Calculate the growth dynamics of root and shoot of bean plants

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Abstract: Dry matter accumulation patterns in most grains are sigmoid-type curve. In the first stage of this model is that if growth is slow, then there is a rapid phase after the flowering stage is followed by growth that is in pod formation stage. Studies have shown that leaf area development and dry matter accumulation in most cereal grains, especially cold for a long period after transplantation is very slow. Accordingly, in order to effect the kinds humic acid plant growth and bean seeds under climatic conditions of Ahvaz in the form of a split-plot experimental design with randomized complete block design based on years of farming 2010 was designed and executed. Factor with three bean varieties (V_1 = Barekat, V_2 = Jazayeri, V_3 = Shame) in the main plot factor with four types humic acid (F_0 = control, F_1 = humic acid, F_2 = full macro humic acid, F_3 = acid Micro humic full) rate of 2 ppm in the sub-plots were placed. The results showed that the use of acid in all varieties humic increased plant growth parameters such as crop growth rate (CGR), plant height, grain yield, harvest index and biological function has been compared to the control. the highest total dry weight of the acid treatment Humic full macro level was 5909 kg per hectare and the lowest rate to the control was 4332 kg per hectare Effective grain filling period (***EFP***) The increase in the treatment process itself revealed .Varieties planted in the province and the third type humic acid with a control rate at 2 ppm was placed in sub-plots. The highest and lowest average number of lateral roots in this experiment in order Humic acid treatments and control macro level 241.7 and 136 numbers were obtained. Note that between the number of acid root treatment and between macro and micro humic acid and acid micro Humic significant difference was found. the highest root dry weight to macro Humic acid treatment with a mean 4.22 grams of control treatment and lowest with mean 2.63 has been hot Total root number from 592 to 899 in number in the control humic full macro will increase the number of roots, a positive regression (***r^2 = 0.89***) with the amount of biological fixation (percentage of nitrogen nodules) showed .[Simin Haghighi, Tayeb Saki Nejad, Shahram Lack. Calculate the growth dynamics of root and shoot of bean plants. Journal of American Science 2011;7(6):19-26]. (ISSN: 1545-1003). http://www.americanscience.org.

Keywords: growth dynamics, root, shoot, bean plants

1. Introduction

Beans as one of the most important sources of vegetable protein-rich grains, the second important source of human food are considered. This plant belongs to the legume family and lounges are below the butterfly family. Bean a member of the large genus with over 130 members Vicia are. Grains but the main diet of many poor people makes up the world because substantial amounts of protein quality in grain cereal products in combination with a compound can provide biologically valuable food (8). Amount of protein found in seeds 2-3 times more protein in cereal grains and 10-20 times more protein in glandular plants and forage legumes are also due to having high protein food value is high. Bean plant having 25-23% protein as well as in other food grains high value and having the ability to stabilize nitrogen, have very good effect that causes the periodic amplification and chemical and biological soil fertility is. Nitrogen fixation in grain legumes by 56-112 kg per hectare a year have been reported (3).

Cereal cultivation based on FAO data (2006) over 7.5 million hectares have been. Bean cultivation in Iran is approximately 35 thousand hectares (4). Statistics suggests increasing importance and widespread as an important source of food grains in many countries and cultures have longstanding experience in Khuzestan is Bean (7). Product to achieve maximum week, despite the needed amount of nutrient elements in the environment and balanced distribution of bean roots is essential. Consumed at the absence of elements in plant growth and development is effecting the amount of nitrogen fixation (6). In 23.8 million hectares are salt and sodium, which causes the nutrient uptake by plants are (9). Organic matter due to the beneficial effects on physical and chemical properties and soil biology have an important role in

soil fertility, plant nutrition and increased functionality and are the product.

Influx molecular nitrogen in the surface of the Biosphere by Rizobium bacteria called biological nitrogen fixation. Humic acid substances, including the dual effect of biological influences on consolidation is a phrase that the root development and lead to more contact with the roots and the bacteria are Rizobium other hand has a positive effect on the activity of soil microorganisms and can increase biological nitrogen fixation in legumes is (13).

