

## An Investigation on The Effect of Application of Nitrogen Manure, Vermi Compost and Nitroxin on The Soil Chemical Specification.

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### Abstract

To investigate the effect of application of different manure treatments on the soil's chemical specifications, a factorial test in block type have been conducted with 3 randomly repetitions on sesame plant in the city of Behbahan. The test elements consisting of 50, 75 and 100 percent usual nitrogen in the area (the amount of usual nitrogen in the area is 50 kilo grams in an acre), vermi compost manure and nitroxin have positive and meaningful effects on the soil chemical specifications. Results obtained show that nitroxin application causes increase in the amount of phosphor absorbable in the soil by 6.7%. Also, with application of 10 Tons of vermi compost in an acre in ratio without using vermi compost, the amount of soil phosphor will increase by 9.1%. The results show that the highest levels of nitrogen in treatment application of 10 Tons of vermi compost together with nitroxin have been obtained, but application of nitrogen chemical manure does not show any meaningful effect on the nitrogen reservoir in the soil. Action of seeds has a positive and high integrity with nitrogen in the total soil ( $r=45^{**}$ ).

**Key Words:** sesame; nitrogen; vermi compost; Nitrogen; soil specification

### Introduction:

One of the most effective methods for success in agriculture and food preparation is protection of soil and maintenance and enforcement of its fertility. Manures and chemical toxics are important in enhancement of production, but high production expenses and their undesirable effects on living environment and agricultural production quality causes more consideration in using the methods which with their use the chemical substances use will be reduced. Soil fertilization management with the use of organic manures such as biological manure and vermi compost manure can help in the advancement of the aim. Soil microorganisms play important roles in causing balance and stability in the ecosystem. Therefore use of biological manures is one of the most effective methods in maintenance of soil favorable quality which cause increase in useful reactions between plant and microorganisms in becoming "RIZ & SEFR" and increases the plant's power in attraction of more nutrition elements (Kokolis et al 2015). Among these microorganisms, Azosperilium and Artobactor bacteria are under more consideration which is due to geographical dimension with regard to agricultural plants importance and have been considered as potential in preparation of biological manure. Biological nitroxin manure consists of two kinds of bacteria. Vermi compost which is one of the organic manures and has enzymes, growth hormones and lots of nutritious elements which plant can receive and effective in the increase in activity of different kinds of products (Rigi 2013). The matter of fertility and stability of soil and also applicability of chemical manures is increasing day by day. Among these application of organic substances, the use of biological manures which consisting of growth increment bacteria instead of chemical manures which cause the production of nutritious elements for the plant and its growth and in addition to maintaining its living environment health and production of soil and disturbing the balance in nutritious elements and therefore causes negative effect on the growth of soil (Ramshwar & singh 2013). Also, application of organic manures alone and too much cannot be useful for the stability of in agricultural production. Therefore, integrative maintenances of nutritious elements with the use of chemical and organic manures will not only compensate shortage of nutritious elements, but also help in retaining the soil fertilization and also stability in production. Results show that



microbial integration cause improvement in soil specification such as organic consistency and increase in nitrogen consistency (Brussard and et al 2011, Wu and et al 2014). In a test in maize (corn) report showed that biological manures use improves the nutritious condition of the plant in stable agricultural systems with the use of organic substances to the soil, but also causes changes in the physical conditions of the soil and absorption of more water in the soil. vermi compost will cause improvement in the construction of soil and stops nutritious substances to be washed from the soil. (Berecz et al 2014, Aroncon et al 2012) reported that use of vermi compost not only help in the maintenance of quantitative and qualitative needs of plant, but also help in the maintenance of living environments health. The most effective elements on the food stability is soil fertility maintenance through the use of organic manure application, soil quality depends not only on the physical and chemical specification, but also it has a close relation with the biological specification of the soil. Use of vermi compost can have considerable effects on the activity and also the quality of products. In many of stable agricultural regimes and specially in biological agriculture, vermi compost have been used for improvement in the quality and conditions and fertility of the soil ( Mahboub Khomami 2013). Although it is necessary to consider the plant's nutritious management for increase and stability in production and also biological environment maintenance and since research on the application of biological manures on the soil chemical specification have been conducted very less, the present study aims on the analysis of the effect of different kinds of manure resources on the soil chemical specification.

