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Study of Biological Phosphate (Biophosphate Fertilizer) Efficiency on Flue_Cured Tobacco Yield and Quality in Comparison with Super Phosphate

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Abstract. We conducted a factorial experiment in Randomized complete block design with 12 treatment and 3 replicates. We had 4 levels of phosphorus fertilizer (p=0, p1=25, p2=50 and p3=75 kg/ha from superphosphate triple source), and three types of bio phosphate: (A) Granulate biological fertilizer 50 kg/ha that was used for transplants under the soil. After transplanting (B) powdery biological fertilizer 100gr/ha that transplant roots were inoculate with it. (C) Powdery biological fertilizer 1 kg/ha that roots were inoculated with it before transplanting; results were as follows .average price of 1 kg tobacco there was significant difference between treatments on 5% level and the best treatment was Ap2. Sugar content in BP3 and phosphorus in CP3 treatments were highest. BP2 treatment had the highest content of Nicotine and the highest percent of Zinc belonged to CP3 treatment. Means of factors were compared by Duncan method and results showed that for Phosphorus content in middle and higher leaves all treatments were in group (a) and in priming only treatment CP3 was in A group other treatments were in next groups. For Nicotine percent lower leaves (priming leaves) of BP2, middle leaves(cutters) of AP0, AP1, CP0, CP1 and CP3 and higher leaves(tips) AP2 treatment was in group(a) and other were in other groups. For sugar content lower leaves of BP3 and middle leaves(Cutters) of all treatments and higher leaves of AP2 treatments were in group one (A). For average price of 1 kg tobacco only AP2 treatment was in group (A). [Table 1]

Keywords: biophosphate fertilizer, flue_cured tobacco, yield and quality, comparison, super phosphate

1. Introduction

Tobacco is one of the most voluble agricultural and industrial crops which is cultivated in more than 100 countries all over the world with different climate and has a major role in the some of economy them [1], A wide spectrum of bacteria was identified in soil Rhizospher in last 2 decades which are able to improve some species growth. Systemically, this wide group is called Rhizobacteria which stimulates plant growth [1]. Although Tobacco is counted as an important industrial plant in the world, it has not been paid much attention by researchers because of its negative aspect in cigarette production. Nevertheless, tobacco has different other usage. For instance, nicotine extraction is carried out from this plant in a large scale and tobacco is also used as a model plant in biotechnology [2], This plant will be able to have more application in production of different materials based on its transgenic parameters [3], Studies have shown that stimulator Rhizobacteria increase absorption of nutrients by plants [4]-[11] .Use of soil-associated micro-organisms to increase the quality of the product and increase agricultural productivity and control plant diseases in the twentieth century were considered and day New Horizons will be opened on the human. The other hand, import volume relatively "high phosphate chemical fertilizer per year of the cause of problems and difficulties attracting elements of effects of soil consumption is low. So find the method that can reduce fertilizer imports irregular and reduce the above problems is essential. The indiscriminate use of phosphate

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fertilizer last exorbitant costs of foreign exchange buying fertilizer from abroad to the effects of loss Technician. Considering the problems mentioned revision of the use of phosphate fertilizer and chemical use of modern methods, such as the use of biological fertilizer is essential [6], [Table 2]. and their availability via biologic fixation of nitrogen as well as decrease of harmful effects of diseases through antagonistic ways [7], The desirable quality of tobacco or its consumable needs to existence of proper equilibrium among chemical, physical and external characteristics of leaf, all factors directly or indirectly are influenced by tobacco nutrition. [8] Nutrition disorders in tobacco are essentially physiological and biochemical phenomena which appear with deficiency or increasing of minerals. Or reciprocal effects among some elements in special environmental conditions and existence of them in fact is a sign of lack of equilibrium in plant metabolic system. As tobacco is sensitive to nutrition, has been studied for this problem more than other crops. Many factors have influenced on disorders in tobacco, including, amount of nutrients using time and form of nutrients, temperature, soil acidity, ways of transfer of nutrients into plant, plant age and situation of stalk [8], [9].