2. Material and Method

2.1. Land preparation and planting

In order to run tests in 2010 on land preparation operations include basic irrigation, deep plowing to 20 cm, 15 cm and depth of the disk was trowel. Urea nitrogen fertilizer rate of 30 kg per ha nitrogen as fertilizer while planting base land was given. After preparation, land plot plan map based on the dimensions of a plot scheme was tested was 6 × 4 m and 7 lines in each plot to kill took over six meters. The space between two rows of seeds on the distance of 60 cm and 15 cm rows were considered.

2.2. Plant growth analysis

Every 12 days once the two plants harvested per plot and then measure the height and number of lateral branches and leaf area index, samples in oven for 48 hours and the temperature 75 degrees to measure the parameters of dry matter accumulation and leaf area index were placed.

2.3. Grain growth analysis

In order to check the growth of seed pods form after every five days once the sample was taken and all pods from each plot by two plants collected during and after measured pods and seed number per pod in the oven 48 hours and temperature 75 ° C dried and then dry the seeds and pods were determined. The grain filling rate and the effective period of grain filling was calculated using the formula.

2.4. Root growth analysis

For review every 12 days once the root growth of two plants per plot completely removed and the roots as cylinders of soil were removed. After separating the roots of plants, their roots washed sub number; root dry weight and volume were measured. Rooted in the oven for 48 hours at temperatures 75 ° C were placed and then dry them this time was calculated. To calculate the size of the root count and root dry weight of lateral roots and the difference through the law of Archimedes cylindrical water volume, volume of roots was calculated.

2.5. Statistical calculations

Analysis of variance, split plot design computer software cholera ***EXCELL2007, MSTATC*** was done and for comparing characteristics of the LSD test was used.

3. Result

3.1. Calculate the growth dynamics shoot

3.1.1. Leaf area Index (LAI)

LAI is simply the product of leaf area than the land surface on the shadow throws. Chart review of the bean leaf area index in a sigmoid curve itself shows, the primary growth in all treatments were 55 days after planting LAI slow process and its value had nearly the number 0.8 show that this trend will expand the family LAI is Leguminoseae. But should note that taking acid types humic cause shorter periods of three varieties grow on bean plants has been tested. According to the diagram (1, 4) added to the macro elements Humic acid treatment than the other three acid Humic increase LAI and shorter growing period will have been getting.

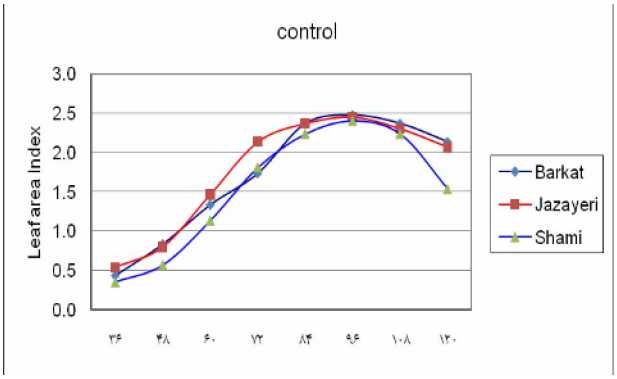

Fig1. Leaf area Index of cultivar in control treatment

Bean plants Foliar Spray in the eyes of nightingale's second trifoliate stage with organic compounds have significant effects on vegetative growth found. Treated leaves and fresh mass were fresh led to higher photosynthetic activity (14).

Effect Humic sprayed acid on traits such as stem height, leaf number, shoot fresh weight, shoot and root dry weight accumulation and leaf NPK in eggplant and pepper seedlings found that stem diameter, number of leaves, shoot fresh weight, shoot and root dry weight significantly Humic acid application on pepper and eggplant seedlings increased(17).

The effect of variety on leaf area index, LAI maximum number Jazayeri the figures showed that between dinner and blessing with the numeric value 3.5 the maximum is reached. Jazayeri figure in the early stages of growth below the figure dinner LAI showed her and even to 50 days after planting cultivars had more leaf area index dinner. But the number of islands during this period of flowering and leaf area index had increased

considerably probably related to the plant and its potential impact has been the quality of fertilizers.

