

ORIGINAL ARTICLE

The effect of Nitrogen and Potassium Fertilizers on the Soil of the plain Zahhab of Kermanshah

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ABSTRACT

Today, due to increased population in the world, pressure on limited land resources in order to increase yield per unit of area has been intensified. In contrast, food security and quality of desirable life for future generations as a major problem have been posed, particularly in developing countries. Farmers, because of the soil productivity and increasing income, use the chemical fertilizers as highly as possible. If the indiscriminate use of chemical fertilizers, they arrive at the underground water and eventually at the human food through agricultural products. Most fertilizers used in the agriculture include fertilizers with nitrogen, phosphorus and potassium that are significant. Including loss of this kind of nitrogen would be Methemoglobinemia disease in children and the incidence of gastric cancer in adults. The major used fertilizers in Iran are potassium chloride and potassium sulfate. Potassium chloride adds the chlorine to the soil and increases soil salinity problem and then because of that, potassium sulphate fertilizer is used. The objectives of this study include the following: A. The evaluation of soil contamination from Zahhab plain with nitrogen and potassium fertilizer. B. The evaluation of effect of fertilizers on soil of Zahhab plain of Kermanshah. 20 soil-sampling stations of Zahhab plain were determined and it was taken in spring and winter, totally 40 samples. The soil nitrogen was investigated by Kjeldahl method and the soli potassium was investigated by ammonium acetate method. The results were analyzed by statistical methods through SPSS software. The minimum and maximum total nitrogen are 0.1 and 0.63 and 0.07 and 1 percent, in the spring and in winter, respectively. The minimum and maximum potassium are of 260 and 780, 205 and 1400 mg per kilo grams, in the spring and in the winter, respectively. According to the data, the nitrogen is in the standard range. In the spring, the soil potassium was 50% higher than standard level and in winter 70% higher than standard.

Key words: chemical fertilizer, nitrate, potassium, plain, Zahhab plain, contamination

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INTRODUCTION

Today, due to increased population, the pressure on limited land resources in order to increase the yield per unit of area has been intensified. In contrast, the food security and quality of desirable life for future generations are posed as a major problem, particularly in developing countries. The nitrate would be considered as main source of supply the energy needed to plant and an increase in production per unit area is dependent on this element. The Nitrogen solubility in water is high. Lack of sufficient information on the factors affecting nitrogen in when decreasing absorption of nitrogen in plant roots and lack of primary information of soil nitrogen in the growing season and the impossibility of predicting weather conditions, the need for increasing per unit area, low irrigation efficiency along with high nitrogen solubility lead the nitrate to leaching strictly beneath of the root zone and out of reach. Although at first glance, these fertilizers to increase productivity and optimize the cultivation, in turn they can make certain contaminants in the environment. For this reason, in the world, the effects of excessive use of chemical fertilizers are studied [1]. The indiscriminate use of chemical fertilizers in agriculture leads to

contamination of water and food consumed by the people, and at last incidence of dangerous complications in the adults, including Methemoglobinemia disease in children and the incidence of gastric cancer in Adults [2]. If the indiscriminate use of chemical fertilizers, they arrive at the underground water and eventually at the human food through agricultural products. Most fertilizers used in the agriculture include fertilizers with nitrogen, phosphorus and potassium that are significant. The indiscriminate use of chemical fertilizers has an impact on the water resources as well as on soil resources and contaminates the soil. The Potassium plays an important role to the plant, mainly include: increasing plant resistance to frost bite, increased concentrations of chlorophyll and the operation of absorption of carbon in the plant. The Potassium deficiency includes poor growth and going yellow or burning of the old leave terminals of the plant, reducing the strength of the plant stem. The Potassium chloride is mainly of the potassium chloride and potassium sulfate. The potassium chlorine has added the chlorine to the soil and increases soil salinity problem and then because of that, the potassium sulphate fertilizer is used [3]. The region of Zahhab plain in Kermanshah province, due to large-scale and successive agricultural operations, was subject to the environmental problem. The farmers from this region like the rest of Iran stress on the mistaken belief that the chemical fertilizers leads to better efficiency of their products and provide the chemical fertilizers at high prices from the free market [4]. A study was conducted to examine the effects of emissions of nitrogen and phosphorus fertilizers on soil and water resources of the lands below Douroudzan dam in Fars province. According to the survey results, the amount of nitrogen existing in the soil was low and due to leaching, high concentrations of nitrogen was observed in water [5]. A research entitled "Evaluating the amount of absorbable potassium in the soil of farmland in the village of Taysheh from Zahhab plain. After sampling and examining the results from measuring, it became clear that the potassium level would be higher than the standard.