### Material and Methods:

This test has been conducted in the factorial form in 3 block plan repetitions in the city of Behbahan in the south east of Khuzistan province with the longitude of 50° 12' east and latitude of 30° 36' north with the height of 320 meters from the sea level. Behbah is an area with semi deserted climate and located in STEPPE hot climate. Mean rain fall and 10 years temperature average equal to 313/5 millimeters and 25-degree centigrad. Test elements consisted of 50, 75 and 100 percent ordinary nitrogen from the area (the amount of ordinary nitrogen of the area is 50 kilo grams in an acre), vermi compost manure consisted of 0, 5 and 10 tons in each acre and application of the nitroxin biological manure is in 2 levels of integration and non-integration with seed, with 0/5 liters consistency for 9 kilo grams seed. Each testing plot consisted of 5 embankment space between blocks is mentioned as 3 meters. To measure soil chemical specifications after the complete removal of sesame from the test plots surface, from 30 centimeters depth of the soil samples have been taken. Phosphors has been measured according to Olson method, organic substance and nitrogen of the total soil with the use of KOJELWAL instrument.

Statistical calculations have been conducted with the use of SAS and Excel software. To compare the averages LSD test has been used in the probable level of 5% error.

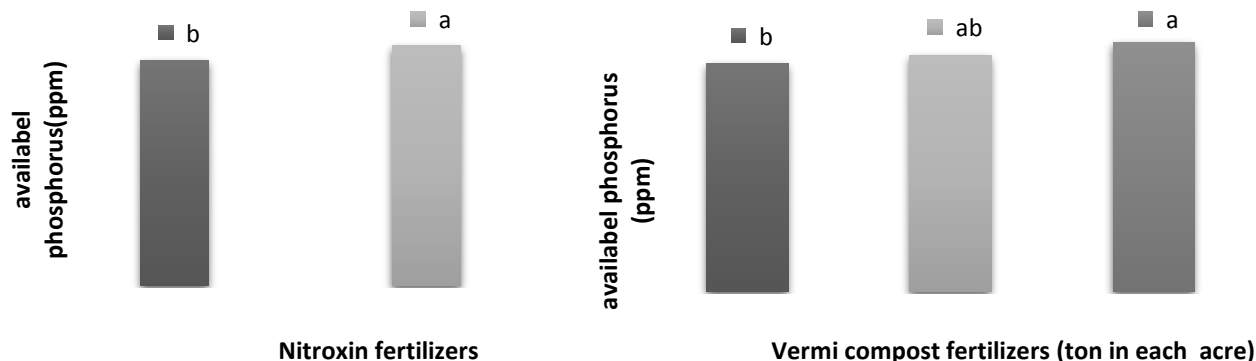
### Results and Discussion: Absorbable phosphorus:

Phosphor is very important in processes of photocynthesis.

Shortage of phosphor causes stoppage in the growth of plants and due to phosphor transfer from old leaves into young leaves therefore the old leaves will fall.

Considering the results obtained the effects of nitroxin and vermi compost on the absorbable phosphor by the soil in the level of 5% probable is meaningful (table 1). Also, none of the mutual effects and nitrogen has meaningful effects on this condition. Nitroxin application cause 6/6 percent increase in the amount of absorbable phosphor in the soil in relation to non-application of it (fig 1). Available bacteria in nitroxin manure cause absorbable increase of this element which is due to increase in microbe and enzyme activity and release of nutritious elements in the soil colloids specially phosphor. These bacteria not only increase the soil's nutrition elements but also cause phosphor and potassium solution through biological nitrogen and also produce arranging hormones and motivate plant's growth, plants' activities and finally effect the regime of agricultural behavior. (Balyan et al 2014). Roesty et al (2015) reported that presence of microbial population in the soil cause nutrition substances rotation and they are more available for absorption. Method of increase of absorbable phosphor with increase in the vermi compost has been shown in pic 2.

