Effect of biological fertilizer of humic acid on metabolic process of biological nitrogen fixation

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Abstract: Soil health is one of the key important factors in determining crop performance. Humic materials in soil have multiple effects of the main components; part of humic material is humic acid that can grow on crops through the effect on physical properties, chemical and biological soil to be effective. Use of organic materials in agriculture to reduce pollution from taking a positive step in the way of chemical fertilizers to achieve sustainable agriculture and fertilizer efficiency is. To order these types of effects on acid Humic biological nitrogen fixation process of bean plants in the form of a pilot project testing split plot with randomized complete block design based on crop year 2010 was conducted in Ahvaz. Invoice number (V1 = Barekat, V2 = Jazayeri, V3 = Shame) in the main plot factor with four types humic acid (F0 = control, F1 = humic acid, F2 = full macro humic acid, F3 = Full Micro humic acid) in sub-plots were placed. Humic acid once, and then at 5-6 leaf after flowering to 2 ppm levels (200 ppm) was sprayed to the plants. The highest and lowest number of nodes in humic acid treatment was respectively humic acid micro average 274.3 and controls with a mean number 179.6 respectively. However, three types of acid humic terms of number of nodes there is no significant difference. The greatest average diameter in micro humic acid treatment was rate 1.39 cm respectively. But between acid and acid Humic Micro significant difference was found. The average minimum diameter to control treatment mean number 0.8 is the cm. The results showed that acid humic improve the process and indicators of biological nitrogen fixation in bean plants were. Results of variance analysis table shows the types of acid humic bean root nodules on the amount of nitrogen in the 1% level were significant. Most nitrous acid humic macro nodes to complete the average 2.06 and the lowest value to control the amount of 0.88 were.

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Key words: biological fertilizer, BFN, Humic acid

1. Introduction

Process that amount of nitrogen available to biological systems, biological nitrogen fixation was called. The monopolies of certain types of phenomena in prokaryotes were performed that contain genetic information necessary for *Nitrogenase* enzymes are synthesized. Nitrogenase enzymes revive the role of a catalyst in N2 to NH3 is responsible and can react in the normal temperature and pressure will lead (5). The following reaction is done through the *Nitrogenase* enzyme in all these organisms is common:

$$N_2 + 6H^+ + 6e^- + n\,MgATP \longrightarrow 2\,NH_3 + n\,Mg\,ATP + npi$$

Biological fixation of nitrogen fertilizer to replace nitrogen in agricultural soils of Iran, qualitative and quantitative study of indigenous Rizobium for maximum efficiency of Rizobium symbiotic systems - Leguminoseae today in the world at large is considered. The wider use of the phenomenon of biological nitrogen fixation as a vital necessity for the realization of sustainable farming systems has been emphasized.

Countries that utilize biological systems nitrogen stabilizers have developed, have proven in practice that theory and nitrogen fixation process or have limited use in laboratory and research program is practical and can be wide performance. In Australia the use of this phenomenon, more advanced than other countries, about one percent of the nitrogen needs of crops through use of chemical fertilizers will be supplied. The overall scale, despite the advanced technology for mass production of these fertilizers are still main plant needs nitrogen, normally provided through the BNF estimated figure of about 175 million tons a year globally confirms the issue (5).

Newer defined humus material is used to the phenol products from lignin and some of the leftover products from decomposition by microbial reactions or through chemical oxidation agglomerate deformation humus find and bring into existence (3). Physicochemical point of view can be combined humus extremely intensely and without external dimensions of the considered variables (screw and polymer chains become more stretched), large internal surface, and changing times and tend to form large complexes with some cations (2).

Exchange capacity of humus 100-300 m/equivalent in 100 g and the specific surface of 800-900 m is g. Humus generally consists of three main materials is:

1. Humin: which includes remnants of cellulose and alkaline solution deposition mode is not playing.
2. Humic acids: proteins that contain material Lignin and alkaline pH in solution and precipitated at pH are acidic.
3. Folic acids from hemicelluloses and wax formation and deposition in acidic and alkaline pH are not (3).

