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The effect of three biological nitrogen fertilizers on yield and yield components of two rapeseed cultivars

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ABSTRACT

This study was performed to examine the effect of nitrogen commercial bio fertilizer on yield and yield components of two cultivars of rapeseed bio as factorial experiment in Firoozabad city, Fars Provience, Iran. Firs factor included cultivars (Julius and Jerry) and secod factor was fertilizer (control, Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer). Measured traits included the number of pods per plant, seeds per pod, seed weight, seed yield, biological yield and harvest index. According to the results, it was founded that there is a significant difference between two varieties, Julius cultivar showed highest seed yield (923 gr/m^2) and 827 gr/m^2 was obtained by Jerry. In relation to fertilizer treatments, it was founded that Nitroxin had higest effect on studied characteristic and this treatment showed 1044 gr/m^2 seed yield, hence, the using of this fertilizer is recommended to weather conditions of firouzabad city.

Introduction

Canola (*Brassica juncea L.*) belongs to *Cruciferae* family and genus *Brassica* (Rafiei et al., 2011). It is introduced as an oily herb (38 to 40% oil content) which is appropriate for zones with short seasons and less rainfall (Burton et al., 1999). Nitrogen increases yield by influencing different growth parameters and by producing more vigorous growth and development as reflected via increasing plant height, number of flowering branches, total plant weight, leaf area index and number and weight of siliquae and seeds per plant (Alien and Morgan, 1972). Nitrogen is one of the most important nutrient elements for crop growth and protein synthesis, cell size, protoplasm, and photosynthetic activity, when compared to cereals; canola is classified as nutrient exhaustive crop (Rathke *et al.*, 2005). Nitrogen plays essential role in its healthy growth and is one of the main precursors of protein which absorbs in the form of mineral, ammonium or nitrate by canola plant (Hopkins & Hunter, 2004). Jackson (2000) found that canola yield and nutrient uptake are highly dependent on nitrogen fertility and high grain yields occur with 120 to 180 kg N/ha. Canola yield and yield components, the number of pods and flowers per plant, the total plant weight and harvest index in some varieties of canola have been found to improve with higher rates of nitrogen (Malhi *et al.*, 2007). Agrochemical fertilizers have been inflicting adverse effect on the environment causing pollution and damaging beneficial soil flora and fauna, causing erosion and no longer able to sustain the productivity. Therefore, in order to make agriculture sustainable,biofertilizer and organic fertilizerhave important role to play in improving nutrient supplies and thus yield. Biofertilizers are ecofriendly, cost effective and renewable source of plant nutrients. They can play a vital role in maintaining soil fertility and sustainability the long term use of Biofertilizer is economical, ecofriendly, more efficient, productive and accessible to marginal and small farmers over chemical fertilizers. The role and importance of Bio fertilizers in sustainable crop production has been reviewed by several authors (Katya let al., 1994; Wane and Lee, 1995). The aim of this study was the effect of three biological nitrogen fertilizers on yield and yield components of two rapeseed cultivars.

Material and Methods

The experiment was conducted in the city of Firozabad at an altitude of 1330 meters above sea level. Average annual precipitation is 400 mm in this city, which in recent years have fallen 270 mm. At first of experiment, soil was analyzed and Table 1 shows soil feature of experiment. Firs factor included cultivars (Julius and Jerry) and secod factor was fertilizer (control, Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer). Measured traits included the number of pods per plant, seeds per pod, seed weight, seed yield, biological yield and harvest index. SAS and Minitab software were performed to analysis of data and EXCEL was used for diagramming. The means were compared with Duncan test at 5% level.

Table 1. Soil Feature of Experiment.

Feature	0-30cm depth	Feature	0-30 cm depth
Clay%	24	SP	55
Silt%	54	EC(ds/m)	1.62
Sand%	22	pH	8.37
Fe	3.1	O.C%	1.46
Zn	0.54	N total	0.126
Cu	1.2	P(p.p.m)	2.5
Mn	3.3	K(p.p.m)	262
B	0.36	Soil texure	S.L

Result and discussion

Number of pods: According to analysis of variance, it was founded that effect of cultivars and fertilizer were significant at 5 and 1% statistical level, respectively, also interaction between cultivars and fertilizer had significant effects on number of pods at 5% statistical level. Between cultivars, Julius showed highest number of pods (118.5). Application of fertilized led to increasing of number of pods and Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer

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showed 5, 11 and 14% increasing in compare to control. In relation to treatments interaction, it was detected that application of Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer for Jerry cultivar led to 5, 8 and 13% increasing in compare to control also, application of these cultivars for Jelius led to 5, 13 1nd 15 % increasing of number of pods in compare to control, respectively.

Seeds per pod

According to analysis of variance, it was founded that effect of cultivars and fertilizer were significant at 5 and 1% statistical level, respectively, also interaction between cultivars and fertilizer had significant effects on seeds per pod at 5% statistical level. Between cultivars, Julius showed highest seeds per pod (23 seeds). Application of fertilized led to increasing of number of pods and Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer showed 27, 27 and 35% increasing in compare to control. In relation to treatments interaction, it was detected that application of Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer for Jerry cultivar led to 15, 21 and 31% increasing in compare to control also, application of these cultivars for Jelius led to 37, 33 1nd 38 % increasing of seeds per pod in compare to control, respectively.