Considering pic 2, we can see that there aren't meaningful statistical differences between application levels of 5 and 10 tons in acre of vermi compost. Results obtained with the use of 10 tons of vermi compost in an acre, the amount of soil phosphor has reached to (9/22 ppm) and in turn the minimum amount of phosphor absorbable ( 8/47 ppm) has been obtained in treatment of non-application of vermi compost (fig 2). One of the reasons for these results is the amount of phosphor in the vermi compost manure. The other reason is positive and meaningful integrity between the percentage of organic carbon in the soil and phosphor absorbed (table 2). The reason for this integrity is shortage of organic substance in the soil before treatment, since the organic substance cause phosphor available in the soil to combine with the soil colloids and get out of the reach of the plant. Vermi compost causes increase of absorption of phosphor and therefore application of vermi compost cause increase in availability of soil phosphor because use of vermi compost cause the surfaces on the soil colloids to become unstable which is due to PH changes and with the use of vermi compost, liquid phosphor and therefore absorbable phosphor in the soil will increase. Anwar and colleagues (2005) mentioned that may be one of the reasons for increase in the phosphor solvency is because of the increase in the vermi compost and constitution of phosphor hyomic complexes which cause the process of consistency in the soil.

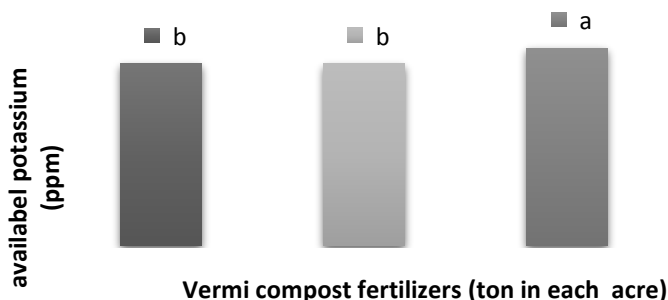


**Figure 1:** Comparison of the effects of Nitroxin soil phosphor **Figure 2:** Comparison of the effects of vermicompost to soil P phosphor

**Potassium:**

Potassium has a positive role in the photo synthesis of the plant through enforcement of NADPH and ATP synthesis and daily closing and opening and decrease in preparation and cause increase in more synthesis of protein and speed in transformation of cultured substances into seeds (Mobaser and colleagues 1384). According to statistical results of decomposition obtained, only the vermi compost with 5% probability has meaningful effects on the amount of soil potassium (table 1). Average comparison of

vermi compost on the soil potassium show that application of 5 Tons in an acre of vermi compost and ratio to application of statistical vermi compost has no noticeable differences, but with increase in the vermi compost up to 10 Tons in each acre, a considerable increase in the potassium reservation in the soil will be noticed. This increase is probably due to increase in the amount of potassium in the form of organic compositions in vermi compost which get free by time past. This eventual becoming free decreases the chance of water wash.



**Figure 3:** Comparison of the effects of vermicompost to soil K

Sources of change	df	Availabel phosphor	Mean square	Availabel potassum	Total nitrogen	Organic matter
Nitrogen(A)	2	/04 <sup>ns</sup>		102/22 <sup>ns</sup>	/0001 <sup>ns</sup>	/02 <sup>ns</sup>
Vermi compost (B)	2	/73 <sup>*</sup>		5677/25 <sup>*</sup>	/0012 <sup>*</sup>	/47 <sup>*</sup>
Nitroxin (C)	1	4/46 <sup>*</sup>		1013/74 <sup>ns</sup>	/0025 <sup>**</sup>	/69 <sup>*</sup>
B* A	4	1/31 <sup>ns</sup>		963/70 <sup>ns</sup>	/0003 <sup>ns</sup>	/12 <sup>ns</sup>
C *A	2	2/04 <sup>ns</sup>		2193/37 <sup>ns</sup>	/0009 <sup>ns</sup>	/28 <sup>ns</sup>
C * B	2	1/65 <sup>ns</sup>		190/18 <sup>ns</sup>	/0013 <sup>*</sup>	/27 <sup>ns</sup>
C * B* A	4	/17 <sup>ns</sup>		2445/25 <sup>ns</sup>	/0001 <sup>ns</sup>	/01 <sup>ns</sup>
Experimental error	33	/75		1491/80	/0003	/11
Coefficient of variation	(%)	9/86		10/59	12/39	11/81

