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RESEARCH ARTICLE

EFFECTS OF DIFFERENT NITROGEN LEVELS ON YIELD AND YIELD COMPONENTS OF DRY LAND WHEAT CULTIVARS

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ABSTRACT

In order to investigate effects of different nitrogen levels on yield and yield components of dry land wheat cultivars, an experiment was carried out at factorial in randomized complete blocks design with three replications at Shirvan dry land research station in 2012-2013. The studied treatment was wheat cultivars in four levels including (Rasad, Sabalan, Cross Sabalan and Azar 2) and nitrogen fertilizer rate in four levels including (0, 25, 50 and 75 kg/ha). Results showed that cultivar and nitrogen effect was significant on yield and yield components. Azar 2 cultivar had the highest grain yield (2.5 ton/ha) and the lowest grain yield was produced for Cross Sabalan equal to 1.8 ton/ha. With increase nitrogen application yield was increased but has not significant different between 50 and 75 kg N ha^{-1}. As, in between yield components except number of spike per m^2 other yield components had highest correlation with grain yield. Azar 2 cultivar was the most number of grain per spike and 1000 grain weight. Cross Sabalan cultivar was the maximum number of spike per m2. With increase of nitrogen use number of spike per m^2 and number of grain per spike had increased but 1000 grain weight has non-significant on nitrogen fertilizer levels. As, harvest index and biological yield had increase with increase in grain yield.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the most crop and near of 1/3 of agricultural farm in of world related to wheat production (Emam, 2007). The most important limiting factor for plant growth in arid and semiarid regions is water limits (Zhenzhu and Guangsheng, 2008). Production in semi-arid regions is mainly dependent on rain and Access to at least nutrient is most important factor for limiting production in these areas (Li *et al*., 2001). Nitrogen is one of the most important macronutrient that has many applications in today's high input farming (Latiri-souki *et al*., 1998; Lawlor, 1995). Nitrogen in cell surface increase cell number and cell volume and increasing the level of radiation absorbed by plant leaves and increase performance (Jenkyn and luch, 1998; Marbet, 2000). As, nitrogen increase cause to performance biomass and LAD (leaf area duration) (Basso and Ritchie, 2005; Yang *et al*., 2001). Wheat production in arid and semiarid regions largely depends on nitrogen management. In these areas because of low soil organic matter, nitrogen is the most limiting element. Nitrogen mineralization in these areas is not sufficient for the needs of crops and appropriate amounts of nitrogen fertilizer application to increase performance in these areas is essential (Ryan, 2002; Ryan *et al.,* 2008).

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Proper application of nitrogen in dry conditions can increase the plant's ability to cope with stress in these situations (Fischer, 1973; Langdale *et al.,* 1983). Several studies have shown that nitrogen fertilization increased grain yield, yield components and grain protein (Asadi *et al*., 2013; Dendan Lio and Yan Shai, 2013; Emam *et al.,* 2010). On the other hand, excessive application of nitrogen fertilizer in rain fed wheat cause to increase growth period, produce more vegetative organs and decrease grain yield, increase number of unfertile grain and decrease harvest index (Basso and Ritchie, 2005; Fischer, 1973).

MATERIALS AND METHODS

In order to investigate effects of different nitrogen levels on yield and yield components of dry land wheat cultivars, an experiment was carried out at factorial in randomized complete blocks design with three replications at Shirvan dry land research station,North Khorasan province (37°, 19' N, 58°, 7' E of 1148 m elevation) from october to june during the 2012 and 2013. The studied treatment was wheat cultivars in four levels including (Rasad, Sabalan, Cross Sabalan and Azar 2) and nitrogen fertilizer rate in four levels including (0, 25, 50 and 75 kg/ha). To prepare the land for planting with chisel plow first and then the disc was used for crushing clods. After the ground was leveling. After preparing the ground for over 5 and a width of 2 m plot was divided. Planting in October and

the density of 300 plants per square meter was performed using a hand sprayer. Consumption of fertilizers and fertilizer according to recommendations, including nitrogen in stages (sowing, tillering and stem elongation and simultaneous precipitation) and P, which amounts to 50 kg per ha of land were planted at the same time. Granstar herbicides were used for weed control.

Method of traits sampling

During the growth time, following characteristics was measured from each plot.

Yield and Yield components

were analyzed base on different samples of plant to determine the spikelet per m^2, seed number in spikelet, seed weight, biological yield and harvest index. Grain yield from each plot was scaled as final grain yield.

Analysis of data: All the data were subjected to statistical analysis using SAS software. Differences between the treatments were performed by Duncan's Multiple Range Test (DMRT) at 5% confidence interval.

1000-grain weight decreased and had a negative relationship with other yield components (Table 3).

Grain Yield

Effects of cultivars and nitrogen rate levels were significant on yield (Table 1). In between different wheat cultivars, Azar 2 cultivar had the highest yield and Rasad, Sabalan and Cross Sabalan was ranked in other levels respectively. With increase in nitrogen application grain yield was significantly increased, although in 50 and 75 kg N ha^{-1} had not significant (Table 2)

Harvest index and Biological yield

Effect of cultivar and nitrogen had significant on biological yield and harvest index. In cultivars and different nitrogen levels with increase biological yield and harvest index, cause to increasing grain yield that showed each factor that increasing plant growth cause to increasing grain yield. In cultivars and nitrogen levels had a highest yield increase in grain yield was more than biological yield. Therefore In increasing harvest index the role of grain yield more than biological yield.

