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ORIGINAL ARTICLE

Study the Effects on Amounts of Nitrogen Fertilizer and PGPR Agronomic traits and Yield and Essential Percentage Herbs Dill (*Anethum graveolens* L.) in Iran

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ABSTRACT
To investigate the effects of nitrogen fertilizer and PGPR on agronomic characteristics and grain yield and essential percentage of medicinal plants dill experiment in 2012, as a split plot randomized complete block design with three replications. Treatments used include fertilizer nitrogen from urea as the main factor with four levels (zero, 50, 100 and 150 kg ha) and the use of PGPR (Azotobacter and Azospirillum) as subplots with four levels (not eating bacteria, the bacteria use as seed money, the water consumption for irrigation Bzrmal +). Dill was harvested at full maturity. The results showed that the average grain yield belonged 1625.83 kg / ha and 1461.23 kg / ha in order to simplify the effects of nitrogen fertilizer level of 150 kg per ha and using the method of irrigation with inoculated PGPR. The highest rate of plant height, biological yield, harvest index, and oil yield was obtained at the same level of nitrogen fertilizer, chemical and biological. Interaction was significant for all traits. Results represent mean values of seed yield and essential percentage of respectively 1939.00 kg / ha with 31.91 kg / ha and a yield of 150 kg ha fertilizer application of PGPR inoculation with the seed method, along with water (N150 × B3), respectively. This result was also true of the other characters.

Key Words: *Dill, nitrogen fertilizer, PGPR, grain yield, essential percentage.*

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INTRODUCTION

Dill scientific name (*Graveolens Anethum L.*) and annual herbaceous plant which has various uses in the food and pharmaceutical industries .One needs to plan crops in order to achieve high performance and quality evaluation of medicinal plants, especially in the case of power plant systems. By avoiding the use of unnecessary and excessive intake of nutrients can reduce production costs to a minimum this is the path to sustainable agriculture [1].

Increased nitrogen causes increased vegetative yield and essential oil production in different climatic conditions. In a study that examined the effects of water stress treatments and nitrogen fertilizer levels on wet and essential percentage of oregano, it was found that the treatment was effective in 80% of the water available in the soil and 2/1 grams of nitrogen per pot, grass and percent increase in the essential percentage of sector [2].

Nowadays use of organic fertilizers and sustainable agriculture are the biological basis with the aim of eliminating or significantly reducing the use of chemical inputs, an optimal solution to overcome the environmental problems and improve the health of crops. The types of organic fertilizers and biological control can be pointed to manure and soil-living bacteria of the genus *Azotobacter* and *Azospirillum* stabilizer consists of two free-living nitrogen, through improved organic matter and soil biological activity and nutrient supply to the plant is cause increase yields, especially medicinal plants [3].

Bio-fertilizers are now considered as an alternative option for chemical fertilizers to enhance soil fertility for sustainable agricultural production [4].

The Objective of this study examines the effects on Amounts of Nitrogen Fertilizer and PGPR Agronomic traits and Yield and Essential Percentage Herbs Dill (*Anethum graveolens* L.) in Iran.