<sup>ns</sup> \* \*\*,Non-significantly, respectively, are significant at the five percent level of probability.

**Table 1:** Variant decomposition of soil chemical specification with the effect of different amounts of nitrogen. Vermi compost and biological manures.



**Total nitrogen:**

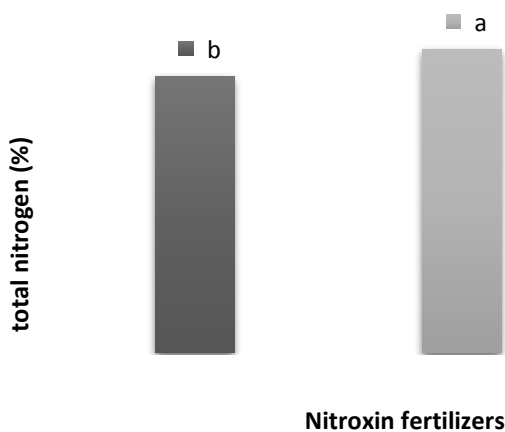
Nitrogen is the main element needed for the plant which has a complete effect on the growth of the plant. This element is one of the main parts of constituent of Amono acids, proteins and neocolek acids and plays an important role in the plant's physiology. For this reason, the effect of nitroxin at the probability of 1% and the effect of vermi compost and the reaction of vermi compost and nitroxin at the probability level of 5% is meaningful (table 1).

According to the results obtained inoculation of nitroxin causes increase of 9.73% total nitrogen in the soil (fig 4). Nitrogen in the soil is available in the form of organic and non-organic and the activity of bacteria in the soil in the cycle of nitrogen is usually different. Nitrogen settler bacteria in the soil are capable of producing its dried nitrogen from the air. Nitroxin containing of useful microorganism from nitrobacteria and nitrosperilium together stimulate the root of the plants which makes the relation of substance better with the nutritious substance. Therefore, the main nutritious substance is with the roots, especially for nitrogen. Considering the average comparisons on the same oction of nitroxin and vermi compost it can be seen the highest level of nitrogen in the soil in treatment of 10 Tons of vermi compost is obtained together with nitroxin (fig 5). The amount of nitrogen sometimes especially at the beginning of growth season in biological regime is less than optimum which causes limitation for the nitrogen in plant's growth. Use of vermi compost in addition to increase of soil organic substance, causes increase in the nutritious elements of the soil especially nitrogen. In total, vermi compost manure because of its high percentage of nitrogen and nitroxin manure through increase in the provocation of nitrogen stability in the soil causes increase in the nitrogen reservoir of the soil. Among the most important matters for nutritious production stability, soil fertility maintenance through application of organic manures, soil quality not only by physical and chemical characteristics but also has close relation with

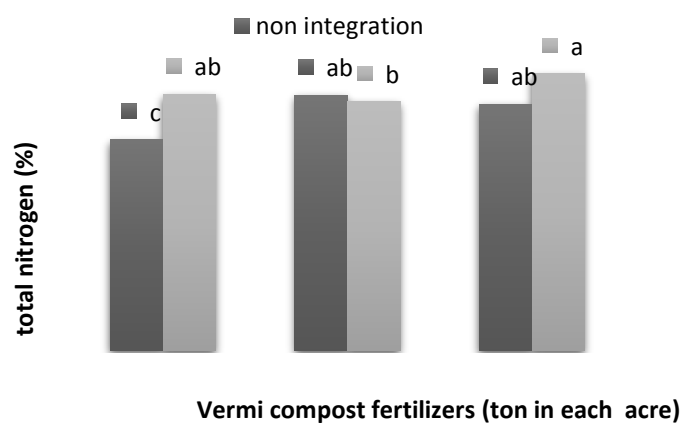
biological characteristics. Use of different sources of manure has considerable effect on the activity and also on the quality of the product. In many of the stable agricultural regimes and especially in biological agriculture vermi compost is used for improvement and fertility of the soil (Mahboob 2013).

