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Article

Study of the seed's quality and vitality from tillers in some Iraqi wheat cultivars

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Abstract

The experiment was conducted in Babylon province, Al-Shomali district, in a clay-loam soil texture in the winter of 2020-2021. to study the effect of cultivars and planting distances between rows and comparison between tillers and the interaction on growth, grain yield and their components in wheat crops. The complete randomized block design RCBD was used in the study for four bread wheat cultivars (C1: Buhooth 22 – C2: French wafer – C3: S 483 and C4: IPA 99). The experiment was analyzed using the spilled plot design into a complete randomized block design with three replicates; the cultivars were considered to be included in the main plot, and the study of tillers in plants was the subplot (T1: main tiller – T2: Second tiller and T3: Third tiller). The most important results can be summarized as follows: The results showed the C3 cultivar excelled in plant height, number of tillers, flag leaf area, number of spikes m-2, spike length, number of grains per spike, biological yield, grain yield and harvest index, while the C4 cultivar was excelled in chlorophyll content and grain 1000 weight. The tillerring system showed the main tiller T1 excelled on the rest of the tillers in each chlorophyll content, flag leaf area, spike length, number of grains per spike, grain 1000 weight, germination power, germination speed, percentage of germination, seedling weight and the percentage of protein, The interaction between cultivars and tillers appeared C4T1 excelled in chlorophyll content, spike length and grain 1000 weight, while C1T2 excelled in plant height, C3T1 interaction in flag leaf area and the number of grains per spike.

Keywords: cultivars, seeds, tiller, wheat.

Introduction

Wheat (*Triticum aestivum* L.) is one of the most important small-grain crops in the world because of its strategic role in achieving food security. Its importance lies in the fact that its grains are used to produce the indispensable loaf of bread for most peoples of the world [1]. The process of seed formation includes a series of developmental stages, starting with fertilization and accumulation of nutrients, which ends with seed drying and dormancy. Each of these stages includes a change in the morphological and physiological development of the seed, which can determine the inherent vitality of the seed and its ability to perform and regrow again [2]. Wheat differs in its growth according to its genetic nature [3], and it is characterized by diversity in growth according to the cultivated variety [4]. Hence, the production of

(tillers) differs according to the varieties. The lateral tillers arise from the basic buds of the Grass family and play a positive or negative role in producing production seeds with the availability of environmental factors and nutrients [5]. The quality and quantity of wheat seeds are also greatly affected depending on the production and competition of (tillers) in unit area [6]. Therefore, the production and development of wheat tillers is significant, as 70% of wheat seeds come from the tillers, and 60% of tillers may abort or die under inappropriate field conditions [7]. The synchronization of the production of the tillers compared to the main tiller is of great importance, as the late tillers are less productive than the main tiller, whose emergence coincides with the main tiller because of the lack of competition [8]. The tillering characteristic in some small grain crops is a distinctive feature because it is the first important stage of growth and the main component of the yield, so it is an important goal to improve and maximize grain crops. A good understanding of the performance of the primary tillers leads to a comprehensive knowledge of how to improve the grain yield. It is considered essential and gives the plant good performance of its functions through its contribution to the grain yield. In addition, it is one of the adaptive mechanisms in cereal crop plants to maintain a balance between source and estuary [9]. The primary tillers usually form on the main stem, while the secondary tillers consist of the primary tillers. Generally, the wheat begins tillering after the emergence of 2-3 leaves on the main stem; the first tiller emerges from the first leaf, the second tiller emerges from the second leaf, and the third tiller emerges from the third leaf. Approximately 30-50% of the grain yield in wheat comes from the main stem, and 50-70% from the other tillers [10] who found most of the grain yield in wheat comes from the tillers that arise from the buds in the axils of the lower leaves that it contributes about 70% of the grain yield. The tillers enable the plant to adapt to the different conditions in the field. There are different points of view regarding tillering, whether abundant or limited, and some go to the first choice. Another new trend has emerged with the abolition of tillering, such as barley [11], which turned into a mono-column plant. Based on these facts, extensive studies were carried out in Iraq in the field of wheat tillering during 2007-2014; these studies dealt with the tillering capacity and the tillering pattern of several wheat cultivars. Therefore, it was necessary to study the effect of the tillering pattern on bread wheat grains, determine the best grains suitable as seeds for wheat production, and determine the effect of the tiller on the size, quality of grains and their efficiency as seeds for wheat production.