MATERIALS AND METHODS

In order to evaluate the effects of biological and chemical nitrogenous fertilizers on some agronomic characteristics, dill the yield and quality of medicinal plants in the area Rey, an experiment was conducted in 2012 as a split plot in a randomized complete block design with three replications. Factors were considered in nitrogen (N) as the main factor (urea) at four levels: zero (N0), 50 (N50), 100 (N100) and 150 (N150) kg ha and PGPR (B) Azotobacter with Azesperium as subplots with four levels: non-eating bacteria (B0), consumption of seed inoculation with bacteria (B1), the bacteria consumed through irrigation water (B2), the use of bacteria inoculated with the seed + irrigation water (B3). Each plot was considered to consist of six lines were planted at a distance cm25. The first line, last line, as margins and cm50 beginning and end of the lines between the margins of compliance with the above sampling procedure. This plant was planted in April 2012. It is worth mentioning that no fertilizer was applied before planting in the ground. Was applied at planting time and seed treatment, seed inoculation with bacteria for 30 min and then soaked in the bacterial inoculum was grown. In order to use 5 liters of water in ha. The amount of seed required is calculated based on the total weight of 1000 grains per unit area. Planting depth was considered to be about 1.5 cm. After the crop was irrigated immediately then each 8-6 days interval was acting than irrigating farms. In order to measure traits such as plant height and number of umbels and umbels in plant, 10 plants were randomly harvested from each plot. In addition to measuring grain yield, biological yield and harvest index (HI) after considering the marginal effects, an area of 2 square meters and the first floor of the plant fresh weight, after drying the sample dry weight (biological yield) is calculated by dividing grain yield, biological yield and harvest index. Essential percentage of for the measurement of 10 samples randomly selected from each plot and transported to the laboratory, after drying under essential percentage of were collected from a sample of 100 g of dry distillation using Clevenger apparatus. For statistical analysis was used program Minitab, SAS, and Excel.
HI= Economic yield / biological yield *100

RESULTS AND DISCUSSION

Agronomic traits and grain yield

The results of variance analysis showed that the effect of nitrogen fertilizer and PGPR interaction of these two factors were significant at the 5% and 1%, except in the case of an umbrella and a shed at the plant were not significant simple effect of nitrogen fertilizer on biological and chemical fertilizer (Table 1).
Interaction between two factors that increase the plant height with increased use of fertilizer and PGPR inoculation method coupled with seeds and irrigation water was obtained (Table 3).
According to the results obtained, whether through PGPR inoculation and irrigation water through irrigation water and inoculated with the same effect as increasing the number of umbel and seeds per umbel and while the use of chemical fertilizers resulted in no significant difference between treatments (Table 2).
The interaction between the two factors were obtained represents an increase in yield due to inoculation increased the amount of nitrogen fertilizer and seed inoculation with PGPR irrigation method.

Harvest index

Increase soil nitrogen additional fruit and higher essence percentage in the plant. Harvest index variance analysis indicated significant simple effect of fertilizer and PGPR in 1% (Table 1).
PGPR using irrigation water with inoculation of seeds method (B3) had a significant effect on harvest index, while there was no significant difference between the other treatments (Table 2).

Yield Grain and essential percentage

According to the results obtained in this project can be seen that essence oil yield of Grain contrast between the different levels of nitrogen fertilizer (Table 1).
Treatment B3 (irrigation water + inoculation with seed) and treated most of B0 (non-biological fertilizer) has the lowest essential oil yield (Table 2).
The comparison of the effect of PGPR on yield and essential content shows use Biological fertilizer change has created significant increase in these parameters (Table 3).

Table 1 - Statistical analysis of the effect of nitrogen fertilizer and PGPR on agronomic traits, yield and essential percentage in herbs dill harvest

S.O.V	DF	Plant height	Umbels per plant	Umbellate per plant	Biological yield	Grain yield	Harvest index	essential	essential yield
Repetition	2	251.10	15.00	31.60	80933.33	12039.58	0.32	0.03	2.86
Fertilizer nitrogen (N)	3	17.19*	8.59 ns	5.35 ns	4909155.56*	13000.32**	300.54**	0.17ns	276.04**
Error (a)	6	71.80	13.40	43.00	2275422.22	20956.25	11.48	0.08	23.15
Biological fertilizer (B)	3	86.19ns	32.39 **	101.68 **	643555.56*	643828.5**	220.44**	0.21*	280.74**
Interaction N × B	9	25.78 *	3.42 *	8.04 *	1861333.33*	48028.1**	27.41**	0.20*	47.71**
Error (B)	24	36.90	3.00	12.10	16774888.89	13403.47	7.21	0.08	8.3
% CV		16.40	23.46	13.87	21.59	10.01	13.37	18.04	16.34

Ns, * and **: respectively non-significant and significant 5% and 1%.

