	Peat Moss+ Alga4	1.94ab	14.88a	15.24a	33.03a	23.47a	677a	33.26abc	44 a
T4	Mix+ Alga0	2.02a	12.77b	13.98a	34.67a	15.00b	563ab	39.84ab	40abc
T5	Mix+ Alga2	1.6abc	11.41cd	18.19a	31.75a	8.80c	356bcd	34.00abc	29bcd
T6	Mix+ Alga4	1.62abcd	11.3d	15.82a	31.33a	18.20ab	594 a	30.60abc	41ab
T7	Sand+ Alga0	1.21d	8.08e	15.82a	28.08ab	6.60c	266cd	19.68bc	31bc
T8	Sand+ Alga2	1.5bcd	12.41bc	14.69a	30.44a	7.20c	242d	14.13c	27cd
T9	Sand+ Alga4	1.29cd	10.9d	13.62a	17.69ab	6.00c	183d	15.33bc	17d

Mean within a column with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

3.2. DISCUSSION

The effect of Alga 600:

It is clear from the results the graphs above the different concentrations of Alga 600 do not significantly different for most of the parameters except the number of shoots and leaf area are significantly different. Generally, Alga 600 extract is used as an application for plant growth, which is rich in macro and microelements, plant hormones like Auxin, Gibberellins and Cytokinin which improve cell division and cell enlargement and cause to balance of biological and physiological processes and increase photosynthesis (Z. Sarhan, 2011). The results corroborate the idea of Akinremi et.al (2000) that the concentration of seaweed extracts (Alga 600) may cause improving plant growth and nutrients uptake from soil to plant the making plant better in the rate of portion. On the other hand, effect of cultivars and seaweed concentration on protein percentage may be due to better nutrient uptake which causes better vegetable growth (Yousif, 2018).

The effect of Growth media

It is clear from experiment parameters that the significant effect of peatmoss on leaf area, shoot length, number of shoots, number of roots, leaf number and root length. This may be due to the peatmoss having a sufficient amount of organic matter and maintaining the moisture, thus, contributing to the increase of cutting growth, probably, the negative effects of sand as growth media might be due to their property, which has the lack of capability to maintain water and nutrient. Sands generally have less water holding and ions exchange capacities. Insufficient water supply will affect the transportation of minerals and nutrients from the soil to the plant body (William Horwitz. 2000). Our results corroborate the idea by Larson (1980) who describe that the optimum planting media have selective pH level to optimum nutrient arability and texture which allowed gas exchange around roots and improve water movement for proper root formation and development, different media such as perlites, vermiculture, peat moss and another organic substrate considerably improve the rooting in cutting (Al-Jabary, 2007). On the other hand, one of the most important factors for successfully cutting plants is different growing media like soil, sand, peatmoss and organic substrate. The media with higher moisture holding capacity enhance root formation(Rathwa et al., 2017). According to Landis (1995) if the soil media is used as growing media it should contain 10 to 30 percent of organic substrate to promote the soil aeration and water holding capacity for a longer period of time (Al-Jabbari et al., 2020). Probably the fact that gibberellin

stimulate the activity of auxin resulting in production of a greater number of shoots and shoot lenght (Dvornic, 1965). Whoever, another study reported that combination of sand with organic matter such as Cocopeat lead to increase number of roots, it might be due to release of amount nutrients and good aeration around root zone cutting (Al-Jabbari et al., 2020). Additionally, peatmoss and its mixing with sand (Mix media) outperformed other media in terms of rooting length and root numbers. Because peatmoss, in addition to its ability to hold water, can gradually release nutrients that are essential for root growth and development.development (Ansari, 2013). The peat moss medium improved the root properties and increased the number of leaves and shoots. Additionally, the mixed medium considerably enhanced leaf area and chlorophyll concentration. With the exception of shoot length, the sand medium had no discernible impact on any of the study's other features. This issue relates to peat moss's function in enhancing water retention and nutrient release over time(Alikhani et al., 2011). Sand medium was also found to have a negative impact on the ability of pomegranate cuttings to produce roots (Rajkumar et al., 2017). The lack of a substantial impact of sand is related to its poor nutritional content. Sand has significantly lower levels of nitrogen, phosphorus, potassium, calcium, and magnesium than peat moss and mixed medium, as seen in all graphs accept graph3.A (chlorophyll concentration). The limited water retention capacity and aeration of sand are other variables that significantly contribute to the promotion of cuttings' root growth (Rajkumar et al., 2017).

