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Research article

EFFECTS OF MYCORRHIZA AND NITROGEN FERTILIZER ON DRY WEIGHT, PROTEIN PERCENT, HARVEST INDEX, GRAIN YIELD IN WHEAT

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ABSTRACT: Wheat is a major cereal crop in many parts of the world and it is commonly known as king of cereals. Properly applied nitrogen fertilizer has a positive effect on crop yield. At a high level of such fertilization it is advantageous to apply it twice or three times to plants at different stages of development. There is an opinion that mycorrhizal fungi occur in chickpea plants and improve the growth and yield of these plants, especially in phosphorus deficient soil. In this study, research crops planted in 2011, and Khash mountain stage carried the gem industry. This study is a factorial experiment in a randomized complete block design with three replicates and all experiments were performed with different levels. To measure this attribute required for analysis (about 250 g) of seeds harvested per plot were randomly selected, were inside the envelope was sent to the labtally after installation. Analysis of variance shows a significant effect on mycorrhiza in 5% of the dry weight, Protein percent, Harvest index, Grain yield of the plant is wheat.

Key words: dry weight, Protein, wheat

INTRODUCTION

Wheat is a major cereal crop in many parts of the world and it is commonly known as king of cereals. It belongs to poaceae family and globally after maize wheat is the second most produced food among the cereal crops, rice ranks third. High substrate salinity is a major limiting factor for plants in coastal habitats that germination being one of the most critical periods in life cycle of halophytes [13, 30]. Arbuscular mycorrhiza fungi (AMF) exhibit considerable functional diversity, at the inter and intraspecific level [20, 23]. There are pronounced plant fungus interactions [19, 25] together with seasonal variability [3, 8] and evidence of many synergistic and complementary effects between fungal species that occur together [14, 18, 32]. Apart from climatic and soil conditions grain quality may be also determined by fertilization. A special role plays here nitrogen fertilization. Properly applied nitrogen fertilizer has a positive effect on crop yield. At a high level of such fertilization it is advantageous to apply it twice or three times to plants at different stages of development. According to foreign and Polish research the most effective in obtaining high crop yields is a dose of 80-120 kg N/ha [28]. While wet gluten content increases with fertilization dose, its quality deteriorates. This may be the result of changes in gluten protein characteristic which are connected with the increase in amount of low molecular weight gliadin affecting gluten rheological properties [1]. There are also reports that in some varieties high nitrogen doses improve wheat protein system whereas in others quite the contrary [31]. Fertilizers are major input costs in many cropping systems worldwide [9]. Management of fertilization is a promising cultural practice to reduce weed interference in crops [4, 13, 21, 22]. Nitrogen (N) is the major nutrient added to increase crop yield [6]. The greatest competition among plants is usually for N, and it is the major nutrient input that farmers utilize to increase crop yield [29]. Nitrogen supply directly influences weed-wheat competition [17]. Decreasing in wheat yield loss by adding N was reported by Pourreza et al [27]. They also reported that N supply increased wheat yield when it compete to wild oat. Blackshaw *et al*. [5] also resulted in fertilized plots produced more wheat yield than unfertilized ones. An increasing in wheat economic and biologic yield was also reported by Hassan and Khan [15] who showed wheat and wild oat competition as affected by N supply and wild oat densities.

But results of Dhima and Eleftherohorinos [10] showed nitrogen fertilization decreased grain yield of wheat grown with wild oat compared with the control (No addition of N). Dhima and Eleftherohorinos [10] also showed grain yield of wheat in weed free treatments increased with adding N rate. Decreasing in wheat yield loss by adding N was reported by Pourreza *et al*. [27]. They also reported that N supply increased wheat yield when it compete to wild oat. Blackshaw *et al* [5] also resulted in fertilized plots produced more wheat yield than unfertilized ones. An increasing in wheat economic and biologic yield was also reported by Hassan and Khan [15] who showed wheat and wild oat competition as affected by N supply and wild oat densities. But results of Dhima and Eleftherohorinos [10] showed nitrogen fertilization decreased grain yield of wheat grown with wild oat compared with the control (No addition of N). Dhima and Eleftherohorinos [10] also showed grain yield of wheat in weed free treatments increased with adding N rate. There is an opinion that mycorrhizal fungi occur in chickpea plants and improve the growth and yield of these plants, especially in phosphorus deficient soils [28]. Arbuscular mycorrhizal fungi (AMF) can be integrated in soil management to achieve low-cost sustainable agricultural systems [16]. Mycorrhizal fungi occur in most of the soils and colonize roots of many plant species. Mycorrhiza is the structures resulting from the symbiosis between these fungi and plant roots, and is directly involved in plant mineral nutrition. The symbiotic root-fungal association increases the uptake of less mobile nutrients [24], essentially phosphorus (P) but also of micronutrients like zinc (Zn) and copper (Cu), the symbiosis has also been reported as influencing water uptake. AMF can also benefit plants by stimulating the production of growth regulating substances, increasing photosynthesis, improving osmotic adjustment under drought and salinity stresses and increasing resistance to pests and soil borne diseases [2]. These benefits are mainly attributed to improved phosphorous nutrition [26]. Lee and George [21] showed that mycorrhizal hyphae of G. mosseae had a significant contribution in the uptake of P, Zn and Cu by inoculated cucumber plants resulting in an increased concentration of those nutrients in the plant shoots.