Material and methods

A field experiment was conducted during the winter season of 2020-2021 in Babylon Province, Al-Shomali district. Random soil samples were taken from different locations and at different depths (0-30 cm) before planting; the samples were mixed well to homogenize them, then air dried, softened and passed through a sieve with a diameter of 2 mm. Irrigation water was mixed well, and one sample was taken for the same purpose. The samples were analyzed in the laboratory, as in Table (1) showing some physical and chemical properties of the experiment's soil and water.

	pH	Ec	Available elements (mg g-1)			Soil Separators (%)			Soil texture
			N	P	K	Clay	Alluvial	Sand	Clay mixture
Soil	8.14	5.79	43.66	15.34	0.78	151	462	398	
Water irrigation	7.63	3.39	15.3	15.3	0.28	-	-	-	

Table 1. Some physical and chemical properties of water and soil of field irrigation.

The complete randomized block design RCBD was used in the study for four bread wheat cultivars (C1: Buhooth 22 – C2: French wafer – C3: S 483 and C4: IPA 99). The experiment was analyzed using the spilled plot design into a complete randomized block design with three replications; the cultivars were considered to be included in the main plot, and the study of tillers in plants was the subplot (T1: main tiller – T2: Second tiller and T3: Third tiller. After tillage, the land with two perpendicular tillages was smoothed and divided into plots with an area of 9 m^2 for the experimental unit; then, local bread wheat was planted on November 28 at a seed rate of 100 kg ha^{-1}. The experiment was fertilized with nitrogen fertilizer at a rate of 120 kg ha^{-1} [12] in three equal batches, the first at planting, the second at tillers, and the last at flowering. Phosphate fertilizer was added as triple super phosphate containing 45% and mixed with the soil according to the 80 kg ha-1 13 recommendation. The experiment land was irrigated immediately after planting; the irrigation process proceeded according to the plant's needs during the growing season.

Studied traits

Chlorophyll content - the area of flag leaf - number of grains per spike – grains 1000 weight - grain yield - percentage of germination – germination power.

Results

The tillering

The results in Table 2 indicated significant differences between the different tillers of the same plant in all study traits; T1 gave the highest values in chlorophyll content, 63.36 SPAD. Area of flag leaf 17.40 cm^2 (The excelled of the main tillers due to their rapid growth and greater utilization of nutrients, causing an increase in the internodes, number of leaves and leaf area, especially the area of the flag leaf [15], number of grains $spike^{-1}$ 46 grains (the main tillers are characterized by their rapid growth, expulsion of spikes, early pollination and increased fertilization of the most significant number of florets before plants are exposed to high temperatures that cause fertilization failure and increase the number of failed florets [16], grains yield 1.602 g $tiller^{-1}$ (The reason of superior of this treatment from No. grains $spike^{-1}$ and grains 1000 weight) and percentage of germination 88.69% and germination power 0.149 (the germination traits of first generation seeds differ among source tiller, it was high in main tiller which gave indicator for using this seeds as production seeds).

Traits / Tillers	Chlorophyll content (SPAD)	Area of flag leaf (cm2)	No. grains spike-1	Grains 1000 weight (g)	Grains yield (g tiller-1)	Percentage of germination (%)	Germination power
T1	63.36	17.40	46.00	34.82	1.602	88.69	0.149
T2	60.81	15.39	40.09	30.36	1.217	76.86	0.126
T3	60.75	12.16	26.80	31.34	0.840	70.81	0.113
L.S.D.0.05	1.11	0.499	3.006	2.99	0.118	3.769	0.0031

Table 2. Effect of tillering in study traits.

The cultivars

The results showed in Table 3 that there was a significant difference between the cultivars in most traits; C4 gave the highest values in chlorophyll content, 65.56 SPAD, and the grains of 1000 weighed 34.99g. The increase in the chlorophyll content of the leaves in the C4 variety had a significant effect on the efficiency of the leaves in the manufacture of nutrients and their accumulation in grains and grains yield 1.259 g $tiller^{-1}$ (The excelled of this treatment from grains 1000 weight

). While C3 gave the highest values in the area of flag leaf 17.3 cm^2, No. Grains $spike^{-1}$ 41.53 grains (The number of grains is affected by the efficiency of the variety's performance in vegetative growth and increasing leaf area) and grains 1000 weight 34.82g.

Traits / Tillers	Chlorophyll content (SPAD)	Area of flag leaf (cm^2)	No. grains $spike^{-1}$	grains 1000 weight (g)	Grains yield (g $tiller^{-1}$)	percentage of germination (%)	Germination power
C1	57.85	14.65	36.89	33.46	1.234	80.63	0.130
C2	61.61	13.22	36.11	30.54	1.103	79.22	0.128
C3	61.53	17.20	41.53	29.70	1.233	77.78	0.129
C4	65.56	14.88	35.98	34.99	1.259	77.52	0.130
L.S.D.$_{0.05}$	3.81	1.808	3.89	2.15	0.095	N.S.	N.S.

