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Response Black Cumin Plant *(Nigelta Sativa L.)* for Boron Spraying and Sowing Dates

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Abstract

This study was conducted in Al-Hirah district of Al-Najaf Al-Ashraf city. The experiment was carried on silty clay soil for two agricultural seasons (2015/2016) to evaluate the impacts of planting date and spraying of boron compound on growth, yield of seeds, and concentration of volatile oil in seeds of the black bean plant (*Nigelta sativa* L.). Randomized Complete Block Design (RCBD) was used for the two factors with three replicates. The factors included planting date (15/10/2015, 1/11/2015, and 15/11/2015) between boron compound concentrations (0, 10, 20, and 30 mg/l). The plants were cultivated in three lines in each plot with 75 cm space among lines and 30 cm among plants. The data were analyzed statistically by using Least Significant Difference (LSD) with 0.05 probability level.

The results indicated that planting date and boron spraying of compound had significant effect on the vegetative properties of black bean plant (Nigelta sativa L.). Planting date of (15/10/2017) and boron compound concentrations (30 mg/l) were highly affected on plant height, branches, number of capsules, weight of one thousand seeds, and plant dry weight. On the other hand, the interaction between planting date and boron praying had no effect on the branches, number of capsules and the weight of one thousand seeds. In addition, the results showed the planting date and boron spraying and their interactions had significant effect on voletile oil in seeds especially planting date of 15/10/2017 and the boron compound concentrations 30 mg/l which gave high percent of volatile oil.

Introduction

Black cumin is a member of the Rananculaceae plant family and considered to be an important medicinal plant used in treatment of many diseases including rheumatism, diabetes and inflammatory diseases, as well as improvement of liver and kidney functions, aging and increased immune activity (Bashnady 1996 and Houghton *et al*.1995). Black bean was commonly used in the Islamic era, as mentioned by the Prophet Muhammad (PBUH). He said: "You have this black grain, and it is a cure for all the disease except for boredom**(** Hamza ,1999), Both (Bashandy 1996 and Al-Hader et al.1993) Found that black cumin used in poultry feed has led to a decrease in the number of cancer cells, As well as reach (El-Ghamry 1998), 1996), (Khodary et al.1996)suggest on increase the production of eggs and fertilization of rooster and increased the proportion of eggs fertilized and mentioned that the black cumin has resistant effect against poultry and sheep diseasesBlack cumin also became on important factor in the areas where cosmetic uses oil extracted from the seeds to treat acne and facial glasses and hair loss (Al-Dajwi 1996). Date of planting suitable for each crop varies according to the environmental conditions in which plant grows. It depends on the climatic conditions necessary to raise the production efficiency of the plant (Samurai,2001 and Abu Zeid, 1996). Dates of planting significantly affected the quantity of seeds and volatile oil. The early planting of the black cumin crop was better than the delayed cultivation, where delayed cultivation discouraged vegetative growth, led to a lack of production and the formation of fruits and this reduced quotient significantly and indicated(Al-Nadawi, 2006 and Samurai 2003) that the number of days required for flowering are few in appointments delayed compared by early as falling flowers significantly affects the number of cans per plant and the number of seeds in the box and holds the seed and the weight of a thousand seed .

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A study conducted on and dill plants found that delayed cultivation led to inhibition of vegetative and floral growth due to the exposure of plants to high temperatures during flowering period and holding of fruits, dry fruits and their fall and the breakdown of seeds by a large percentage up to 50% . It also was noted by Esfandiari et al. 2009 that the date of black cumin cultivation had a significant effect on the ratio of volatile oil , weight of 1000 seeds , number of seeds per plant canopy and the height of plant where the early date led to a significant increase (Aptin *et.al*. 2010). Seed production in many plants Such as the sunflower and sweet bean is the date of inappropriate cultivation (Barros and others 2004). In addition, fertilization with micronutrients gain an effect on the quantity and quality of fruits among the micro-food age. Boron plays a large role in the growth of black seed plants and output of the production through its effect on the process of photosynthesis (facilitates the movement and transmission of photosynthesis products from leaves to active areas in plant) and activates the movement of sugars and water into plant and thus contribute to increase the contract of fruits (Muhammad 1994) and may be a component of boron toxic effect if added high concentrations. (Jabouri,2007**)** The quantity and quality of seeds and the volatile oil content in sweet bean plants were significantly affected by the competition of plants on nutrients. Spraying plants with boron element led to an increase in seed production and the volatile oil, Extracted oil from the black cumin is of importance industrially and medicinall, the oil contains Nigellone containing (2 - 5%) of volatile oil which is considered the main compound while, the second compound is Thymohydroquinone with about 0.5% of the volatile oil (Qutb, 1981 and Al-Dajwi, 1996).

The aim of this study is to clarify the importance planting date and boron spraying and their effect on growth and yield of seeds and their content of volatile oils.