Table 2 - Comparison of the average simple effect of nitrogen fertilizer and PGPR on agronomic traits, yield and essential oil content in herbs dill harvest

Treatment	Plant height (cm)	Umbels per plant	Umbellate per plant	Biological yield (kg / ha)	Grain yield (kg / ha)	Harvest index (%)	The essential oil (%)	Essential yield (kg / ha)
Levels of fertilizer nitrogen (N)	-	-	-	-	-	-	-	-
No use nitrogen N0	92.83b	6.33a	24.33a	5206.70b	866.58 c	16.64b	1.39a	13.73b
50 kg N50	93.33b	7.08a	24.79a	5993.30a	1019.08b	17.00b	1.48a	15.53b
100 kg N100	94.83b	7.63a	25.33a	6000.00a	1114.08b	18.57b	1.60a	16.83b
150 kg N150	98.75a	8.33a	25.87a	6773.30a	1625.83a	24.00a	1.65a	24.61a
Different methods Use PGPR (B)	-	-	-	-	-	-	-	-
not use B0	93.25a	5.42b	22.33b	5840.00b	903.00c	15.46c	1.39b	12.51c
Seed with inoculation B1	95.00a	6.58b	22.96b	5853.30b	1095.75 b	18.72b	1.45ba	15.94b
irrigation B2	95.50a	8.37a	26.67a	5946.70ab	1165.50b	19.60b	1.63a	18.22b
Seed inoculation with + irrigation B3	96.00a	9.00a	27.38a	6333.30a	1461.33a	23.07a	1.65a	24.02a

Similar letters in each column indicate no significant difference at the 5% level.

Table 3 - Comparison of the average interaction between of nitrogen fertilizer and PGPR on agronomic traits, yield and essential oil content in herbs dill harvest

Treatment	Plant height (cm)	Umbels per plant	Umbellate per plant	Biological yield (kg / ha)	Grain yield (kg / ha)	Harvest index (%)	The essential oil (%)	Essential yield (kg / ha)
N0×B0	88.67d	3.67d	20.367c	4826.00c	743.00f	15.40c	1.03c	9.72d
N0×B1	89.33c	4.67cd	21.50bc	4826.00c	746.70f	15.47c	1.04c	11.08cd
N0×B2	92.00c	5.67cd	22.50bc	5120.00c	816.70e	15.95c	1.30bc	12.72cd
N0×B3	92.00c	6.00c	22.50bc	5146.00c	846.70e	16.45c	1.33bc	12.95cd
N50×B0	93.00b	6.33c	22.67bc	5573.00bc	863.30e	15.49c	1.45b	13.09cd
N50×B1	93.33b	6.67c	23.00b	5600.00bc	883.30e	15.77c	1.50b	13.5cd
N50×B2	93.67b	7.00ab	23.67b	5626.00bc	909.70ef	16.17c	1.50b	14.52cd
N50×B3	94.67b	7.00ab	24.67b	5706.00b	1020.00ef	17.88c	1.50b	14.54cd
N100×B0	95.67b	7.33ab	26.00ab	5733.00b	1056.00d	18.42c	1.61ab	15.10cd
N100×B1	95.67b	7.67ab	26.33ab	5920.00b	1239.00c	20.93bc	1.64ab	15.68c
N100×B2	97.00a	8.50ab	26.50ab	6426.00ab	1263.00c	19.65bc	1.69ab	15.81c
N100×B3	97.33a	8.67ab	26.67ab	6666.00ab	1420.00c	21.30bc	1.69ab	24.01b
N150×B0	98.33a	9.00a	27.50ab	7013.00a	1430.00c	20.39bc	1.71ab	24.06b
N150×B1	99.00a	9.33a	27.50ab	7200.00a	1653.00b	22.96b	1.73ab	24.34b
N150×B2	99.00a	9.67ab	27.67ab	7226.00a	1672.00b	23.14b	1.80ab	29.57a
N150×B3	100.30a	10.33a	32.00a	7280.00a	1939.00a	26.63a	1.95a	31.91a

Similar letters in each column indicate no significant difference at the 5% level.

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