Table 3. Effect of cultivars in study traits.

The interaction

It is noticed in Table 4 that there is a significant effect of the interaction between the different cultivars and tillers in most study traits; the combination C4 * T1 gave the highest values of chlorophyll content 67.58 SPAD and grains 1000 weight 36.72g, the combination C3 * T1 gave the highest values of area of flag leaf 19.68 cm^2, No. Grains $spike^{-1}$ 48.37 grains and grains yield 1.654 g $tiller^{-1}$.

Traits / Interaction		Chlorophyll content (SPAD)	Area of flag leaf (cm^2)	No. grains $spike^{-1}$	grains 1000 weight (g)	Grains yield (g $tiller^{-1}$)	percentage of germination (%)	Germination power
C1	T1	59.25	17.42	48.06	35.37	1.600	92.44	0.149
	T2	57.25	14.89	41.83	32.91	1.377	78.56	0.128
	T3	57.06	11.63	20.79	32.10	0.667	70.89	0.114
C2	T1	63.11	15.24	43.98	35.00	1.539	88.67	0.149
	T2	61.48	13.64	39.09	26.88	1.051	77.56	0.127
	T3	60.24	10.77	25.27	29.73	0.751	71.44	0.111
C3	T1	63.48	19.68	48.37	34.20	1.654	86.67	0.150
	T2	61.32	17.62	41.11	28.79	1.183	75.56	0.123
	T3	59.79	14.29	35.12	26.10	0.917	71.11	0.114
C4	T1	67.58	17.26	43.61	36.72	1.601	87.00	0.150
	T2	63.21	15.41	38.32	32.83	1.258	75.78	0.127
	T3	65.89	11.97	26.01	34.42	0.895	69.78	0.114
L.S.D.$_{0.05}$		4.18	1.87	8.43	5.05	0.242	N.S.	N.S.

Table 4. Effect of interaction in study traits.

Discussion

The main tillers were characterized by possessing growth elements more than secondary tillers. The first is germination and root formation, which gives it high vegetative growth [14]. However, it was found that wheat cultivars vary among themselves in their ability to form Compounds, including chlorophyll, as this trait is affected by the genetic expression of amino acids and the formation of enzymes responsible for the formation of chlorophyll, which varies from one cultivar to another [17]. Furthermore, the area of the flag leaf is affected by the cultivated variety. It significantly affects wheat yield [19], the ability to divide and

expand cells and an increase in the size of leaves. It varies from one cultivar to another, and the degree to which it is affected by the environmental conditions surrounding the crop and the variety's ability to proliferate and expand leaves [4]. This variation between cultivars is due to the ability of the source to supply nutrients on the one hand and the capacity of the sink (grain) to store these nutrients on the other hand [18]. The number of grains depends on the pollination efficiency and fertilization of the most significant number of florets in the spike, which varies from one variety to another [20]. Finally, the main tillers are characterized by their early growth and ability to collect compounds early before exposure to high temperatures, which gives them more space to produce grains of greater weight [21,22,23].

Conclusions

The tillerring system showed the main tiller T1 excelled on the rest of the tillers in each chlorophyll content, flag leaf area, spike length, number of grains per spike, grain 1000 weight, germination power, germination speed, percentage of germination, seedling weight and the percentage of protein, The interaction between cultivars and tillers appeared C4T1 excelled in chlorophyll content, spike length and grain 1000 weight, while C1T2 excelled in plant height, C3T1 interaction in flag leaf area and the number of grains per spike.