Fertilizers Humic

Recently, using a variety of organic acids to improve the quality and quantity, and garden crops has increased. Very small quantities of organic acids significantly effects on improving physical and chemical and biological properties of soil due to have beneficial effects on hormonal compounds to increase production and improve the quality of agricultural products have (2). Tests showed that adding humus to the soil material in barley cultivation, sugar beet and potatoes to a significant performance increase was caused by Kalat elements enhance absorption by the plant material and humus can cause long-term soil carbon storage, root and shoot growth in plants, nitrogen uptake and storage, increased photosynthesis, increased resistance to disease and .... Is (7). Humic acid and soluble granule forms, there are also applications as well as sprayed on earth is used.

In addition to fertilizers to increase soil nutrient elements can be sprayed on the leaves are used to this method is called a leaf called spry (adequate and colleagues, 1378). Power plants can be sprayed through an effective role in increasing the quantity and quality of agricultural products have.

2. Material and Method

Pilot project specification and plan

In this study the effects of two factors as a split plot with randomized complete block design in three replicates were examined.

2.1. The treatments tested in the study include:

A - Cultivar (V) with three levels as main plots
• BARAKAT cultivars (V1)
• JAZAYERI (V2)
• SHAME (V3)
B - Treated with acid Humic four types as sub-plots
• Control (without taking Humic acid) (F0)
• Humic acid treatment (F1)
• Full macro + humic acid treatment (F2)
• Acid treatment Humic + Full Micro (F3)

Humic acid products used under license Caspian Environment under license *jorafourm* Sweden company fertilizer was recommended according to the amount of 7 liters per hectare (2 ppm per plot) and two times after the 5-6 leaf and flowering plants were sprayed.

2.2. Sampling and procedures

Biological nitrogen fixation for review once every twelve days of two plants per plot completely removed and the roots as cylinders of soil were removed. After separating them from the plant roots washed and the root node, the average diameter of nodes (by caliper), color and dry nodes, the number of secondary roots, root dry weight and volume were measured. Roots and nodules in the oven for 48 hours at temperatures 75 ° C were placed after this time, their dry weight 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. Some nodes intact experimental units to estimate the amount of nitrogen to the university and research laboratories were given and the method of micro nodes Kjeldal percent nitrogen calculated.

Fig1. Land preparation and planting procedures

3. Result

3.1. Characterization of biological nitrogen fixation Morph physiological

Number of nodes per plant:

Humic acid treatments impact on the number of nodes during the growing season at 1% level was significant. The highest and lowest number of nodes humic acid treatment, were respectively humic acid micro average 274.3 and controls with a mean number 179.6 respectively. However, three types of acid humic terms of number of nodes there is no significant difference. High average number of nodes in the micro humic acid treatment can be due to the effect of micro elements is on the nodulation process. For example, on the inception of nodes, increasing the amount of hemoglobin and the stork is involved in nitrogen uptake. Other elements also each micro somehow have a positive impact on nodulation (6).

Fig2. In view of the field spraying acid humic

Fig3. A view from the field after spraying acid Humic

Table 1. Effect of treatments on biological nitrogen fixation parameters

Humic acid	N%	No of nodule /Plant	Nodule dry weight	Diameter of Nodule
Humic acid	1.88	252.6	703.9	1.16
Humic acid+macro	2.06	262.9	765.9	1.28
Humic acid+micro	1.97	274.3	818.7	1.39
Control	0.88	179.6	449.4	0.8

And your stated humic acid and acid Folic significant effect on total plant dry weight is. They declared that by taking 100-400 mg kg Humic acid soil and root dry weight and number of nodes compared to the control nodes increased. Acid and sodium acid Humic like Human Folic effect on growth stimulation produced Trifoli Rizobium found (9).

