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Evaluation of quality of bread wheat (*Triticum aestivum* L.) cultivars grown under rain-fed and supplementary irrigation locations in Nineveh Province

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ABSTRACT

A study was conducted to evaluate 65 cultivars of bread wheat under two irrigation systems (supplementary and rain-fed) and their effects on the yield and its components traits, for this purpose, a field experiments were implemented in Nineveh province in two environmentally locations (TelKaif and Fayda) during the agricultural season 2021-2022. A new study at 2023-2024 was conducted to study the qualitative traits of grains and flour of the same 65 bread wheat cultivars. Under rainfed irrigation in Tel kaif location, the results indicates that superiority in these traits were in the cultivars of (test weight 75.43 Kg. hi^{-1} in Adana-99, Ash % 3.17% in Wifi, Fat % 2.58% in Mahdi, total Carbohydrate 77.17% in Attilla-50, Protein and wet gluten 13.19% and 27.52% respectively in Saberbeak. In Fayda location. The results indicates that superiority in these traits was in the cultivars of (Test weight and total Carbohydrate 65.75 Kg. hi-1 and 75.97% respectively in Attilla-50, Ash % 3.375% in Wifi, Fat % 3.16% in Falado, Protein and wet gluten % 13.57% and 24.90% respectively in Saberbeak. Under Supplementary irrigation all traits were superior comparing with it in the rain-fed location.

Keywords: Bread wheat, Rain-fed irrigation, SI Area, MRA Area, Quality traits.

Introduction

Wheat is an important food and strategic crop, it represents as a food source for about 35% of the world's population, it also provides 20% of the protein and calories for humans, its grains are used in many food industries such as bread and pastries. also, can be used its straw and bran in animal feed (Seleiman et al., 2010). The qualitative traits of cereal grain play an effective and important role in determining price policy and raising manufacturing efficiency and product quality; therefore, it became necessary to improve the quality of cereals, especially wheat by testing the grain quality of different cultivars of wheat to select the best cultivars with the best quality traits.

Many studies showed that the chemical composition of wheat grain differs among wheat cultivars for several reasons, the most important of which are: Diversity in cultivars, climate, geographical location, cultivation season, rainfall amount and distribution of it during the growing season, maturity date and agricultural operations. The qualitative traits of wheat were affected by the cultivar more than by the season, the environmental variation had a significant effect on qualitative traits, except for the protein percentage (Amr, 1988). Wheat crop grown under different environmental conditions in Iraq, and is mostly grown in the northern regions under rainy conditions, either in the central and southern regions under supplemental irrigation conditions. Today, Iraq suffers from a lack of rainfall rates and a large variation in the distribution of rainfall over the stages of plant growth, which negatively affected the quantitative and qualitative traits of wheat grains. The amount of water added by supplemental irrigation to the crop depends on the environmental conditions and genetic factors of the crop. wheat cultivars differ in their response to supplementary

irrigation to give high yield and best grain quality . Water plays an important role in the growth stages of crop. The most important growth stages of wheat that need sufficient irrigation are flowering and grain filling stages (Dizlek et al., 2013).

The Current study is to complete the taxonomic data for all bread wheat cultivars grown in Iraq with respect to some qualitative traits in order to complete the environmental and genetic data for all wheat cultivars in Iraq and to be a general base for serving farmers, researchers and breeders. The study also aims to evaluate cultivars of wheat in terms of quality traits in order to prepare a national quality guide for the local and introduced wheat cultivars and the extent of its affected by rain-fed and supplementary irrigation for these reasons this study is prepared.