Table 1. Analysis of variance of effects of cultivars and levels of nitrogen on yield and yield components

s.o.v	fd	Yield					
			Number of spikelet per m^2	Number of seed in spiklet	1000grain weight	Biological yield	Harvest Index
Replication	2	0.2108^{**}	2.0208^{ns}	29.6875^{**}	0.5833ns	0.0080^{ns}	2.0208^{ns}
Cultivar	3	1.3990^{**}	23158.5763^{**}	325.4722^{**}	137.0555^{**}	1.1146^{**}	232.2986^{**}
Nitrogen	3	1.4744^{**}	3398.4097^{**}	299.8055^{**}	8.7222^{**}	3.1020^{**}	129.6875^{**}
N×C	9	0.0122^{**}	1575.4652^{**}	5.6388^{**}	2.7407^{ns}	0.0694^{ns}	0.3171^{ns}
Error	30	0.0037	256.3097	0.6430	1.4500	0.0501	0.7541

Ns, **, *: non-significant and significant, respectively, at the level of 1 per cent and five per cent

Table 2. Mean comparison of yield and yield components for differents cultivars

Cultivar	Yield(Ton\ha)	Number of spikelet per m^2	Number of seed per spikelet	Thousand grain weight	Biological yield	Harvest Index
Rasad	2.3983b	259.833 c	29.0000 b	34.5000 a	5.4641 b	43.1667 b
Sabalan	2.0408c	315.417 b	24.9167 c	28.9167 b	5.1941 c	39.1667 c
Azar2	2.5885a	273.083 c	32.8333 a	33.5833 a	5.7866 a	45.5000 a
Cross Sabalan	1.8325d	356.750 a	20.7500 d	27.6667 c	5.1116 c	35.7500 d

Means with similar letters in each column are not significantly different at the %5 level of probability. (Duncan)

Table 3. Mean comparison of yield and yield components for differents levels of nitrogen

Levels of nitrogen(kg/ha)	Yield(Ton\ha)	Number of spikelet per m^2	Number of seed per spikelet	Thousand grain weight	Biological yield	Harvest Index
0	1.7172c	290.083 b	20.8333 d	32.3333 a	4.6391c	36. 5833 c
25	2.2232b	283.667 b	25.2500 c	31.2500 b	5.5133 b	40.0833 b
50	2.4397a	315.500 a	28.9167 b	30.6667 b	5.7316 a	43.3332 a
75	2.4800a	315.833 a	32.5000 a	30.4167 b	5.6725 ab	43.5833 a

Means with similar letters in each column are not significantly different at the %5 level of probability. (Duncan)

A thousand grain weight

1000-grain weight has been effect by cultivar and nitrogen (Table 1). Higher yield in Azar 2 cultivar is because of increase in number of grain in spike and 1000 grain weight compare to other cultivars (Table 2). Alavi *et al*., (2013) in investigate of wheat cultivars tolerance to drought stress found that role of 1000 grain weight for increase grain yield is higher than other yield components. With increase of nitrogen

Interaction of Cultivar and Nitrogen

Interaction of cultivar and nitrogen rates had significant on grain yield, number of spike per m2 and number of grain per spike (table 1). Nitrogen increasing cause to increase optimum character related to cultivar yield. Interaction of treatment had not significant on 1000 grain weight, harvest index and biological yield. All of wheat cultivar except Cross Sabalan has not significant difference between 50 and 75 kg N ha^{-1}

(Figure 1). Therefore, in this cultivar fore reach to higher yield better used 75 kg N ha^{-1}, but other cultivars for control of environment pollution and decrease of cost better use 50 kg N ha^{-1}.

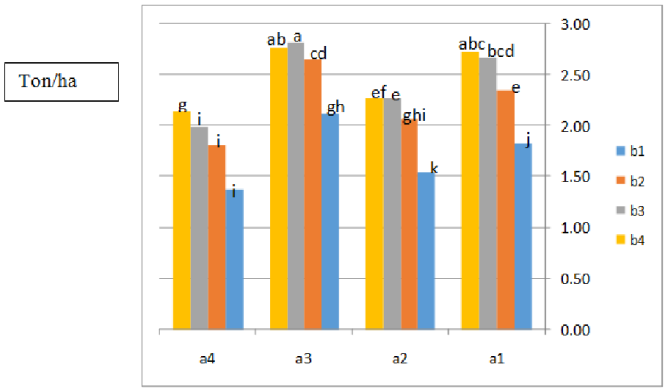

Figure 1. Interaction of cultivar and nitrogen on yield

a1= rasad cultivar, a2= sabalan cultivar, a3= azar cultivar, a4= cross sabalan cultivar, b1= 0, b2= 25, b3=50, b4=75 kg ha-1

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