Results showed that the variance analysis table of figures on the number of nodes is significant. Comparison shows that islands with an average figure 248.9 knots maximum number and variety blessed with 236.2 the number of nodes were having the least number of nodes. Any figure that more positive reaction to acid Humic show greater number of nodes allocated to that same figure is Jazayeri.

Interactions humic acid on the number of nodes at 5% level has been significant. According to Table 1 digits islands and micro Humic acid treatment mean 274.3 maximum number of nodes and the treatment and control acid blessed with variety 179.6 the number of nodes to the minimum number of nodes allocated. Greater number of nodes in the treatment of acid interactions and micro Humic figure Jazayeri genetic potential and the effect of this plant is related quality of fertilizer treatments.

3.2. Average diameter of nodes

Results of variance analysis showed that the effect of acid type on the average diameter humic nodes at 1% is significant. The greatest average diameter in micro humic acid treatment was rate 1.39 cm respectively. But between acid and acid Humic Micro significant difference was found. The average minimum diameter to control treatment mean number 0.8 is the cm. More nodes because of the size of micro humic acid treatment can be a positive effect on the activity of microorganism's humic acid soil attributed. Stimulating effect on the activity produced humic acid bacteria by increasing membrane permeability and better use of nutrient elements are (11).

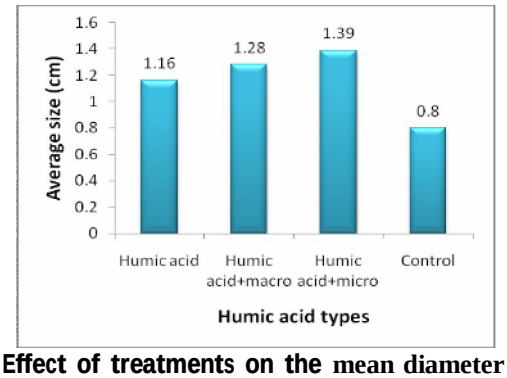

Fig4. Effect of treatments on the mean diameter of nodules

Analysis of variance table of the average diameter of the node number is significant. Node size and diameter is dependent on the plant meristem. In fact, the root meristem anatomical discussions of each variety as different nodes are created. Node size too many factors such as physics, soil, moisture content, consolidation activity, type of meristem plant, plant age and the amount of water depends. All these factors can alter the size of the node. Once in a variety of node sizes are related because the plant meristem, and the varieties are so much a tie between the different varieties of plants with no difference, because the meristem are similar (Saki Nejad, 2010)(10).

But the interaction of varieties and sizes of nodes humic acid at 5% level is significant. Average based on comparisons with related tables and the interaction of two factors most studied in the node size and micro humic acid treatment with a mean figure Barekat 1.45 and figure Jazayeri rate 1.39 cm were observed. Lowest average number of nodes in diameter and blessed with an average numerical control treatment 0.61 cm respectively.

More significant interaction effects related to the effects of variety Cody. Because different varieties respond to different types of fertilizer and the highest value Humic the Barekat and the acid treatment Humic micro figure is derived. Barekat varieties respond better than other varieties with fertilizer micro Humic has shown that the node size is increased. Should be stated that sometimes the size of any relation with the amount of nodes is established (Saki Nejad, 2010)(10).

3.3. Dry weight of nodules

Analysis of variance table of results showed that application of acid humic types and varieties and their interactions, respectively, no significant effect at 1% and 5% had weight nodes. Maximum weight equivalent nodes 818.7 mg treatment plants and micro humic acid were the least related to the control treatment with 4 / 449 mg in the plant. Note that the three types of acid, there was no significant difference Humic.

Comparison of nodes with weight factors that figure was the highest node weight associated with the numeric value 719 varieties Jazayeri mg plant has been. The lowest figure Barekat to rate 567.8 mg plant has been. But between the sizes of knots in three varieties in terms of average significant difference was observed.