MATERIAL AND METHODS

In this study, research crops planted in 2011, and Khash mountain stage carried the gem industry. This study is a factorial experiment in a randomized complete block design with three replicates and all experiments were performed with different levels. In this experiment, a variety of wheat called clear that improved cultivars were used. Mycorrhiza arbuscular fungi (AM) in both the inoculated and non-inoculated with three levels of nitrogen and phosphorus fertilizer in three levels as other experimental treatments were used. Urea nitrogen is used by organizations of agricultural support services were provided. The farm has been in previous years under fallow land preparation including plowing, disk loader and fustigation is. The plowing by moldboard plow to a depth of 30 cm was used. The operation of the disc, the disc plow was perpendicular offset to a depth of 15 cm. To soil and plant nutrient land of the amount needed according to soil test results fustigation was done. To measure this trait after five plants were randomly selected and harvested from the middle two lines by removing the border took place clusters Koobideh of each of the plant to seed removed separately the for the plant out and counting were recorded.

Protein percent

To measure this attribute required for analysis (about 250 g) of seeds harvested per plot were randomly selected, were inside the envelope was sent to the labtally after installation.

Harvest index

This trait divided by the yield on biological function is obtained by multiplying the percentage.

Plant dry weight

To measure the characteristics of the samples, the act of hitting the grain clusters were isolated, bushes and hitting the straw clusters exposed to the air and sunlight was put up dry. The dry weight of plants per plot clusters separated by tons was weighed and recorded the corresponding number.

Data analysis and statistical calculations

After data collection, by ANOVA statistical program SPSS, MASTATC took. And for drawing the figures and graphs from Excel software was used.

RESULTS AND DISCUSSION

Plant dry weight

Analysis of variance shows a significant effect on mycorrhiza in 5% of the dry weight of the plant is wheat (table 2). So that the minimum dry weight of plants inoculated with the fungus mycorrhiza terms and conditions of the maximum dry weight of plants inoculated mycorrhiza not have been achieved. Use mycorrhiza has increased dry wheat [23]. The results of these experiments are consistent with the experiments conducted.

The increase in plant dry weight, probably because of the increased photosynthetic activity and bolster mycorrhiza CO_2 and shoot biomass is increasing. Nitrogen at 5% level caused a significant effect on plant dry weight of wheat.

Harvest index

Analysis of variance indicated that significant mycorrhiza effect on harvest index is 1% (table 2). The comparison shows that most of the Harvest index is mycorrhiza inoculum size, and the lowest Harvest index condition mycorrhiza inoculum size has been achieved. A two-year field test of the fennel plant cultivation showed that the inoculum size increased Harvest index is mycorrhiza. The results of these experiments are consistent with the results of experiments performed. Probably due to the mycorrhiza effect on grain yield through increased absorption and increased photosynthetic activity may be a result of increased Harvest index. Nitrogen in wheat causing significant effect on Harvest index was so that the high levels of nitrogen fertilizer also increased harvest index. Also have a positive impact on the nitrogen harvest index reported. The results of these experiments are consistent with the results of experiments performed. Probably due to the positive effect of making assimilate more nitrogen is a result of increased Harvest index.

Table 1. Anova analysis of the wheat affected by interactions of mycorrhiza in nitrogen

S.O.V	df	Protein (%)	Grain yield	Harvest index	Plant dry weight
R	2	0.59	149.1	49.16	44.6
Mycorrhizal	2	5.22**	582.5*	64.6**	398.5*
N	2	1.15**	930.46*	23.7**	751.7**
N*M	2	0.649*	695.01*	33.5*	394.4*
C.V	-	0.221	185.4	7.9	112.9
*, **, ns: significant at p<0.05 and p<0.01 and non-significant, respectively. M: Mycorrhiza, N: Nitrogen					

Grain yield

Analysis of variance indicated that significant mycorrhiza effect on the yield is 5%. The comparison shows that most of the Grain yield is mycorrhiza inoculum size, and the lowest Grain yield condition mycorrhiza inoculum size has been achieved. Effect of Arbuscular mycorrhiza fungi on wheat yield was investigated. The results of these experiments showed that the yield on the application of mushroom mycorrhiza increased (Kapoor *et al*. 2004; Raja *et al*. 2002). Mycorrhiza symbiotic fungi increase the seed yield of fennel that the results above are consistent with the results of trials, this increase is probably due to the increased absorption of nutrients, improved plant water potential, improvement in growth resulting in better power plants and may be due to increased plant photosynthetic activity.

Table 2. Comparison of different traits affected by interactions of mycorrhiza in nitrogen

Mean-square				
	Protein (%)	Grain yield	Harvest index	Plant dry weight
inoculated				
0 kg	15.1a	4111.3d	60.22d	631.4d
50 kg	15.13a	4700.4c	69.55c	783.1b
100 kg	15.23a	5652.6a	78.22a	797.6a
Non-inoculated				
0 kg	14.06ab	4052.8e	60.4d	577.2d
50 kg	14.58b	4692.7c	69.2c	696.1c
100 kg	14.94c	5111b	74.8b	786.1a
Any two means not sharing a common letter differ significantly from each other at 5% probability				

Protein percent

The results of this experiment show that variance analysis mycorrhiza 1% level caused a significant effect on grain protein are content. The comparison shows that most of the Protein percent is mycorrhiza inoculum size, and the lowest Protein percent condition mycorrhiza inoculum size has been achieved.

The experiments were conducted on wheat inoculated with the fungus mycorrhiza analysis of variance showed Cultivars inoculated with the fungus mycorrhiza significant difference in the percentage of the amount of protein that figure was inoculated percent more protein. The results of these experiments are consistent with the experiments conducted. This effect is probably due to mycorrhiza protein in brain uptake from the soil and fine roots to shoots by transferring these are elements.

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