MATERIAL AND METHODS

20 soil-sampling stations were determined in Zahhab plain were determined and the specifications of stations were developed by GPS device. It was sampled in two ways of composite and topsoil (0-30 cm), in winter and late spring. More agriculture is to cultivate the wheat in Zahhab plain. The soil samples transported to the laboratory were dried under air, were passed by 2 mm sieve. In this study, the level of electrical conductivity, pH, total nitrogen and amount of potassium in the soil were determined [6-9].

In addition to the elements under study, other physical, chemical properties of the soil will be determined by standard methods [10].

Statistical processing was performed by SPSS software.

RESULT

The minimum and maximum total nitrogen were 0.1 and 0.63 and 0.07 and 1 percent, in spring and in winter, respectively. The minimum and maximum potassium were 260 and 780, 205 and 1400 mg per kilo grams, in the spring and in the winter, respectively.

A. The results of soil analysis: N and K in were studied spring and winter, for each one, 40 samples were taken.

The level of nitrogen in spring	The level of nitrogen in winter	The level of nitrogen in spring	The level of nitrogen in winter
0.30	0.1	260	0.1
0.17	0.34	280	0.34
0.18	1	290	1
0.3	0.6	620	0.6
0.176	1	580	1
0.208	0.07	280	0.07
0.184	0.15	480	0.15
0.16	0.14	340	0.14
0.63	0.12	320	0.12
0.52	0.16	620	0.16
0.12	0.17	420	0.17
0.18	0.12	780	0.12
0.17	0.35	339	0.35
0.12	0.37	322	0.37
0.1	0.19	341	0.19
0.21	0.17	360	0.17
0.35	0.16	342.5	0.16
0.21	0.22	420	0.22
0.18	0.22	411	0.22
0.13	0.21	380	0.21