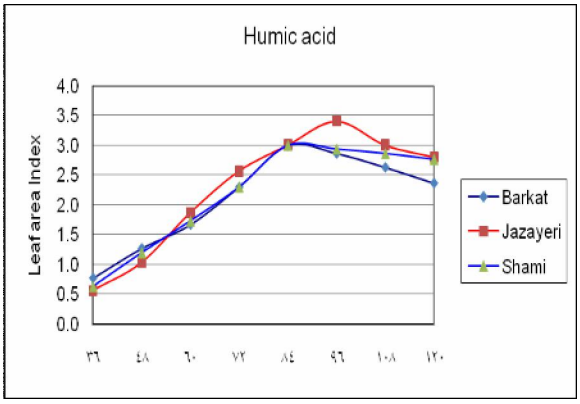

Fig2. Leaf area Index of cultivar in humic acid treatment

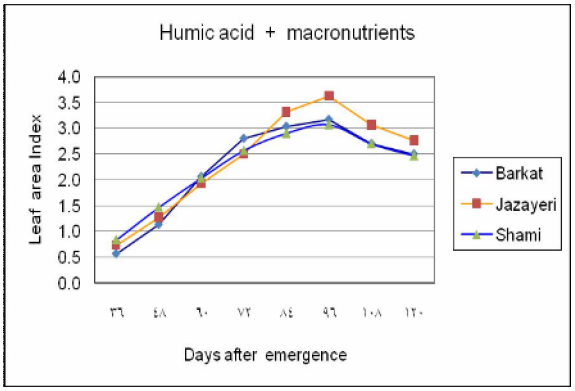

Fig3. Leaf area Index of cultivar in humic acid + macro treatment

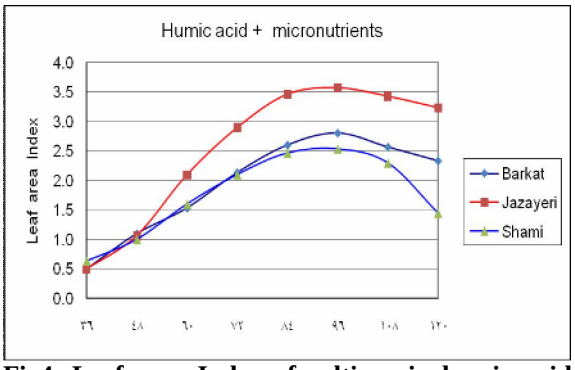

Fig4. Leaf area Index of cultivar in humic acid + micro treatment

3.1.2. Total shoots dry matter accumulation (TDW)

Results of variance analysis shows the effect of acid on dry matter accumulation of total Humic in different periods of significant growth at 5% has. This shows that the consumption of the kind Humic acid organic fertilizer rich in carbon and increased leaf dry matter has increased LAI and increased absorption of radiation in order to increase photosynthesis and plant growth and ultimately improve the material increases dry has.

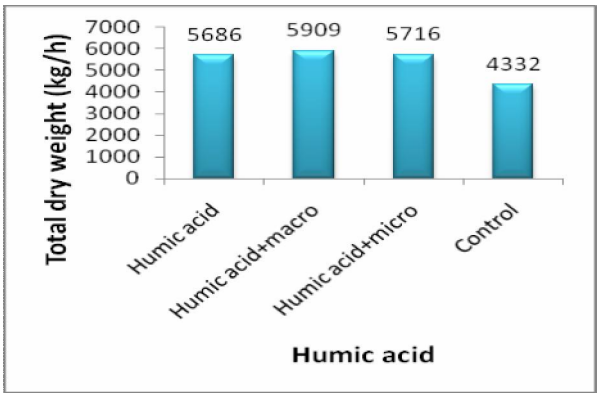

Fig5. Effect treatment on TDW

Results Comparison table shows the consumption of acid varieties humic significant effect on total plant dry matter accumulation has. So that the highest total dry weight of the acid treatment Humic full macro level was 5909 kg per hectare and the lowest rate to the control was 4332 kg per hectare. The process of dry matter accumulation totally dependent on leaf area index has expanded to include other phenomena, or any positive or negative effects of treatments on leaf area index components to put together TDW gives affected (Saki nejad, 2010)

The effect of variety on dry matter accumulation was significant and the most and the least performance figures associated with the numeric value Jazayeri 5543 kg ha blessed with a figure of 5260 kg ha dry matter respectively.

