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Research Article

Effect of Manure and Foliar Application of Humic Acid on Yield and Yield Component of *Nigella sativa*

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ABSTRACT

The organic manures are numerous, they prepared initially from either animal or plant residues. All organic manures improve the behaviors of several elements in soils through that active group (filvic and humic acids) which have the ability to retain the elements in complex and chelate form. Humic acid improves the physical, chemical and biological properties of the soil and influences plant growth. Humic substances are recognised as a key component of soil fertility properties, since they control chemical and biological properties of the rhizosphere. Black cumin, *Nigella sativa* L. plant belongs to Ranunculaceae family, common known as black cumin (is cultivated for seed yield and oil production. The whole seeds contain 30- 35% of oil which has several uses for pharmaceutical and food industries. The field experiment was laid out factorial with randomized complete block design with three replications. Treatments included fertilizer in five levels (100% manure (F1); 75% manure + 25% chemical fertilizer (F2); 50% manure + 50% chemical fertilizer (F3); 25% manure + 75% chemical fertilizer(F4) and 100% chemical fertilizer (F5); and humic acids in two levels control (H1) and 0.001 liter (H2). Analysis of variance showed that the effect of manure and humic acid on all characteristics was significant.

Key words: Black cumin, Chemical fertilizer, Manure, Humic acid

INTRODUCTION

The organic manures are numerous, they prepared initially from either animal or plant residues. All organic manures improve the behaviors of several elements in soils through that active group (filvic and humic acids) which have the ability to retain the elements in complex and chelate form. These materials release the elements over a period of time and are broken down slowly by soil microorganisms. The extent of availability of such nutrients depends on the type of organic materials and microorganisms (Saha *et al.,* 1995). Humic acid improves the physical, chemical and biological properties of the soil and influences plant growth. Humic substances are recognised as a key component of soil fertility properties, since they control chemical and biological properties of the rhizosphere (Rengrudkij and Partida, 2003, Nardi *et al*., 2005, Trevisan *et al*., 2009). The effects of humic substances have been directly correlated with enhanced uptake of macronutrients, such as N, P and S, and micronutrients like Fe, Zn, Cu and Mn (Chen *et al.*, 2001). The mechanism of humic acid activity in promoting plant growth is not completely known, but several explanations have been proposed by some researchers such as increasing cell membrane permeability, oxygen uptake, respiration and photosynthesis, phosphate uptake, and root cell elongation (Turkmen *et al*., 2004). Also, organic manure supplies the plants with many nutrients which improve the physical properties of the soil consequently improve the plant growth (Slawon *et al.,* 1998) on radish plant and yield of both qualitatively and quantitavely. However, Marculescu *et al*., (2002) revealed that, the soil with its content in macro and microelements, enhanced by the use of organic fertilizers, play an essential role in the plants growing and development, in biosynthesis of the organic substances. In the same respect, Shafeek *et al* (2003) on Japanese radish reported that increasing the rate of organic manure up to (40 m3/fed.) resulted in the highest total roots yield and the highest values of crude protein, N, P and K as well as the heaviest seed production. Also it is very cheap and expressed cash money improving the income of farmer, in addition, uses this organic material are safe for human health. However, Entesharil *et al.* (2012) on turnip plants reported that using

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organic compost reduces the negative effects of chemical fertilizer and increase soil fertility. The results showed that the germination, growth parameters (total chlorophyll content, fruit diameter, leaf number, leaf area, shoot fresh weight and dry weight) was significantly altered, especially with these root of plants in 20% organic compost. Moreover, El-Sherbeny *et al.* (2012) found that adding organic compost tea increased carbohydrate content of turnip roots. Also, Heba and Sherif (2014) found that compost manure as a soil drench alone or with yeast increased the N % and % P uptake rates, the values were 126%, 174% for N and 255%, 322% for P respectively. Because the need of increasing the medicinal plant production all over the world, its production became an ultimate goal to meet the great increase of population to avoid chemical therapy side effects on human health through utilization of the medical herbs. However, the use of the most suitable and recommended agricultural practices in growing such crops could provide the producers with higher income, in comparison with many other traditional crops (Hassan *et al*., 2012). Black cumin, Nigella sativa, L. plant belongs to Ranunculaceae family, common known as black cumin (is cultivated for seed yield and oil production. The whole seeds contain 30- 35 % of oil which has several uses for pharmaceutical and food industries (Ustun *et al*., 1990). The black cumin seed cake is a by-product obtained from the black cumin seeds with cold pressing and it is used in the production of bio-oil (Sen and Kar, 2012).

