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REGULAR ARTICLE

Surveillance the occurrence of black stem rust disease Ug 99 on different wheat cultivars (*Triticum aestivum* L.) and evaluation of their growth characteristics in the fields of Diyala province, Iraq

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Abstract

Five wheat cultivars (8/172, 8/70, Tammuz/4, Guard and 124) were planted in the field at the Baladrooz district, Diyala province, Iraq during winter season 2011 to monitor the emergence of Ug 99 on different wheat cultivars and evaluate their performance under similar conditions in the field. The experimental unit consisted of 15 plots in area 25 m^2 for each plot according to randomized complete block design. Results showed all cultivars of wheat were not exposure to infection by the black stem rust disease (Ug 99), cultivar of 8/172 gave the highest number of spikes /m^2, weight of grains /m^2 (g) and weight of grains /25 m^2 (g) from another treatments which recorded (401.0, 601.5g and 15037.5 g) respectively. Wheat cultivars of Tammuz/4 and 124 gave the highest total weight of 50 plants which recorded (140 g), whereas Tammuz/4 surpassed other treatments in plant height (79 cm) and 124 cultivar was superior from other treatments in weight of 1000 grains (36.3 g).

Key words: Wheat cultivars (8/172, 8/70, Tammuz/4, Guard and 124); black stem rust disease Ug 99

Introduction

The grains are the most imperative food plants and supply the food of 70 percent of the general population of Earth. They shape the fundamental base of nourishment and human survival (Emam, 2004). Wheat (*Triticum aestivum* L.) belonging to family Poaceae (Gramineae) is the major cereal crop of the world (Singh et al., 2014). Wheat is a significant crop amongst the food plants because of its more extensive flexibility, it can be cultivated under different agro-natural conditions (Munjal and Dhanda, 2005). Wheat is the common diet for more than one third of the world population and contributes more calories and proteins to the world diet than any other cereal crop (Morgan, 1995). Wheat is second only to rice as a source of calories in the diets of developing country; wheat provides 21% of the food calories and 20% of the protein to more than 4.5 billion people in 94 developing countries (Braun et al., 2010).

Wheat is cultivated on around 215 million hectares around the world, from the equator to scopes of 60◦N and 44◦S and at elevations extending from sea level to more than 3,000 m. Around 630 million tons of wheat are produced every year. Climate change–induced temperature increments are relied upon to lessen wheat production in developing nations by 29% (Rosegrant et al., 1995). Wheat production differs in relation to year to year and from area to area and under changing worldwide climate, it is ending up plainly progressively critical to adjust the yield to new

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ecological conditions (Almeselmani et al., 2011b). Production of wheat cultivars is one of the most important factors for increasing wheat production, its differs in yield and its components (Metwally et al., 1998, Sultan et al., 2000). Race Ug99 of the fungus *Puccinia graminis tritici* that causes black stem rust disease on wheat was first detected in Uganda in 1998 (Singh et al., 2011). Disease of rust has been a major problem historically in all of Africa, Australia , the middle east of Asia (except Central Asia), America, Europe, and New Zealand, the last major stem rust epidemic occurred in Ethiopia in 1993 and 1994 (Shank, 1994).

The aim of this study was monitoring the occurrence of Ug 99 on different wheat cultivars and evaluate their growth parameters under similar conditions in the field.

Material and methods

A field experiment was carried out at the Baladrooz district, Diyala province, Iraq during winter season 2011. Five different wheat cultivars were used as treatments in this study viz, 8/172, 8/70, Tammuz/4, Guard and 124. The experimental unit consisted of 15 plots in area 75 m^2 for each treatment with three replications in area 25 m^2 for each replicate according to randomized complete block design, weight of seeds for each treatment was 400 g, Wheat was sown by hand in plots on 4 December 2011, date of first irrigation was in 5/12/2011, Irrigation was applied according to crop demand during season, a total of six irrigations were applied up to the maturity of the crop with also rainfall were two times, Yara fertilizer was used at a rate of 15 kg/acre, date of spikes emergence 5/4/2012, date of flowering 15/4/2012, date of mature spikes 25/5/2012. Data for plant height (cm), number of grains / spike, grains weight/ spike (g), weight of 1000 grains (g), number of spikes /m^2, weight of grains /m^2 (g), weight of grains /25 m^2 (g), weight of grains /50 spike (g) and total weight of 50 plants (g) were recorded after maturity of crop . Disease incidence of Ug99 (DI) was computed as the proportion of infected plant to the total number of the plant in assessed from each cultivar and it calculated as follows:

$$DI = \frac{\text{Number of diseased plants}}{\text{Total number of plant assessed}} \times 100$$