3.1.3. Dry matter accumulation of leaves (LDW)

Results of variance analysis shows the effect of acid on leaf dry weight Humic significant effect on levels of 5% is shown. In this experiment according to the diagram (6, 7) the highest leaf dry weight to humic acid treatment and the amount of macro elements 898.5 kg per hectare and the lowest rate to control treatment 644.9 kg per hectare was. Increasing the amount of leaf dry weight in this treatment could be due to increased LAI and increased photosynthesis and vegetative growth period in its result is the macro elements, nitrogen is available, the increase in leaf dry weight has been treated.

Bean plants Foliar spray materials humic nightingales' eye on vegetative growth of treated leaves showed no significant increase was LAI (15).

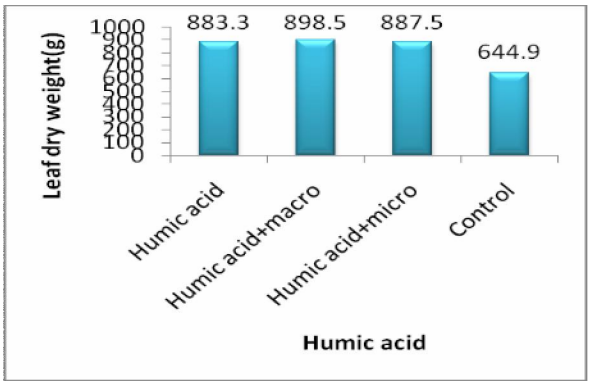

Fig6. Effect treatment on LDW

Humic by increasing nitrogen content, plant dry weight increase and leaf area is.

Increasing acid humic increase in nitrogen content and dry matter accumulation in the growth is. In the pilot was on acid humic oat dry weight was increased (3, 9). Experimental acid sprayed humic increase in wheat shoot dry weight was. These results are consistent with the results of these researchers (14).

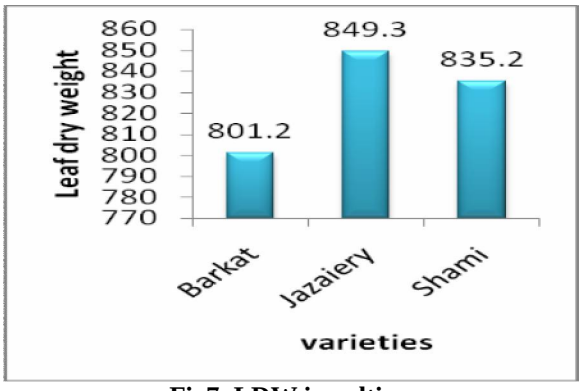

Fig7. LDW in cultivars

Analysis of variance showed that the effect of cultivar on leaf dry weight at 5% level was significant and the highest leaf dry weight to figure the amount of islands 849.3 kg per hectare and the minimum to figure Blessing rate of 801.2 kg per hectare respectively.

Greater amount of leaf dry weight in islands can figure because of genetic factors, including high fertilizer absorption properties (absorption of nitrogen) and the potential to produce more leaves than other varieties and character compatible with the environment is Khuzestan.

3.1.4. Dry matter accumulation of Stem

Analysis of variance humic acid effect on stem dry weight at 5% level is significant. Chart (8, 9 and 10) on shoot dry weight of most acid-related macro humic numerical average 1798 kg per hectare and the lowest rate of 1471 kg per hectare to control treatment.

Urinary cultivar also shoot dry weight at 1% level was significant. Highest stem dry weight to number average number Jazayeri 1745 kg per hectare and the lowest figure blessing to the numerical average was 1617 kg per hectare. It can be inferred that due to the nitrogen in acid Humic enriched with macro elements that make more vegetative growth period and increase the number and height of secondary stems may be related. Most of the average shoots dry weight in the genetic characteristics of plant varieties to the islands, including the number of secondary stems and flexibility or adaptability of this cultivar is associated with the testing environment.