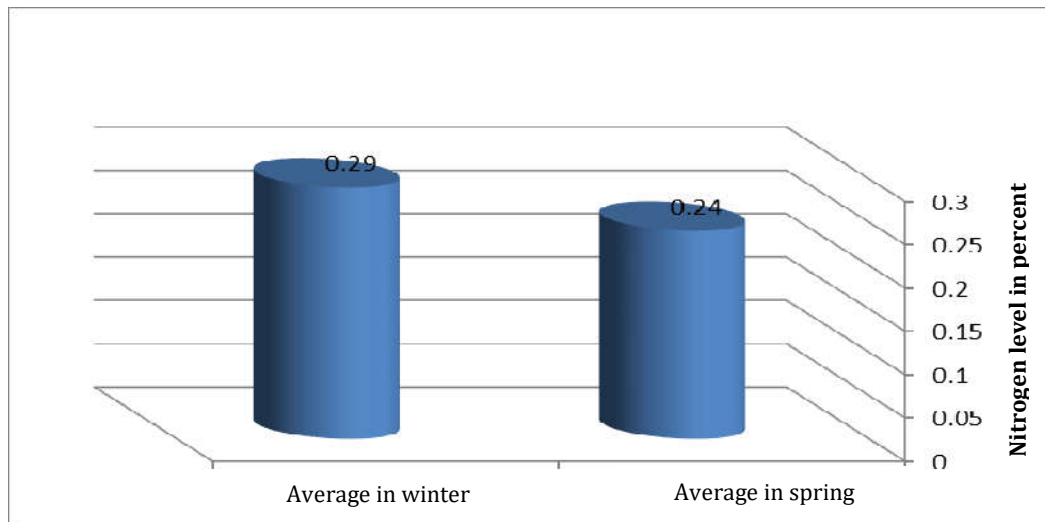


Fig 1: Average Nitrogen fertilizers in both seasons

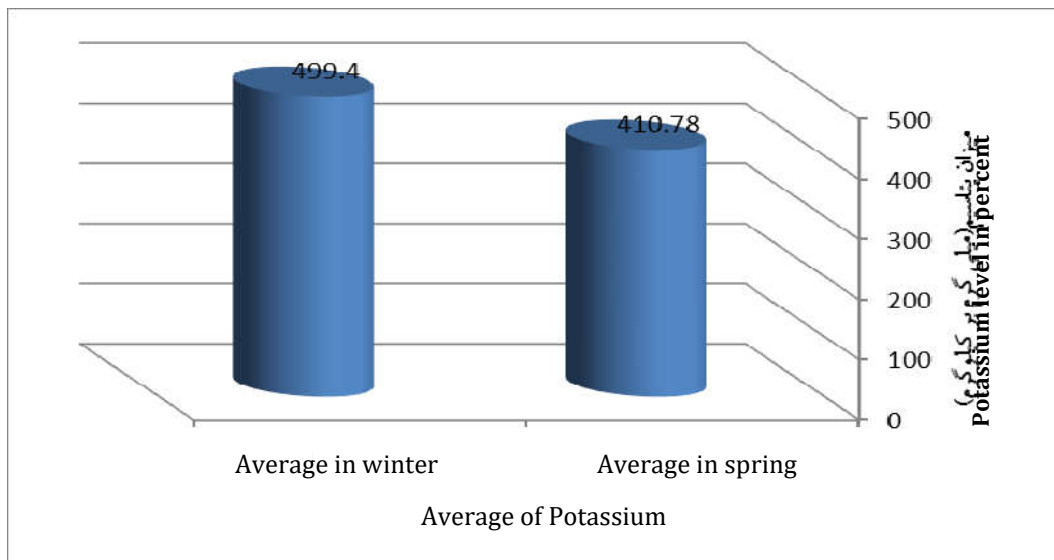


Fig 2: Average Potassium fertilizers in both seasons

B. Soil analysis by SPSS software

1. The required standard value of the nitrogen fertilizer for the plant $\leq 2\%$

$$H_0: \mu > 2$$

$$H_1: \mu \leq 2$$

Type of fertilizer	Mean value of sample	t-statistics value	Degree freedom	Significance level
Nitrogen	0.23	-59.41	19	0.00

T-test value for nitrogen fertilizers in spring

Type of fertilizer	Mean value of sample in percent	t-statistics value	Degree freedom	Significance level
Nitrogen	0.29	-28.33	19	0.00

T-test value for nitrogen fertilizers in winter

1. The required standard value of the potassium fertilizer for the plant ≤ 350

$$H_0: \mu > 350$$

$$H_1: \mu \leq 350$$

Type of fertilizer	Mean value of sample	t-statistics value	Degree freedom	Significance level
Potassium	410.77	1.95	19	0.96

T-test value for potassium fertilizers in spring

Type of fertilizer	Mean value of sample	t-statistics value	Degree freedom	Significance level
Potassium	499.4	2.38	19	0.98

T-test value for potassium fertilizer in winter

DISCUSSION

Based on the statistics table in winter and spring, according to the values obtained in the table above and the significance level, H_0 is rejected at 95% confidence level, meaning that with respect to values obtained, the average of the samples is lower than standard. According to results, the amount of nitrogen is at the standard level that the nitrogen level is at the standard level and we cannot conclude that whether this level contaminates the soil or not, because it indicates the total soil nitrogen but not usable forms, but in effect of changes in and transformations of nitrogen into the usable forms, the potential necessary is provided for leaching and contamination of soil and groundwater [11]. In this research, he analyzed the amount of total nitrogen and the average total nitrogen varied between 0.073 and 0.177%. If using too much nitrogen fertilizer in agricultural operations, the added nitrates arrive at the water. It was found that this water consumption by the people can produce different complications, including nitrates conversion within the body into compounds are carcinogenic. Therefore, the indiscriminate use of chemical fertilizers in agriculture sector can cause stomach cancer. If there are high levels of nitrates in food and drinking water, a part of them is converted to the nitrite carcinogens by bacteria in the stomach [12, 13]. 0.5 to 2% of total nitrogen is known to be useful for plant uptake, but higher levels, harmful.

Based on the statistical table on the regions with potassium in winter and spring, according to the values in the table above and the significance level, H_0 is not rejected at 95% confidence level, meaning that the amount of potassium in the sample was higher than standard in the spring. The major fertilizers are potassium chloride potassium sulfate in Iran. Potassium chloride adds the chlorine to the soil and increases the soil salinity problem, so because of that, potassium sulphate fertilizer is used. The minimum and maximum total nitrogen were 0.1 and 0.63 and 0.07 and 1 percent in the spring in winter, respectively, they are lower than standard level. The minimum and maximum potassium were 260 and 780 205 and 1400 mg per kilo grams, in the spring and in the winter, respectively. In the spring, the soil potassium was 50% higher than standard level and in winter 70% higher than [14]. Continuing the trend of consumption in addition to soil salinity leads to lack of soil fertility as well as the transmission of fertilizers to the soil and water and to the food chain, too, human health will be endangered.

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