References

1. Salim, H. A.; Mahdi, S. J. Effect of tillage and chemical herbicides on the control of weeds in wheat crop. Karkok Univ. *J. for Agric. Sci* **2012**, *3.2*: 87-104.
2. Gergely, S.; Salgó, A. Changes in moisture content during wheat maturation—what is measured by near-infrared spectroscopy? *Journal of near-infrared spectroscopy* **2003**, *11.1*: 17-26.
3. AL-Salihy, A.A.; Hassan, I.; Jabbar, M.K. Study of TaSOS4 gene and yield, chemical traits in some bread wheat genotypes under salinity conditions. *The Iraqi Journal of Agricultural Science* **2018**, *49*.4: 586.
4. Mueen, A.S.; Jabbar, M.Kh. Creation of Molecular Databases to Iraqi Bread Wheat Cultivars. Plant Archives 2019, 19.2: 3607-3612 .
5. Assuero, S.G.; Tognetti, J.A. Tillering regulation by endogenous and environmental factors and its agricultural management. *Am. J. Plant Sci. Biotechnol* **2010**, *4*(Special Issue 1), 35–48.
6. Xu, Hai-Cheng, Tie, C.; Zhen-Lin, W.; Ming-Rong, H. (2015). Physiological basis for the differences of productive capacity among tillers in winter wheat. *Journal of Integrative Agriculture* **2015**, *14.10*: 1958-1970. doi: 10.1016/S2095-3119(15)61094-2.
7. Moeller, C.; Evers, J.B.; Rebetzke, G. Canopy architectural and physiological characterization of near-isogenic wheat lines differing in the tiller inhibition gene tin. Front. Plant Sci. 2014, 5, 617.
8. Bunting, A. H.; Drennan, D. S. H. Some aspects of the morphology and physiology of cereals in the vegetative phase. The growth of cereals and grasses 1966, 20-38.
9. Evers, J. B.; Vos, J.; Fournier, C.; Andrieu, B.; Chelle, M.; Struik, P. C.. A 3D approach for modeling tillering in wheat (Triticum aestivum L.). In: 4th International Workshop on Functional-Structural Plant Models, Montpellier, 7-11 June 2004. 2004. p. 210-215.
10. Al-Tamimi, H. .; Al-Qaraghouli, A. A. .; Khudair, Z. .; Jbara, A. A. . Effect Of Different Concentrations Of Nano-Magnesium And Nano-Titanium Oxide On The Cumulative Mortality Of Larvae Of Two Species Of Cucurbit Fruit Fly Affiliated With The Dacus In Iraq. JLSAR **2021**, 2, 9-13..
11. Donald, C. M. In search of yield. *J. Aust. Inst. Agric. Sci*. **1962**, *28*: 171-178.
12. Ratan, N.; Singh, U. N.; Pandey, H. C. Yield and quality of oat (Avena sativa L.) as influenced by nitrogen and varieties in Bundelkhand region (UP) India. *Agricultural Science Research Journal* **2016**, *6.1*: 27-30.
13. José, A. G.; da Silva; Constantino J.; Goi Neto; Sandra B. V.; Fernandes; Rubia D.; Mantai; Osmar B.; Scremin; Rafael Pretto. Nitrogen efficiency in oats on grain yield with stability. Revista Brasileira de Engenharia Agrícola e Ambiental 2016, 20: 1095-1100
14. Mali, H.; Choudhary, J. Performance of bread wheat (Triticum aestivum L.) varieties under different row spacing. *Journal of Cereal Research*, **2013**, *4.2*.

15. Karwashra, R.; Sh. Kaushal. Effect of seed rate and row spacing on wheat yield components (Triticum aestivum L.). *J. Agric. Res* **2010**, *48.2*: 151-156.
16. Hussain, I.; Khan, A. A.; Malik, S. U. Comparison of Wider row spacing with Normal row spacing in Five Wheat Cultivars. *Gomal University Journal of Research* **2016**, *32.2*: 13-23.
17. Attia, H. J.; Jabbar, M. K.. Gene Expression Of Hkt And Seedling Growth Parameters Of Three Plant Crops Under Salinity Stress. Plant Cell Biotechnology And Molecular Biology 2021, 1-7.
18. Al Mishhadani, I. I. 2015. Estimation of salt tolerance degree in some selected wheat genotypes by using detection of the salt-tolerant gene (TaSTK) and its expression under salinity conditions. *Int J Appl Agric Sci* **2015**, *1*.2: 31.
19. Sadeghi, H.; Bahrani, M. J. Effects of crop residue and nitrogen rates on yield and yield components of two dryland wheat (Triticum aestivum L.) cultivars. Plant production science, 2009, 12.4: 497-502
20. Zamir, M. S. I; Azraf-ul-Haq, A.; Javeed, H. M. R. Comparative performance of various wheat (Triticum aestivum L.) cultivars to different tillage practices under tropical conditions. *African Journal of Agricultural Research*, **2010**, *5.14*: 1799-1803.
21. Ghafari, S. R.; Dass, A.; Hamayoun, H.; Mangal, M. Q.; Omran, A. H. Effect of row spacing on different wheat (Triticum aestivum L.) varieties in semi-arid region of Kandahar. *International Journal of Applied Research*, **2017**, *3.7*: 93-97.
22. A.L.- Shamary, W. A. .; Alkhateb, B. A. A. H. .; Abdel, E. T. . Role Of Perlite Quantity And Intervals Of Irrigation On Potatoes (Solanum Tuberosum L.) Grown In Gypsiferous Soil. Journal of Life Science and Applied Research. 2020, 1, 31-39.
23. Abdul-Lateif, K. M., & Abdulateef, S. M. The effect of injecting hatching eggs with different concentrations of biotin on the quality and physiological characteristics of the hatched chicks. Iraqi Journal of Veterinary Sciences. 2012, 26, 391-397.

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