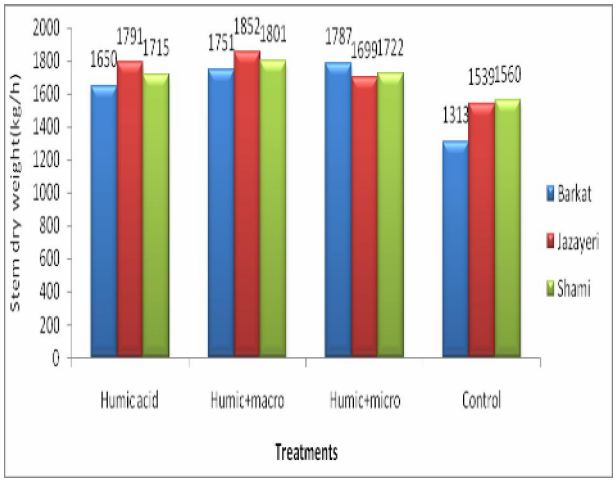

Fig8. Effect treatment on dry matter accumulation of Stem in cultivars

Acid and acid Humic Folic stem growth in plants stimulates different. Seeds treated humic acid solution 38% increase in stem dry weight demonstrated (21, 25).

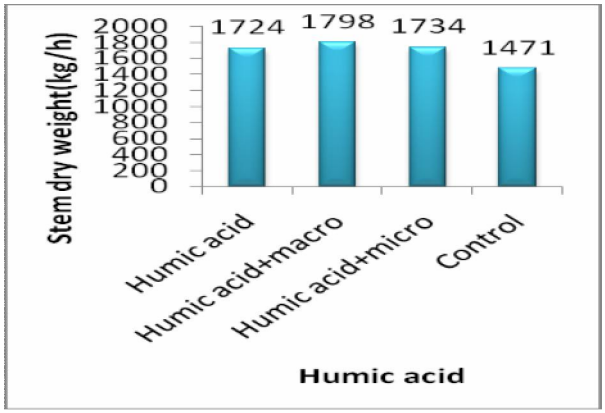

Fig9. Effect treatment on dry matter accumulation of Stem

Increased stem dry weight can be due to an increase in plant height, he said. Humic acid increased with increasing enzyme activity robisco photosynthetic activity and thus plant growth is in (27).

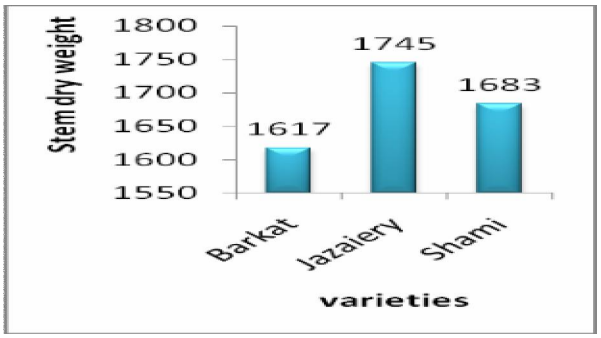

Fig10. Dry matter accumulation of Stem in cultivars

3.2. Calculate the growth dynamics of root

3.2.1. Dry matter accumulation of root

According to variance analysis table and figure humic acid effect on root dry weight, respectively, at 1% and 5% were significant. Comparison of treatments given, the highest root dry weight to macro Humic acid treatment with a mean 4.22 grams of control treatment and lowest with mean 2.63 has been hot.

Increased weight and volume and number of secondary roots Humic by acid can be a good indicator of the environment by limiting resources, plant and considered generally can be said that increasing the acid concentration Humic root biomass will increase significantly.

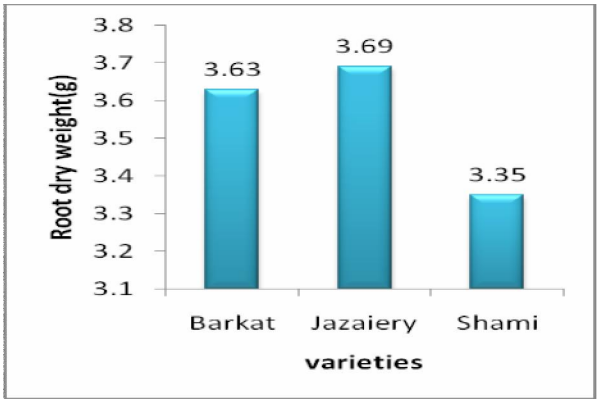

Fig11.dry matter accumulation of root in cultivars

Comparison between the average root weight highest figures related to the islands and the lowest figure to figure, respectively dinner averages 3.69 and 3.53 was hot. Also worth noting is that the average weight figure blessing roots have been significant.

Findings with the results of many investigators regarding the effect of acid on root growth Humic match.