Seed weight

According to analysis of variance, it was founded that effect of cultivars and fertilizer were significant at 5 and 1% statistical level, respectively, also interaction between cultivars and fertilizer had significant effects seed weight at 5% statistical level. Between cultivars, Julius showed highest seed weight (4.47 g). Application of fertilized led to increasing of number of pods and Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer showed 5, 7 and 8% increasing in compare to control. In relation to treatments interaction, it was detected that application of Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer for Jerry cultivar led to 7, 7 and 12% increasing in compare to control also, application of these cultivars for Jelius led to 5, 7 1nd 5% increasing of seed weight in compare to control, respectively.

Seed yield

According to analysis of variance, it was founded that effect of cultivars and fertilizer were significant at 1% statistical level, respectively, also interaction between cultivars and fertilizer had significant effects on seed yield at 5% statistical level. Between cultivars, Julius showed highest seed yield (923.2g). Application of fertilized led to increasing of number of pods and Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer showed 42, 51 and 67% increasing in compare to control. In relation to treatments interaction, it was detected that application of Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer for Jerry cultivar led to 31, 41 and 67% increasing in compare to control also, application of these cultivars for Jelius led to 53, 62 1nd 68 % increasing of seed yield in compare to control, respectively.

Biological yield

According to analysis of variance, it was founded that effect of cultivars and fertilizer were significant at 1% statistical level, respectively, also interaction between cultivars and fertilizer had significant effects on biological yield at 5% statistical level. Between cultivars, Julius showed highest biological yield (2875 g/m^2). Application of fertilized led to increasing of number of pods and Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer showed 29, 34 and 46% increasing in compare to control. In relation to treatments interaction, it was detected that application of Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer for Jerry cultivar led to 19, 25 and 46% increasing in compare to control also, application of these cultivars for Jelius led to 39, 42 1nd 47 % increasing of biological yield in compare to control, respectively.

Harvest index

According to analysis of variance, it was founded that effect of cultivars and fertilizer were significant at 5% statistical level, respectively, also interaction between cultivars and fertilizer had significant effects on harvest index at 5% statistical level. Between cultivars, Julius showed highest harvest index (31.8%).

Generally, Application of fertilized led to increasing of number of pods and Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer showed 1.09, 1.13 and 1.14 fold increasing in compare to control. These results are in conformity with that obtained by Shaharoona et al., 2006, who reported that the Biofertilizers significantly affect growth characters. Addition of organic fertilizer to Biofertilizer has enhanced growth in potato (Awad, 2002); rice (Naseer and Bali, 2007); Brassica (Datta et al., 2009); and in pea (El-Desuki et al, 2010) as also observed in wheat in the present

Table1. Analysis of variation for studied characteristics.

	d.f	number of pods	seeds per pod	seed weight	seed yield	biological yield	harvest index
Block	2	256.0	50.4*	17.9	1127.0	423.0*	48.5
Cultivar	1	611.4*	87.4*	54.9*	8414.7**	1049.3**	75.1*
Fertilezer	3	443.3**	67.3**	67.4**	5033.8**	802.3**	58.9*
Cultivar*Fertilezer	3	389.8*	46.1*	37.4*	3155.5*	400.0*	53.6*
Error	14	76.4	11.2	8.3	751.3	109.3	15.2

Table2. Mean comparisons of characteristics in response to treatments and treatment interaction.

		number of pods per plant		seeds per pod		seed weight (g)		seed yield(g/m^2)		biological yield (g/m^2)		harvest index%	
Varieties	Jerry	112	b	22.2	b	4.3	b	827.7	b	2666.4	b	30.8	b
	Julius	118	a	23	a	4.4	a	923.2	a	2875.1	a	31.8	a
Fertilizer	control	107	d	18.5	c	4.2	c	623.1	d	2170.6	d	28.7	c
	Bio-farm nitrogen	113	c	23.5	b	4.4	b	888.0	c	2811.1	c	31.5	b
	Nittrokara bio-fertilizer	119	b	23.5	b	4.5	ab	945.9	b	2911.4	b	32.4	a
	Nitroxin bio-fertilizer	122	a	25	a	4.5	a	1044.7	a	3189.9	a	32.7	a
Jerry	control	105	e	19	d	4.1	d	613.4	f	2167.7	e	28.3	e
	Bio-farm nitrogen	111	d	22	c	4.4	bc	805.8	d	2599.5	d	31	cd
	Nittrokara bio-fertilizer	114	c	23	bc	4.4	bc	865.2	c	2720.9	c	31.8	bc
	Nitroxin bio-fertilizer	119	b	25	a	4.6	a	1026.3	a	3177.6	ab	32.3	bc
Julius	control	109	d	18	d	4.3	c	632.7	e	2173.6	e	29.1	de
	Bio-farm nitrogen	115	c	25	a	4.5	ab	970.3	b	3022.7	b	32.1	bc
	Nittrokara bio-fertilizer	124	a	24	ab	4.6	a	1026.7	a	3101.8	b	33.1	a
	Nitroxin bio-fertilizer	126	a	25	a	4.5	ab	1063.1	a	3202.1	a	33.2	a

study. In relation to treatments interaction, it was detected that application of Bio-farm nitrogen, Nittrokara bio-fertilizer and Nitroxin bio-fertilizer for Jerry cultivar led to 1.09, 1.12 and 1.14 fold increasing in compare to control also, application of these cultivars for Jelius led to 1.10, 1.13 1nd 1.14 fold increasing of harvest index in compare to control, respectively.

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