On the other hand, seed's functioning has a positive and high integration( $r=45$ ) with the nitrogen of total soil (table 2). Since nitrogen cause stimulation in the growth of root, increase in production of SITOKENINS ( especially ZATIN) in the roots cause delay in the appearance of ABSTIC ACID in the leaves and increase in the ZATIN in relation to ABSTIC ACID and finally this causes increase in the construction of protein, absorption and production of Carbon and transferring it to the seed in the filling stage. Therefore, nitrogen by effecting on the production of nutriment concentrates effects on the leaves surface and maintenance of photo synthesis in the filling stage and increase in the absorption of other substances. Therefore, increase in the nitrogen reservoir of the soil is a rational increase in the amount of nutritious elements in the soil which the integral coefficient is mentioned in table 2. As can be noticed phosphor and potassium elements have a positive and high integration with soil nitrogen. Different studies show that the phosphor and potassium increase with the increase in nitrogen with is coordinating with the results from the test (Latiri et al 2012). Nitrogen in the chemical manure is in the form of mineral, and suitable environmental condition is situated in the process of nitrogen production and most probably transfers to the lowest level of the soil in the form of nitrogen. This reaction takes place more slowly in the treatment of vermi compost manure.

Kocheki et al 2008 reported that an integration of chemical manure and 5 Tons of vermi compost for each acre cause maximum nutritious substance absorption in comparison to application of only 100% of chemical manure or 5 Tons of vermi compost in each acre.



**Figure 4:** Comparison of the effect of Nitroxin for total nitrogen



**Figure 5:** comparing the effect of vermicompost and nitroxin for total nitrogen



**Organic substance:**

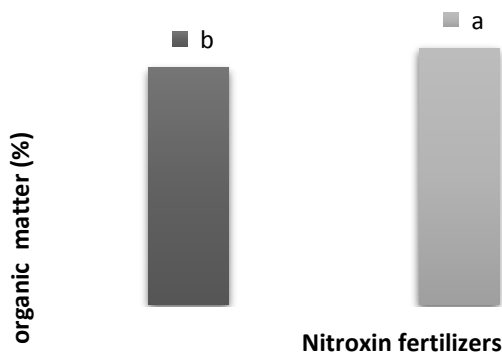
Optimal use and management of organic substance is an important side of stable production in the agricultural systems. Organic substances (organic carbon) is a key element in the soil quality. This element plays an important role in the cycle of nutritious elements, soil construction, and usability of water and soil biological specifications.

According to the results tables from the variance partition (No.1), the effect of nitroxin and vermi compost in the probable level of 5% is meaningful for this condition and none of the bilateral effects are meaningful.

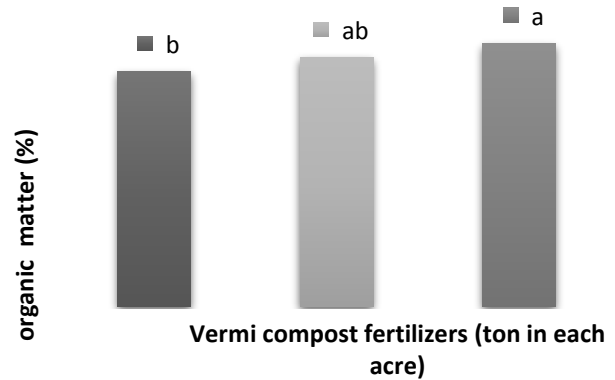
Average comparison shows that without noticing the effects nitrogen and vermi compost nitroxin will increase at the rate of 8.22% in the organic soil (fig 6). Microorganisms available in the nitroxin due to its own functioning cause the ions to stimulate from the surface and the depth of the soil profile. In the other words electrical conduction of the soil will increase with this work. In this stage they exudates chemical substance can take away some of the stable substances from the soil and transfer them in the form of absorbable plant and cause increase in the organic substances in the soil. Kokalis et al 2015 mentioned that soil microorganisms play an important role in the balance and stability of ecosystem and therefore use of biological manure is one of the effective methods in creation of suitable quality of the soil which cause increase in the useful reaction between plant and microorganism in RIZO SEFAR and increases the potentiality for absorption of more nutritious substance.