Effect of Acid on Plant Humic Bent Grass Humic specifically found that the concentration of acid 400 mg significantly assimilation rate and root weight increase.

During the trial on wheat Humic acid levels 54 mg, 50% increase in length and 22% increase in dry matter to roots along.

Nitrogen uptake in the presence of acid Humic showed significant increase. Consumption humic acid solution or powder form in the soil increased root length and weight of carrots and whole plant growth were increased (15).

3.2.2. Number of root

The results of variance analysis table used humic acid types and the number of varieties of plant rootlet Bean significant effects at 5% level is. Humic acid increases the numbers of secondary roots are. The highest and lowest average number of lateral roots in this experiment in order Humic acid treatments and control macro level 241.7 and 136 numbers were obtained.

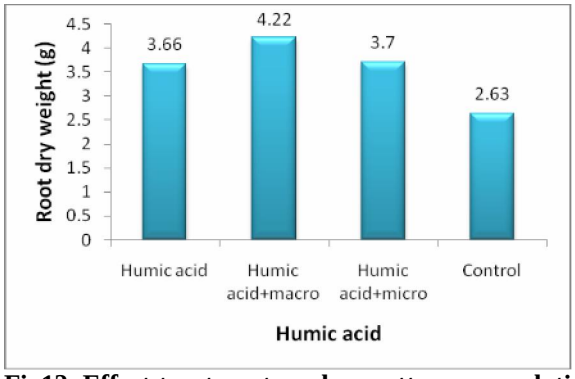

Fig12. Effect treatment on dry matter accumulation of root

Note that between the number of acid root treatment and between macro and micro humic acid and acid micro Humic significant difference was found. Foliar application materials Humic significantly antioxidant concentration in leaves increased and enhanced photosynthesis, respiration, nucleic acid synthesis and ion uptake and root growth is (23).

Treatment compared to the number of digits rootlet, to the highest and lowest average figures Chipset about the amount of islands and dinner 214.8 and 200.5 is the root number. But between the average number of secondary roots and dinner blessing figures differ significantly in terms of comparing test average there.

Most rooted in the interaction cultivar and cultivar Humic acid in acid Jazayeri Humic macro numerical value 254.3 the number of roots and the lowest figure in the control treatment mean blessing 7.126 numerical number allocated to the roots is.

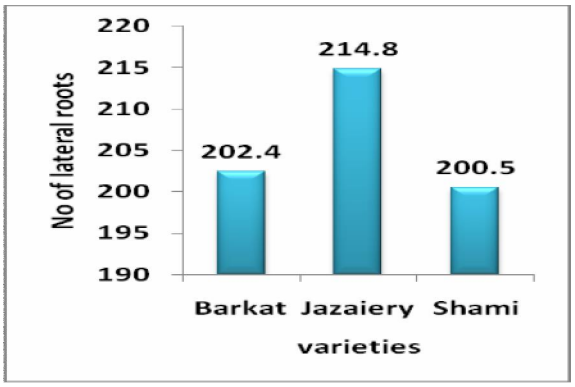

Fig13.No. root in cultivars

Research on the effect of acid on the elemental composition humic roots in bean plants was studied. The results showed that acid respectively humic significant increase in root dry weight of bean plants to the amount of 30.1% and 56.6% found. Also Humic acid increases sodium and potassium content of the roots, but significant effect of calcium and iron, and no significant decrease in copper, manganese and zinc contents were. (27). Foliar application materials Humic significantly antioxidant concentration in leaves increased and enhanced photosynthesis, respiration, synthesis of nucleic acids and ions were absorbed (11).

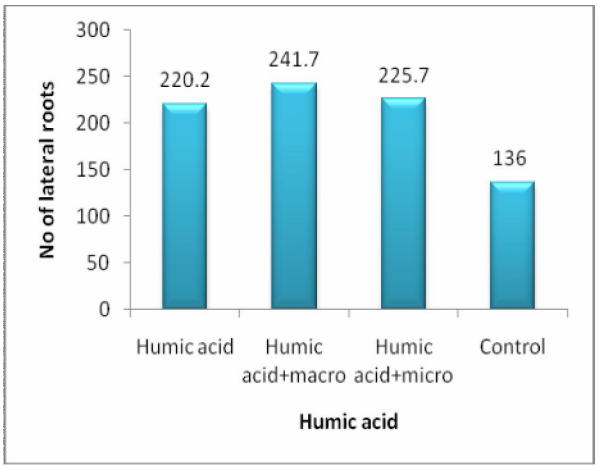

Fig14. Effect treatment on No. root

3.2.3. Root volume

Results of variance analysis table shows the interaction of acid and acid Humic and varieties at 5% on increased volume of work has roots. Average based on comparisons with related tables to the highest volume of acid treatment Humic 11.22 macro numerical value to control treatment and lowest average number 2.63 cc respectively.