4. CONCLUSIONS

The purpose of current study was to determine effect of different growth media and Seaweed extract (Alga600) and their interaction between them on the pomegranate cv, Salakhani cutting. The research has also shown that growing media due main roll for improve root system of cutting which cause proving most vegetative growth. while seaweed extract has less effect on pomegranate cv. Salakhani cutting.in general therefore, it seems that growth media have more effect than seaweed extract on pomegranate cv. Salakhani. The variation in the quality and quantity of the root and shoot characteristics by using different growth substrate substrates such as organic substrate can be impact to the direct consequence of the medium on the root portion of the cutting.

REFERENCES

Al-Jabary, A. M. (2007). *Effect of GA3 and some nutrients of pomegranate fruit (Punica granatum L.) Splitting and storability CV.(Salakhani)*. university of sulaimani.

Al-Jabbari, K. H., Pakyürek, M., and Yaviç, A. (2020). Comparison of rooting situations for salakhani and zivzik pomegranates under different iba doses. *Applied Ecology and Environmental Research*, *18*(1), 201–217. https://doi.org/10.15666/aeer/1801_201217

Al-Shatri, A. H. N., Pakyürek, M., and Yaviç, A. (2020). Effect of seaweed application on the vegetative growth of strawberry cv. Albion grown under iraq ecological conditions. *Applied Ecology and Environmental Research*, *18*(1), 1211–1225. https://doi.org/10.15666/aeer/1801_12111225

Alikhani, L., Ansari, K., Jamnezhad, M., and Tabatabaie, Z. (2011). The effect of different mediums and cuttings on growth and rooting of pomegranate cuttings. *Iranian Journal of Plant Physiology*, *1*(3), 199–204.

Ansari, K. (2013). Effects of Different Collecting time and Different Medium on Rooting of Pomegranate " Malas torsh cv." Cuttings. *Bull. Env.Pharmacol. Life Sci.*, *2*(November), 164–168.

Dvornic, V. (1965). *LUCRARI PRACTICE DE AMPELOGRAFIE de*.

Hartmann, H. T. (1990). Hartmann and Kester ' S Plant Propagation. *Hartmann & Kester's Plant Propagation: Principles and Practices*, 928.

Manila, Tanuja, Rana, D. K., and Naithani, D. C. (2017). Effect of different growing media on vegetative growth and rooting in pomegranate (punica granatum l.) CV. "kandhari" hardwood stem cutting under mist. *Plant Archives*, *17*(1), 391–394.

Rajkumar, R., Gora, J. S., Kumar, R., Singh, A., Kumar, A., and Gajender, G. (2017). Effect of different growing media on the rooting of pomegranate (Punica granatum L.) cv.

"Phulearakta" cuttings. *Journal of Applied and Natural Science*, *9*(2), 715–719. https://doi.org/10.31018/jans.v9i2.1263

Rathwa, A. D., Singh, V., Patel, D. D., and Patel, A. H. (2017). Influence of Propagation Media on Growth of Hardwood and Semi-Hardwood Cuttings of Pomegranate cv . Bhagwa. *Trends in Biosciences*, *10*(28), 6023–6027.

Singh, K. K. (2017). Vegetative Propagation of Pomegranate (Punica granatum L.) through Cutting- A Review. *International Journal of Current Microbiology and Applied Sciences*, *6*(10), 4887–4893. ttps://doi.org/10.20546/ijcmas.2017.610.458

William Horwitz. (2000). *Official methods of analysis of AOAC International*.

Yousif, K. H. Y. (2018). Effect of spraying with different concentrations of Seaweeds extracts on vegetative growth and yield of two cultivars of Peas (Pisum sativum L.). *Journal of Zankoy Sulaimani - Part A*, *2ndInt.Con*(Special Issue), 15–26. https://doi.org/10.17656/jzs.10648

Z. Sarhan, T. (2011). EFFECT OF BREAD YEAST APPLICATION AND SEAWEED EXTRACT ON CUCUMBER (Cucumis sativus L.) PLANT GROWTH, YIELD AND FRUIT QUALITY. *Mesopotamia Journal of Agriculture*, *39*(2), 26–32. https://doi.org/10.33899/magrj.2011.30359

Zareian Baghdad Abadi, Z., Kamali Ali Abad, K., and Tabandeh Saravi, A. (2020). Comparison of Different Culture Media and Hormonal Concentrations for In-Vitro Propagation of Pomegranate. *International Journal of Fruit Science*, *20*(S3), S1721–S1728. https://doi.org/10.1080/15538362.2020.1830916