According to comparisons with related tables in the islands mean figure acid fertilizer treatments Humic Micro mean number 885.3 mg of plant varieties and the lowest to the islands with control levels 418.7 mg plant has been. Possible environmental conditions or pilot error because the creation of the highest and lowest weight nodes in the figure is Jazayeri.

Node weight parameter that is dependent on the rate stabilization. The consolidation increased the weight of nodes increases. In fact, the weight amount of nodes and positive regression established there. According to test results as a more positive reaction to the islands varieties of treatments has shown that the adjective dry weight than the rest of the knot varieties respond better to treatments has.

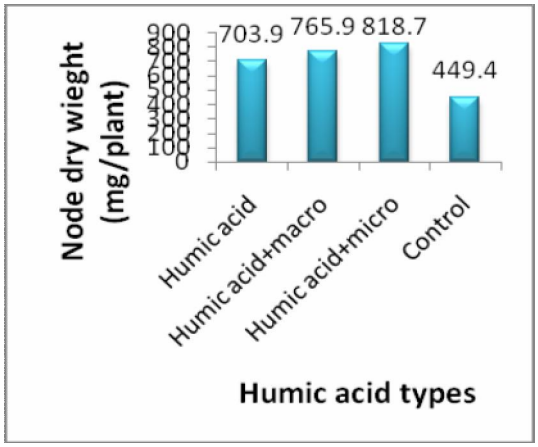

Fig5. Effect of treatments on the mean dry weight nodules

Research on the effect of acid and acid Humic Folic production dry soybeans and peanuts, and clover was studied. The results showed that acid consumption increased crime humic nodes and nodes increase in dry weight and root dry weight increased total plant dry weight was positively correlated (13).

3.4. Percent nitrogen nodes

Results of variance analysis table shows the types of acid on the amount of nitrogen Humic bean root nodules at 1% level was significant. Most nitrous acid humic macro nodes to complete the average were 2.06 and the lowest value to control the amount of 0.88.

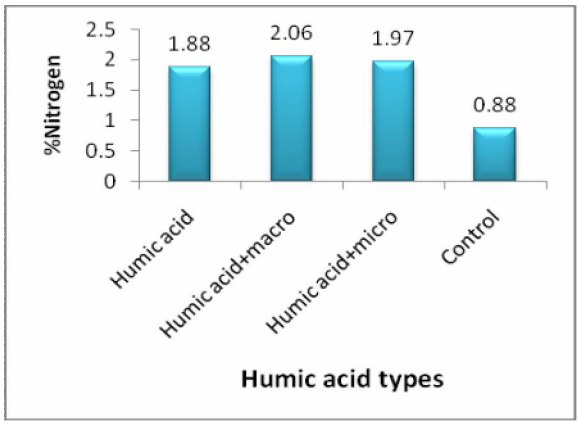

Fig6. Effect of treatments on the mean Nitrogen%

Since the biological nitrogen fixation requires a lot of energy there macro elements such as nitrogen and phosphorus can to solve this need. In fact Humic acid through increased cell membrane permeability of root uptake and transport elements such as Na + and K + and Ca +2 increases (6). When the plant is in possession of all the elements, especially biological nitrogen fixation elements needed to stabilize the biological causes will increase substantially.

According to variance analysis table cultivar effect on the percentage of nitrogen in the nodules was not significant, and all figures of average compared to the same level were. However, most related to the average numerical cultivar barekat was 1.71 respectively. Humic acid interaction in the figure is not significant.

4. Discussion

Statistics indicate the increasing importance of growing and developing as important sources of food grains in most countries have long experience of local culture is a bean (5). Grains with high levels of energy, protein, vitamins, minerals and medicinal properties of elements of Iran's agricultural products are important (8). Protein found in cereal seeds two to three times higher than the protein in cereal grains and 10 to 20 times higher than the protein in glandular plants (starch) and forage legumes is due to the protein having a high nutritional value is high. The bean plant with 25-23 percent protein, like other legumes with high nutritional value and having the ability nitrogen fixation, the periodic effect was very good, and enhances soil fertility and chemical Biological are. Bean plants under cultivation in Iran are about 35,000 hectares (9).