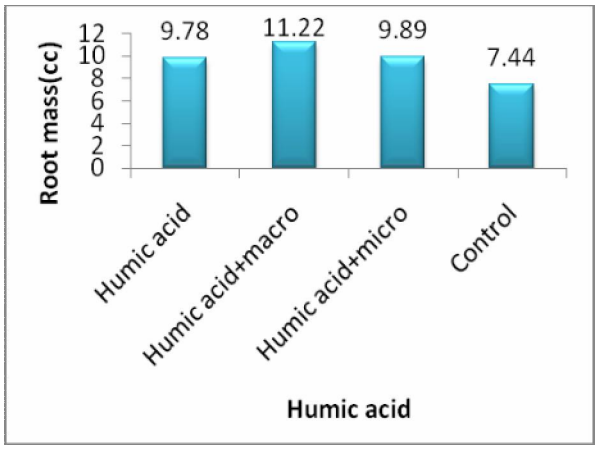

Fig15. Effect treatment on root volume

Effect of variety on the root volume is significant and the most and the least volume, respectively, to figure the volume of 10 islands and having dinner with volume number 9.25 is CC.

Based on comparisons with related tables mean the most to root volume and acid varieties Jazayeri Humic macro numerical value and the minimum to 12 digits in the control treatment having dinner with the numeric value is 7 cc.

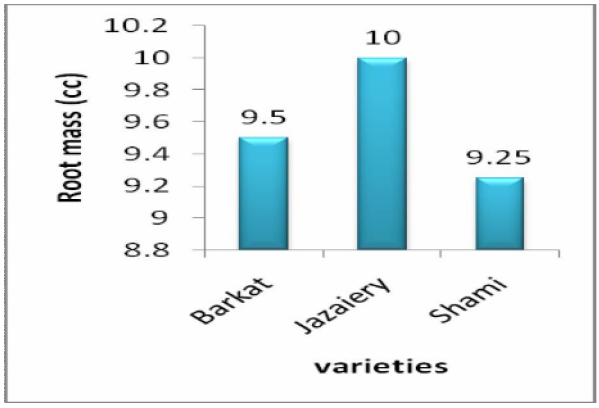

Fig16. Root volume in treatment

Size-dependent root is the root number. Because macro humic acid cultivar islands could not increase the number of roots after root large amount of time is allocated to.

Humic acid increases the numbers of lateral roots are in broad bean plants. the pilot plant showed that Bent Grass Humic acid concentration of 400 mg, root dry weight significantly increased the enzyme activity from 23% to 100%, which increased its increased root respiration and growth factors that were more. Researchers Humic material effect on the development of plant root systems of grasses and found Bennett Humic acid significantly in root dry weight of plants Bent Grass 1.5 g

control treatment to 2.5 g treatment increased with acid Humic was(4, 12)

4. Discussion

Review process of dry matter accumulation, leaf area index and net photosynthesis

Dry matter accumulation patterns in most grains are sigmoid-type curve. In the first stage of this model is that if growth is slow, then there is a rapid phase after the flowering stage is followed by growth that is in pod formation stage. Studies have shown that leaf area development and dry matter accumulation in most cereal grains, especially cold for a long period after transplantation is very slow (22).

A positive relationship was between total dry weight of aerial plant and grain yield there. However, the maximum total production of dry matter does not necessarily yield the most direct relationship with no. Route because the formation of biological function (TDM) and economic performance (dry seeds) are different. Maximum of dry bean yield in the physiological maturity stage is achieved. After this step, the total dry matter yield 10 to 20 percent and it decreases due to the shadow set of leaves, this transfer of nutrients to the roots and secrete various substances from roots to soil. According to comments bean LAI were 3.5 to 4 vary (8).

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