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GROWTH AND YIELD OF FIVE WHEAT GENOTYPES AS INFLUENCED BY DIFFERENT IRRIGATION FREQUENCIES

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The growth and yield of five newly developed wheat genotypes as influenced by different irrigation frequencies, was determined on a medium loam soil with a water table at a depth of 210 cm from the soil surface. The growth characteristics like tillering, plant height and thousand grain weight were affected significantly by the genotypes. Wheat genotypes 79100, 79143, 79353 and LU-26 produced statistically the same grain yield but yielded significantly more than K-342. The irrigation frequencies did not affect the total as well as fertile tillers and grain yield per hectare. The plant height, number of grains per spike and 1000-grain weight were affected significantly by the irrigation frequencies. Two irrigations, first at tillering and second at grain development, proved to be sufficient for obtaining the optimum yield of 44.20 quintals per hectare.

Key words: Wheat, Genotypes, Irrigation frequencies.

INTRODUCTION

Wheat (*Triticum aestivum* L.), being a staple food, has been a subject of extensive research to maximize its production. Day and Intalp [1] considered yield to be a function of genetic as well as environmental factors and any change in these would cause variation in grain and straw yield. Khan [2] could grow wheat successfully without irrigation on a soil with the water table at 210 cm below the ground surface. According to Cheema *et al.* [3] crown root initiation was a critical stage for irrigation to wheat and omission at this stage reduced the grain yield by 27 percent. Omission of irrigation at tillering and flowering reduced the grain yield by 23 and 20 percent respectively. Moisture stress at late jointing or milk stage caused little reduction in grain yield. Nayak and Sengupta [4] concluded that three irrigations each of 50.6 mm depth at crown root initiation, late tillering and peak flowering were needed by cultivar Sonalika to produce optimum yield. Flowering was found to be the most critical stage followed by crown root initiation, while grain filling stage was less critical for moisture supply. Metha *et al.* [5] observed that out of five wheat cultivars, irrigated at crown root initiation, tillering, flowering and dough stage, HD-1949 gave the maximum yield with one irrigation at crown root initiation, while Kalyansona produced the highest yield when irrigated twice, at crown root initiation and flowering.

The wheat yield can also be increased by the selection of high yield potential varieties with a wide range of adaptability to edaphic and climatic conditions. Nawaz [6] concluded that various yield components such as stand density, fertile tillers per unit area, spike length, grain number per spike and 1000-grain weight were affected significantly by different wheat genotypes. Sarwar [7] in a field trial on Chenab-70, Najam-3, AU-43 and LU-22 evinced that these varieties differed significantly in tillering, number of grains per spike and 1000-grain weight. While Ali [8] substantiated that number of tillers per unit area, grain number per spike and 1000-grain weight of different wheat varieties did not differ significantly.

MATERIALS AND METHODS

Five wheat strains 79100, 79143, 79353, K-342 and LU-26S were grown at 'Ochkera' Farm, University of Agriculture, Faisalabad. The experiment was quadruplicated in a split plot design by placing the irrigation frequencies in the main plots and strains in sub-plots of 2 x 6 m. There were two irrigation frequencies first at tillering and second at grain development, 3 irrigations, first at tillering, second at booting and third at grain development and five irrigations, first at tillering, second at jointing, third at booting, fourth at anthesis and fifth at grain development. The crop was sown in the first week of December with a single row hand drill 25 cm. apart. The crop was fertilized at the rate of 100 kg N + 75 kg P_2O_5 per hectare in the form of urea and single super phosphate, respectively. All other cultural operations were kept normal and uniform for all the experimental units. Total and fertile tillers per unit area were determined from an area of one square meter marked randomly at three different places in each sub-plot. Plant height, spike and grain number were determined from 50 tillers selected at random from each experimental unit. Thousand grain weight was taken by weighing 3 samples, from every sub-plot. The data collected were analysed and the significance of the treatment means tested.

RESULTS AND DISCUSSION

The irrigation frequencies affected the grain number and 1000-grain weight significantly (Table 1). Five irrigations not differing significantly from three irrigations, produced more and heavier grains per spike than two irrigations. Two and three irrigations gave statistically the same grain number and weight. The increased moisture supply might have caused more nutrient uptake and better photosynthetic efficiency which resulted in better grain setting and development but not observed in yield. The yield was not affected significantly by the different irrigation frequencies. The maximum (47.78 Q/ha) and the minimum (44.20 Q/ha) yield was produced by five and two irrigations, respectively. The results are in conformity with those of Khan [2], Cheema *et al.* [3], Nayak and Sengupta [4] and Metha *et al.* [5] who obtained optimum yield either with one irrigation or more coinciding with critical stages of water requirements of the crop.