2. Materials and Methods

This experiment was conducted as a factorial randomized complete block design with 12 treatments included four levels of pure phosphorus fertilizer (P = 0, P1 = 25, P2 = 50 and P3 = 75 kg ha from triple super phosphate) and three fertilizer biological phosphate as 1 - Biological fertilizer granule (Bacilus subtilis) (A) (rate 50 kg/ ha, use under plants) 2 - fertilizer biological powder (Pseudomonas) (B)100 g/ ha inoculated to transplants) 3 - fertilizer biological powder (Bacilus subtilis)(C) 1 kg inoculated to transplants) in 3 There are repeated "in the 36 plots, in 30 m ²area (m 6 × m 5) with the cultivation of Cocker 347 variety in tobacco research center in Rasht was executed. Traits evaluated in this study include leaf fresh and dry weight and the average price of one kilogram of priming (harvesting) and finally mixed of the first and second priming (priming leaves), [Fig 1], third and fourth cutter leaves and the Fifth priming of upper Leaves (tips) were allocated in order to, measuring Sugar, Nicotine, Phosphorus and Zinc (Zn) were analyzed and then analyzed by statistical method follow-up by MSATC and Duncan's test was performed. [Fig1], [Fig2], [Fig3], [Fig 4].

3. Results

Table analysis of variance for qualitative and quantitative evaluation, including fresh and dry weight, percent sugar price of one kilogram of tobacco, Nicotine, Phosphorus and Zinc (Zn), according priming (harvesting) separately evaluated (Table 1), mean comparison of treatments have been done by Duncan's method(Table 2). The results of which showed that the BP3, CP3 treatment of sugar and phosphorus in levels of 1% were significant (Fig4 and Fig 2). In matter of Nicotine BP2 treatment and about study Zn treatment CP3 in level of 5% was significant (Fig 3 and Fig 1). In study of Price of a 1 kg of tobacco from fifth priming stages in level of 5% were significant(Table 1). But in study of with the fresh and dry weight there is not significant differences between of treatments. Results showed that the amount of phosphorus in cutters (middle) leaves and tips (top leaves) all of them were in one group (a) (Table 1, Fig 2) and treatment CP3 in priming (lower leaves) also was in the first group (a) and the another treatments were in the next groups in study of Nicotine in priming leaves, (Fig 3), CP1 treatment with 1.54 and in cutters leaves AP3 treatment with 1.62 and CP3 tips (upper Leaves) treatments were minimum amount allocated .In study of sugar of leaf in the priming leaves BP3 treatment with 2.268 and AP2 treatment in upper Leaves (tips) with 2.956 was the higher amount of sugar but in study the price of 1 kg of tobacco treatment AP2 highest price was 7236 rials and in compared to other treatments was highest amount, according to tables [1], [Fig 4]

Table 1: Analysis of variance biological phosphate fertilizer on the concentration of sugar, nicotine, phosphorus, and Zn and price of a kilogram tobacco

	Average of squares											
Resources	D.F	% S.I	% S.II	%S.III	%N.I	%N.II	%N.III	%P.I	%P.II	%P.III	Zn(PPm) III	Rial/Kg
Repeated	2	0.078^{*}	0.145^{ns}	0.052^{ns}	0.007^{ns}	0.003ns	0.01^{ns}	0.001^{ns}	0.003	0.01^{ns}	29.8^{ns}	2049569.1^{*}
Treatment	11	0.073^{**}	0.132^{ns}	0.361^{ns}	0.008^{ns}	0.023^{ns}	0.021^{*}	0.001^{**}	0.001^{ns}	0.01^{ns}	46.3^{*}	1331674.1^{*}
Error	22	0.021	0.297	0.303	0.005	0.013	0.007	0.0001	0.001	0.001	20.13	425249.1^{*}
CV%		%7.23	%23.18	%25.7	%4.39	%6.35	%5.04	%3.57	%5.52	%4.96	%11.1	%12.02

I: Lower Leaves, II :Middle Leaves, III: Higher Leaves, S: Sugar, P: Phosphorous N: Nicotine, Z: Zinc