MATERIALS AND METHODS

Location of experiment

The experiment was conducted at the zahak which is situated between 31° North latitude and 61° East longitude.

Composite soil sampling

Composite soil sampling was made in the experimental area before the imposition of treatments and was analyzed for physical and chemical characteristics.

Field experiment

The field experiment was laid out factorial with randomized complete block design with three replications.

Treatments

Treatments included fertilizer in five levels (100% manure (F1); 75% manure + 25% chemical fertilizer (F2); 50% manure + 50% chemical fertilizer (F3); 25% manure + 75% chemical fertilizer(F4) and 100% chemical fertilizer (F5); and humic acids in two levels control (H1) and 0.001 liter (H2).

Data collect

Data collected were subjected to statistical analysis by using a computer program MSTATC. Least Significant Difference test (LSD) at 5% probability level was applied to compare the differences among treatments` means.

RESULTS AND DISCUSSION

Harvest Index

Analysis of variance showed that the effect of manure on harvest index was significant (Table 1). The maximum of harvest index of treatments Nitroxin was obtained (Table 2). The minimum of harvest index of treatments Control was obtained (Table 2). Analysis of variance showed that the effect of harvest index was significant was significant (Table 1). The maximum of harvest index of treatments 200 mg/l was obtained (Table 2). The minimum of harvest index of treatments control was obtained (Table 2).

Harvest index

Analysis of variance showed that the effect of manure on Harvest index was significant (Table 1). The maximum of Harvest index of treatments F4 was obtained (Table 2). The minimum of Harvest index of treatments F1 was obtained (Table 2). Analysis of variance showed that the effect of humic acids on Harvest index was significant was significant (Table 1). The maximum of Harvest index of treatments H1 was obtained (Table 2). The minimum of Harvest index of treatments H2 was obtained (Table 2).

Grain yield

Analysis of variance showed that the effect of manure on grain yield was significant (Table 1). The maximum of grain yield of treatments F4 was obtained (Table 2). The minimum of grain yield of treatments F1 was obtained (Table 2). Analysis of variance showed that the effect of humic acids on grain yield was significant was significant (Table 1). The maximum of grain yield of treatments H1 was obtained (Table 2). The minimum of grain yield of treatments H2 was obtained (Table 2).

Plant height

Analysis of variance showed that the effect of manure on plant height was significant (Table 1). The maximum of plant height of treatments F4 was obtained (Table 2). The minimum of plant height of treatments F1 was obtained (Table 2). Analysis of variance showed that the effect of humic acids on plant height was significant was significant (Table 1). The maximum of plant height of treatments H1 was obtained (Table 2). The minimum of plant height of treatments H2 was obtained (Table 2).

Table 1: Anova analysis of the black cumin affected by manure and humic acids

Sov	df	Harvest Index	Grain yield	Biological yield	Plant height (cm)
R	2	86.07	45583.33	1267000	20.93
Manure (A)	3	585.4**	1213875**	2354500**	121.66**
Ascorbic humic (B)	2	892.2**	1950750**	2296333.3**	128.13*
A*B	6	521.4**	470541.6*	4110500**	3.13^{ns}
Error	22	65.97	145212.96	216259.2	23.08
CV	-	15.89	10.95	6.57	15.33

*, **, ns: significant at P<0.05 and P<0.01 and non-significant, respectively.

Table 2: Comparison of different traits affected by manure and humic acids

Treatment	Harvest Index	Grain yield	Biological yield	Plant height (cm)
Manure				
F1	25b	2908.3c	6066.7c	27.66b
F2	27b	3508.3ab	7150b	30b
F3	30b	3833.3a	7216.7b	32.33b
F4	36a	3983.3a	7800a	38.66a
F5	26b	3158.3bc	7116.7b	28b
Humic acids				
H1	28b	3223.3b	6793.3b	29.26b
H2	32a	3733.3a	7346.7a	33.4a

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