Statistical analysis

For calculating analysis of variance and comparisons of means, Statistical software (Fisher and Yates, 1968) was used. The CD test was used to detect and separate the mean treatment differences. Correlation analyses were used to describe the relationships between growth parameters. All comparisons were made at the 5% level of significance.

Results and discussion

All studied cultivars were not infected by the black stem rust disease and all growth characteristics in (Table 1) significantly differed among them except number of grains/spike, weight of grains/spike (g) and weight of grains /50 spikes (g) were without significant difference at the end of the maturity of the crop. However, Tammuz/4 surpassed other treatments in plant height (79 cm) followed by wheat cultivars 124, Guard, 8/172 and 8/70 were recorded (71, 67, 65 and58 cm) respectively, 124 cultivar was surpassed from another treatments in weight of 1000 grains (36.3 g) followed by 8/172, Tammuz/4 8/70 and Guard (34.9, 34.4, 32.5 and 31.3 g) respectively, wheat cultivar of 8/172 was recognized with significantly increased in number of spikes /m^2 ,weight of grains /m^2 (g) and weight of grains /25 m^2 (g) from another treatment which recorded (401.0, 601.5g and 15037.5 g) respectively, wheat cultivars of Tammuz/4 and 124 were the best in total weight of 50 plants which recorded (140 g).

Broers *et al.* (1996) and Ali *et al.* (2009) found that resistance level ranged from very low to very high among the tested wheat cultivars against yellow rust. The disease incidence was 0% for all wheat cultivars because the cultivars seemed to have resistance or the disease of black stem rust was not existent in the region of the study. Peyman et al. (2014) indicated a significant difference among genotypes for all traits such as yield per ha, plant height, spike length, the number of grains per spike and seed weight. The wheat cultivars differed significantly by the investigated quality indices depending on the year conditions (Ivanova et al., 2013). Grains, straw, yields and its components were significantly differed owing to variety (Zaki et al., 2004, Abdel-Ati and Zaki, 2006). Grain quality is expressed as a complex of indices specific for each particular cultivar (Paunescu and Boghici, 2008; Kirchev et al., 2009; Stoeva and Ivanova, 2009; Peymanpour et al., 2010).

Table 1. Effect of different cultivars performance of wheat on some growth characteristics.

T	% DI	Plant height (cm)	Number of grains/ spike	Weight of grains / spike (g)	Weight of 1000 grains (g)	Number of spikes /m²	Weight of grains /m² (g)	Weight of grains / 25 m² (g)	Weight of grains /50 spikes (g)	Total weight of 50 plants (g)
8/172	0.0	65.0	46.0	1.5	34.9	401.0	601.5	15037.5	75.0	120.0
8/70	0.0	58.0	45.0	1.5	32.5	255.0	382.5	9562.5	75.0	115.0
Tammuz/4	0.0	79.0	50.0	1.7	34.4	278.0	472.6	11815.0	85.0	140.0
Guard	0.0	67.0	51.0	1.6	31.3	210.0	336.0	8400.0	80.0	135.0
124	0.0	71.0	49.0	1.7	36.3	257.0	436.9	10922.5	85.0	140.0
CD 0.05	N.S	10.6	N.S	N.S	1.6	18.7	5.8	81.5	N.S	13.4

T-Treatments of wheat cultivars, %DI-% Disease Incidence

Conclusion

All cultivars were not infected by the black stem rust disease because spores of this fungus do not exist in this region and the variation in environmental conditions has a major influence on the prevalence and incidence of Ug99 disease or resistance of these cultivars and the findings were showed different growth characteristics among cultivars.

Author contributions

HAS - Main author (Research and manuscript writing); AHF - Samples collection; MMS - Experiment design; ALF - Correction and submission of manuscript.

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