The different irrigation frequencies did not affect the number of total and fertile tillers, and straw yield significantly. However, there had been a linear increase with the increased frequencies in these growth parameters. The crop was sown on a medium loam soil with a water table at a depth of 210 cm, thereby meeting some of its water requirements from the under-ground water [2]. Precipitation amounting to 136.52mm was received at regular intervals during the growth period of the crop. Furthermore, two irrigations, at tillering and grain development, would have proved sufficient in meeting the water requirements of the crop. These could be the reasons that irrigation frequencies did not affect the grain yield and growth characteristics.

The genotypes 79100, 79143, 79353 and LU-26S did not differ significantly from one another in grain yield but proved statistically superior to K-342 (Table 1). The genotype 79143 gave the maximum grain yield of 48.54 quintals per hectare. Latif [9] obtained significant differences in grain yield of different cultivars. The number of grains per spike was not affected significantly by the various genotypes. K-342 produced significantly the least fertile tillers per unit area and medium 1000-grain weight. The number of total tillers per unit area was affected significantly by the genotypes. The genotypes 79100 and K-342 produced significantly the maximum and the minimum fertile tillers per unit area. Statistically the same number of total tillers was given by 79143 and LU-26S. The results are supported by those of Nawaz [6] and Sarwar [7] who

Table 1. Growth and yield of five wheat genotypes as influenced by different irrigation frequencies.

Treatments	Plant height at maturity (cm)	Number of total tillers (m^2)	Number of fertile tillers (m^2)	Spike length (cm)	Number of grains per spike (no)	Thousand grain weight (gm)	Grain yield per hectare (quintals)	Straw yield per hectare (quintals)	Harvest index (%)
Irrigation Frequencies									
2 Irrigations	82.30*^{c}	343.00$^{N.S.}$	335.00$^{N.S.}$	9.70^{b}	40.8^{b}	37.43^{b}	44.20$^{N.S.}$	94.87$^{N.S.}$	31.78$^{N.S}$
3 Irrigations	85.95^{b}	349.20	339.83	10.30^{a}	41.85^{a}b	38.68^{ab}	45.80	99.85	31.43
5 Irrigations	90.40^{a}	354.30	346.55	10.30^{a}	43.05^{a}	39.48^{a}	47.78	104.77	31.32
Strains									
79100	89.58^{b}	439.17^{a}	428.92^{a}	11.08^{a}	42.75$^{N.S.}$	32.78^{e}	48.14^{a}	115.06^{a}	29.51^{b}
79143	74.00^{e}	338.50^{c}	330.33^{c}	9.33^{d}	42.50	36.79^{c}	48.54^{a}	99.37^{b}	32.63^{a}
79353	81.67^{d}	366.17^{b}	357.25^{b}	9.58^{d}	41.17	34.55^{d}	47.29^{a}	101.45^{b}	32.00^{ab}
K-342	99.67^{a}	245.33^{d}	241.17^{d}	10.50^{b}	42.00	40.38^{b}	39.99^{b}	92.77^{bc}	30.26^{b}
LU-26S	86.17^{c}	355.00^{bc}	344.58^{bc}	10.00^{c}	41.08	48.72^{a}	45.83^{a}	89.51^{c}	34.12^{a}

*Means followed by the same letter for each variable within irrigation frequencies and strains or no. significantly different at the 0.05 level of probability by Ducan's multiple range test.

N.S. = Non-significant.

had opined the tillering to be a varietal character. The straw yield was affected significantly by the genotypes. The maximum straw yield was produced by 79100 due to the maximum total tillers per unit area. LU-26S did not differ from K-342 which in turn remained at par with 79353 and 79143. Significant differences in straw yield had been reported by Latif [9]. The genotype LU-26S, giving reasonably good grain yield of 45.83 Q/ha and the minimum straw, gave the highest harvest index value, but did not differ from 49143 and 79153. The genotypes 79100, 79353 and K-342 gave statistically the same harvest indices.

It can be concluded that two irrigations, first at tillering and second at grain development, proved sufficient to mature the wheat crop successfully, on a medium loam soil with water table at a depth of 210 cm below the soil surface. The genotype 79353 should be preferred for obtaining maximum grain yield.

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