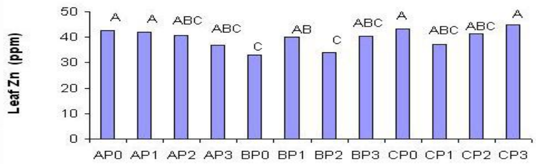

Fig. 1: The average effect of treatments used and Higher Leaves Zinc

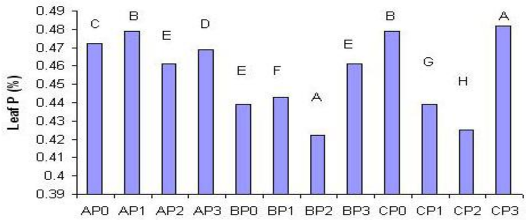

Fig. 2: The average effect of treatments used and Higher Leaves Phosphor

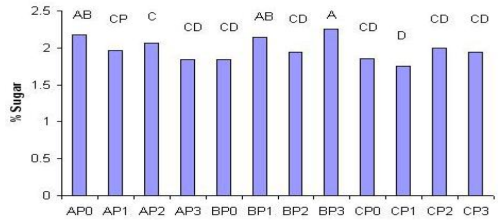

Fig. 3: The average effect of treatments used and Higher Leaves Nicotine

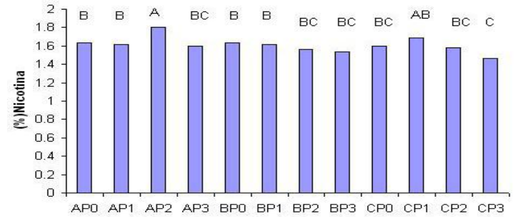

Fig. 4: The average effect of treatments used and Higher Leaves Sugar

Table 2: Mean Comparison treatments in compare biological fertilizer (biological phosphate fertilizer)

T	Zn ppm I	Zn ppm II	Zn ppm III	%S I	%S II	%S III	%N I	%N II	%N III	%P.I	%P.II	%P.III
AP0	43.78A	36.02A	46.37A	2.18AB	2.3A	2.07AB	1.62ABC	1.86A	1.63B	0.472C	0.482A	5057B
AP1	42.07A	42.07A	42.08A	1.96BCP	2.05A	1.91AB	1.62ABC	1.88A	1.62B	0.479B	0.465A	5102B
AP2	40.58ABC	41.05A	42.85AB	2.06BC	2.2A	2.95A	1.61ABC	1.77AB	1.8A	0.461E	0.438A	7236A
AP3	36.9ABC	41.08	29.67B	1.84CD	2.58A	2.28AB	1.59BC	1.62B	1.6BC	0.469D	0.465A	5266B
BP0	32.93C	32.28	46.25A	1.843CD	1.93A	2.28AB	1.68AB	1.82B	1.63B	0.439E	0.465A	4859B
BP1	42.05AB	46.07	43.07AB	2.14AB	2.39A	2.25AB	1.61BC	1.79AB	1.62B	0.443F	0.443A	5677B
BP2	34BC	49.72	43.2AB	1.94BCD	2.61A	2.23AB	1.73A	1.82AB	1.56BC	0.422I	0.465A	5469B
BP3	40.43ABC	43.8	46.92A	2.26A	2.49A	2AB	1.57BC	1.82AB	1.54BC	0.461E	0.461A	5797B
CP0	43.17A	35.923	40.07AB	1.85CD	2.43A	1.79B	1.64BC	1.89A	1.6BC	0.479B	0.461A	4801B
CP1	37.27BC	35.92	38.68AB	1.75D	2.35A	1.75B	1.54C	1.85A	1.69AB	0.739G	0.472A	5449B
CP2	41.4ABC	43.82	45.75A	2ABCD	2.28A	1.79B	1.55BC	1.77AB	1.58BC	0.425H	0.446A	4792B
CP3	44.95A	43.32	47.58A	1.94BCD	2.55A	2.24AB	1.62ABC	1.99A	1.46C	0.428A	0.438A	5580B

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