Due to environmental considerations, most recently using a variety of organic acids to improve the quality and quantity, and garden crops has increased. Very small quantities of organic acids significantly effects on improving physical and chemical and biological properties of soil due to have beneficial effects on hormonal compounds to increase production and improve the quality of agricultural products have (celestial and divine, 2006). Humus can be defined as organic material stabilized (10) that part of humic acid, acid Humin Folic and is composed of.

Most parts of the soil humus acid compounds and acid Humic Folic form (12) from different sources (terrestrial plants and vegetative resources) are obtained when considering the source of molecular size and chemical structure together are different. Humic acid compounds naturally in soil, peat, coal, and ... There are (1). Tests showed that adding humus to the soil in the planting material of barley and sugar beet, potatoes, watermelon, tomato, a significant performance increase was caused by Kalat elements enhance absorption by the plant material and humus are caused storage long-term soil carbon, root and stem growth in plants, nitrogen uptake and storage, increased photosynthesis, increased resistance to disease and .... Is (12)

Importance of nitrogen in the formation, survival and development to the extent that life is definitely without this element, life with what we are seeing today was completely different. Approximately 78% of Earth's atmosphere is composed N2. Plants, animals and microorganisms, all are surrounded by nitrogen gas and indeed all the world live in N2. However, this huge source of nitrogen, except for certain bacteria, the rest is useless creatures (10).

New molecular nitrogen to the surface called Biosphere is called nitrogen fixation. This form of consolidation and conversion of nitrogen to form plants can use, mainly through industrial or biological form (by a group of bacteria) is possible (13). Biological nitrogen fixation by bacteria, mainly through the establishment of symbiosis with legumes is a family of plants. Importance of legumes in soil fertility of the six thousand years ago, the Egyptians kill them in their rotation would be; was clear (14).

Symbiotic nitrogen fixation method is a variety from which the example of symbiosis with rhizobial bacteria, legumes family plants have been reported. Legumes in symbiosis with rhizobial bacteria sex Furthermore the Main nitrogen fixation seems to consume plant, the soil will be strengthened in terms of nitrogen (11). Nitrogen fixation in annual grain Lgvmhay 56 to 112 kg ha (6) and according to my research (3) Go 280.2 kg ha have been reported.

Considering the positive Asras Humic acid on the growth and activity of soil microorganisms can be said that this acid improves biological nitrogen fixation in legumes is. Vyramvnd Tanty (1982) showed that the stimulus effect on growth Humic acid may be due to pulses of nitrogen fixation in the soil is improved. Their research Humic acid on dry matter production, nodulation and nitrogen content in nodes of soybean, peanut and clover were studied. Humic acid levels 400 to 800 mg were used. The results showed that acid Humic dry matter production was increased. Dry weight of roots and nodules also increased and correlated positively with the increase in shoot dry weight found.

Bkardvaj and Gear (1972) found that acid and sodium acid Humic like Hvmat Folic effect on growth stimulation produced Trifoli Rizobium found. Highest concentration of 500 mg was found. Folic acid extraction and purification of humus tangible effect on growth stimulation showed Hvmat while untreated sodium showed less effect. Stimulate the growth of the fertilizer producer to farm in an equal amount of acid Humic less than half had positive effects Hvmat sodium. Valine and colleagues

(1997) Humic acid on bacterial activity and Nytrvbaktr Nytrvzmvnas laboratory conditions were isolated. Two Humic acids (derived from plant residues and Lyvnardyt) were added to the culture medium. The results showed that both humic acids, ammonium ions combine with oxygen and nitrite and nitrate grown cells constructive bacteria increased. Humic acid stimulation effects produced on the activities of these bacteria by increasing membrane permeability and better use of the nutrient elements

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