Increase in the vermi compost cause increase in the amount of organic substance of soil, on the other hand use of 5 Tons of vermi compost in an acre statistically does not have a meaningful differences with 10 Tons of vermi compost or treatment of nonuse of vermi compost (fig 7). Also use of 10 Tons of vermi compost in each acre consist of the most and highest amount of organic substance against the nonuse of vermi compost. Vermi compost improves the physical and mechanical conditions of the soil and causes increase in the absorption and better use of the nutritious substances by the plant. Vermi compost also causes constitution of soil spore and soil stability. Enriched carbon which is available in the earth worms sludge will be saved as one of the sources for production of energy also use of vermi compost in addition to maintainance of qualitative and quantitative needs of plant causes health and living environment for the plant ( Arankon et al 2012)( Beres et al 2014) reported that with the use of organic substances of vermi compost to the soil cause fertility to the soil, changes soil physical specification and absorb more water in the soil. This manure causes correction to the soil construction with absorption of nutritious substances and stops nutritious substances water wash.

There is a meaningful and positive integration ( $r=0.42$ ) between the amount of soil nutritious substances and its functioning (table 2). Positive effect of organic substances on plant production can be called as physical specification and therefore it depends on the capacity of water maintenance in the soil and increase in the availability of nutritious substances and in total increase in the soil fertility.



**Figure 6:** Comparison of the effects of nitroxin for organic matter



**Figure 7:** Comparison of the effects of vermicompost for organic matter

Soil fertility management with the use of organic manures such as biological and vermi compost manure can affect in the advancement and improvement of this aim which is very important. In this regard among the applicable substances are the use of biological manure which contains growth increment bacteria instead of chemical manure which cause nutritious substances for plant and increasing growth in the plant and also causes health to the living environment and soil production (Dey et al 2014).

Treatment	phosphor (1)	Potassum (2)	Total nitrogen (3)	Organig matter (4)	Yield (5)	Bio yield (6)
(2)	/53**	1				
(3)	/83**	/41**	1			
(4)	/91**	/49**	/95**	1		
(5)	/31*	/20 <sup>ns</sup>	/45**	/42**	1	
(6)	/19 <sup>ns</sup>	/21 <sup>ns</sup>	/23 <sup>ns</sup>	/23 <sup>ns</sup>	/57**	1

<sup>ns</sup> \*, \*\*, Non-significantly, respectively, are significant at the five percent level of probability.



**Table 2:** Integration coefficient between analyzed conditions.

Long term studies show that the use of compressed chemical manures cause decrease in the agricultural plants functioning. This decrease due to acidity of the soil, cause decrease in the biological function and special physical decrease in the soil and also non availability of micro elements in the nitrogen, phosphor and potassium manures (Adediran and colleagues 2004). On the other side use of organic manure alone and high amount cannot be useful for stable agricultural productivity. Therefore, integrative maintenance of nutritious substances with the use of chemical and organic manures maintains fertility of the soil and stable productivity while compensating shortage of food substances. Also, vermi compost provides food substances for the plant in a short time and also motivates the microbial function of the soil and protecting the nutritious and organic substances in the long term. And cause increase in the fertilization and production potential of the soil.

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#### Conflict of interest:

All authors declare that there is no conflict of interest in this work.

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