Materials and conducted

This study was conducted in agricultural land in Al-Hira / Najaf area for autumn seasons of 2015 and 2016. To study the effect of date of planting and boron spraying on some traits of vegetative growth and volatile oil. Soil samples were collected from different places of the field randomly at a depth of 30 cm before planting. The results of the analysis were shown in Table (1). The field was tilled twice for fine soil mixture and the fertilizer of 0-27-18 was added to the soil before sowing according to the recommended amount (Abu Zaid,1986). seeds were obtained from A.D. Ibrahim al-Jubouri, Head of the Department of Pharmacology at the Faculty of Pharmacy, Mustansiriya University. Seeds were sown in holes 30 cm apart, each hole contains 3-4 seeds covered with thin layer of soil because of the small size of seeds. of the national herb were classified as the seeds of the local black bean. The distance was 30 cm between the plants and 3-4 pits seeds germination are 30-40 days after sowing Plants were thinned at the height of 15 cm. plants were irrigated weeds were removed continuously for better and clean crop seeds. When plants reached 75% of flowering (Jabouri ,2007) data were collected and growth and yield parameters were recorded for three planting dates, the first from 12/5…19/5, the second date 22/5 …6/6 and the third date 6/6 …9/6, respectively.

Studied traits :

1 - Plant height (cm): Plant height was measured from the surface of soil to the highest point in the main branch and the calculation was done of ten plants randomly selected from the experimental unit.
2 - Number of branches: represented by the mean of ten plants.
3 - Number of follicles / plant: - Count the number of follicles in mean was calculated the ten plants for each plant
4 - Weight of a thousand seeds.
5 – Plant dry weight (g): plants were dried in the electric oven at 80 m for 48 hours according to the method used by (1995 Zhang and Krikham).

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6. The percentage of volatile oil (%):Volatile oil was extracted for each treatment by the method of distillation described in The Constitution of Egyptian Medicine. (1984). The Clevenger device was used to extract volatile oil using 100 g of seeds, then placed in a flask with 250 ml of water and put the beaker on a thermal source. The extraction process lasted 6 hours for each sample to obtain the highest possible amount of oil, where the extract was saved in small sealed boxes.

Results and discussion

Vegetation traits studied season of 2015:

The results shown in Table (2) indicated that there was a significant effect of sowing date and spraying with different concentrations of boron on the vegetative characteristics. the date of sowing 1/11 / 2015 and the spraying with boron at concentration of 30 mg / L significantly increased plants height and gave the highest plant height among other treatments. The highest number of plant branches reached the height of 56 cm and the largest number of branches was 11 branch / plant and the largest number of follicles per plant reached 34 follicle / plant and gave the highest weight of 1000 seeds of 3.2 g and the highest dry weight of plant that up to 131 g /plant. The highest values gained may related to suitability of region in Iraq for early planting, where it was found that the late sowing negatively affected the growth, proportion of flowers and number of fruits (Alison,2009,Heidari 2009,Shukri,2002 and Al-garalli,2001).Based on the table, there was no interaction effect of planting date and spraying with boron on branches number. Spraying with boron also did not affect the weight of 1000 seeds which is mostly attributed to plant genetics (Isa, 1990).

Vegetation traits studied for black cumin plants for the second season2016: Results in Table (3) showed that the date of cultivation has a significant effect on all vegetative traits studied. The first date gave the highest plant height (53.38 cm), number of branches (9.5 branch/plant), follicle number (28 follicle/plant), A 1000 seeds weight (2.65 g) and plant dry weight (106.25 g/plant) compared to the third sowing date which resulted in the lowest values of plant height (48.12 cm), number of branches (6.75 branch/plant), follicle number (19.25 follicle/plant), weight of 1000 seeds (1.525 g) and plant dry weight (23.5 g/plant). Spraying with boron had no significant effect on all tested traits. However, interaction between sowing date and spraying with boron, especially the first sowing and boron treatment at concentration of 30 mg/Liter, affected and resulted in the highest values of follicles number (35 follicle/plant), a 1000 seeds weight (3.2 g) and plant dry weight (165 g/plant). These results indicate that the cultivation of black cumin plants at the first date and spraying of boron at 30 mg / L is the best treatments to produce the highest average values of the studied traits. This came to suit agriculture by the first date and spraying with the third concentration 30 mg / L of boron on plant growth and yield. The black cumin is sensitive to high temperatures, especially at the time of flowering, where high temperatures lead to the death of a large proportion of pollen causes a lack of holding fruits and seed composition (Samurai, 2003 ,Aptin, 2010 and Qutb 1992).

Percentage of volatile oil in black cumin fruits for the two seasons 2015 and 2016 :

Results in table (4) showed that seasons and sowing dates and their interactions have a significant effect on the percentage of volatile oil content in black cumin seeds, while spraying with boron had no significant effect in this ratio. First sowing date at the first season (2015) significantly resulted in the highest percentage of seeds volatile oil content (1.9%) with 30 mg/L of boron spraying . But the same interaction in the second growing season (2016) resulted in 1.8% of volatile oil content. Although spraying with boron at all levels did not affect volatile oil content percentage, Growing season and sowing date had significant effect on the percentage of volatile oil in seeds. The increase in the percentage of volatile oil can be attributed to the suitability of environmental conditions in the first season at the first sowing date combined with spraying with the third level of boron (30 mg/L) which

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helped better growing of black cumin plants and led to the higher percentage of volatile oil in the fruit that agreed with the previous studies of Bahram ,2010,Abu Zaid,2000 **and** Ehsan ,1999)

Table 1: Physical and chemical proprieties of field soil

---	**7.3**	**pH(1:1)**	
DC. SE. m-1	**2.5**	**EC(1:1)**	
Gr. -1	**8.98**	**Organic material**	
Mg.L-1	**10.4**	**Nitrogen**	**Available Ions**
Mlg.L-1	**6.2**	**Phosphorous**	
Mlg.L-1	**248.1**	**Potassium**	
Mlg.L-1	**3.3**	**Zinc**	
Gr. -1	**120**	**Sand**	**Soil particle**
Gr. -1	**430**	**silt**	
Gr. -1	**450**	**Clay**	
Silt-clay		**Soil texture**	

Table 2: sowing date and spraying with boron and their interaction effect on growth and yield of *N. sativa* of 2015 growing season

Plant d.wt.)g(	1000 seed wt.(g)	No. of follicles/plant	No of branches	Plant height cm)(	Boron	Planting date
49	2.0	22	8	49	B0	D1
77	2.3	25	9	50	B1	
119	2.6	29	9	53	B2	
151	3.2	34	11	56	B3	
46	2.8	23	6	48	B0	D2
34	2.5	26	7	48	B1	
41	2.3	26	7	49	B2	

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32	2.1	28	7	50	B3	
27	1.7	17	6	48	B0	D3
19	1.5	18	6	48	B1	
10	1.3	18	7	49	B2	
14	1.0	19	7	50	B3	
99	2.5	28	9	52	D1	Mean D
41	2.4	26	7	49	D2	
18	1.3	18	7	49	D3	
41	2.1	21	7	48	B0	Mean B
46	2.1	23	7	49	B1	
57	2.0	24	8	50	B2	
66	2.1	27	8	52	B3	
0.659	0.3673	0.802	0.872	0.658	D	LSD 0.05
0.761	0.423	0.928	1.007	0.763	B	
1.317	0.734	1.607	1.743	1.317	DB	

Table 3: sowing date and spraying with boron and their interaction effect on growth and yield of *N. sativa* of 2016 growing season

Plant d.wt.)g(	1000 seed wt.(g)	No. of follicles/plant	No of branches	Plant height cm)(	Boron	Planting date
55	2.2	24	9	50	B0	D1
80	2.4	26	10	52	B1	
125	2.8	30	9	54	B2	
165	3.2	35	10	57	B3	
49	2.6	25	7	50	B0	D2
48	2.4	27	8	49	B1	
46	2.2	28	7	47	B2	
38	2.2	30	7	47	B3	
35	1.8	20	7	48	B0	D3
29	1.6	19	6	47	B1	
23	1.5	19	7	48	B2	
7	1.2	19	7	47	B3	
106	2.7	29	9	53	D1	Mean D
45	2.3	28	7	48	D2	

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23	2.1	20	7	48	D3	
46	2.2	23	8	49	B0	Mean B
52	2.1	24	8	50	B1	
64	2.1	26	7	50	B2	
70	2.2	28	8	51	B3	
3.815	0.2353	0.796	0.883	0.686	D	LSD 0.05
4.402	0.2715	0.915	1.018	0.796	B	
7.628	0.4703	1.586	1.761	1.376	DB	

Table 4:Effect of season sowing date and spraying with boron and their interactions on *N. sativa* content of volatile oil percentage for growing seasons of 2015 and 2016

Average of SD	Date avrage	Season avrage	B3	B2	B1	B0	Boron	
S1D1 1.377 S1 D2 1.176 S1 D3 0.800	D1 1.350	S1 1.117					Date	Season
			1.800	1.700	1.100	0.800	D1	2015 S1
			0.900	1.000	1.200	1.700	D2	
			0.800	0.900	1.900	0.700	D3	
S2 D1 1.325 S2D2 1.100 S2D3 0.776	D2 1.141	S2 1.071	1.800	1.500	1.200	0.850	D1	2016 S2
			0.750	0.900	1.100	1.750	D2	
			0.750	0.800	0.800	0.700	D3	
	D3 0.800		1.135	1.117	1.051	1.067	B	Mean
			1.167	1.167	1.066	1.066	S1	
			1.100	1.066	1.034	1.056	S2	
			1.200	1.600	1.150	0.800	DB	
			0.800	0.950	1.150	1.750		
			0.800	0.800	0.900	0.750		

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0.1038		**LSD 0.05**
0.1271		
0.1467		
0.1790		
0.2077		
0.2544		
0.3597		

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