Materials and Methods

This study was conducted in two locations (TelKaif and Faida) North of Nineveh Governorate Which is a Moderate Rainfall Area MRA, during the 2022 season to evaluate the yield components traits, and in 2023-2024 to evaluate the qualitative traits of grains and flour. The experiment included two factors, the first was 65 bread wheat cultivars and the second was the irrigation types with two levels, Supplementary and Rain-fed Irrigation. A Randomized Complete Block Design (RCBD) was used with three replications according to the split-plot design, Irrigation types were in the main plots, and wheat cultivars were in the secondary plots . The GenStat program was used to analyze the data for the studied traits (Antar and Aziz, 2021), The means were compared using the least significant differences test (LSD) in the level (0.05).The seeding rate was (300 grains.m^{-2}), manually sowing was implemented on 15/12/2021, the distance between rows was 20cm, DAP fertilizer was added at a rate of (160 Kg.ha^{-1}), and Urea fertilizer at a rate of (80 Kg.ha^{-1}). Soil's Physical and chemical characteristics and rainfall rates are shown in Table (1).

Table (1): Soil analysis and rainfall precipitation.

Measurement type	TelKaif	Fayda
pH	7.4	7.07
EC ds.m^{-1}	0.39	0.26
Organic Matter %	2.20	1.88
available Nitrogen ppm	64	43.85
Available Phosphorous ppm	4.57	15.59
Available Potassium ppm	354.4	171.42
Clay %	23.15	30.50
Silt%	47.4	26.50
Sand %	29.45	43
Texture	loam	clay loam
Total Rain PPT (mm)	281.5	216.2

Studied traits

1. Test weight (Kg.hl^{-1}): it was estimated by Test weighing device.
2. Ash %: It was estimated by the infrared device (Inframatic 9500).
3. Protein %: It was estimated by (Inframatic 9500) device.
4. Fat % (%): It was determined by the Soxhlet extractor device according to the approved methods in (AACC, 2000), No. (25-30).
5. Total Carbohydrate %: Calculated according to the following formula: Total Carbohydrates (%) = 100-(Moisture% + Ash% + Protein% + Fat%).
6. Gluten %: It was estimated by the Glutamic System device according to the approved methods in (Yabwalo et al., 2018), No. (12-38).

Result and Discussion

Telkaif location: The average of the cultivars has been arranged in descending order to facilitate reading and explanation for all tables.

Test weight (Kg.hl^{-1}): Table (2) showed that the bread wheat cultivars differed significantly among themselves in the test weight values as they ranged between (75.43-68.60 Kg.hl^{-1}), the cultivar of (Adana-99) achieved the highest value, while the (Saberbeak) cultivar scored the lowest value, also no significant differences were observed between the cultivars (Adana-99, Aladnaneyah, Babel-113, Lancelillotto, Sherwana, Attilla-50, Boora, Almadaeen, Alaa, Almahmoodeyah, Dejlatolker, Koya-8, and Bohouth-22) for this trait, the reason for the differences between cultivars in this trait may be

due to the variation in the protein % in their grains, these results are consistent with [6] who showed an inverse relationship between test weight and protein % in wheat grains. From observing the means of the types in Table (2) we find that the supplementary irrigation achieved the highest test weight (76.43 $Kg.hl^{-1}$) compared to rain-fed (69.90 $Kg.hl^{-1}$), the reason for this may be due to the grain being filled with dray matter and increasing its size, as a result of the availability of moisture during the stages of plant growth, which was positively reflected in the increase of test weight, these results are consistent with (Jalali-Honarmand et al., 2016). the binary interaction between the two factors showed that the (Adnaneyah) cultivar with supplementary irrigation gave the highest test weight (79.07 $Kg.hl^{-1}$), while the (Klaverto) cultivar with rain-fed type recorded the lowest value (66.27 $Kg.hl^{-1}$).

Ash %: The results of Table (3) showed that ash % in most cultivars was high, and this may be due to the dry season that accompanied the stage of grain filling, also we observed that the cultivars of bread wheat differed significantly among themselves in the ash %, as the cultivars superiors (Wifi, Saberbeak, Falado and Sofia), and there were no significant differences between them in ash % as they reached(3.17, 3.15, 3.05, 3.05%), respectively. While it was the lowest ash % in (Alaa, Hasad, Razkari and Aladnaneyah) cultivars that were recorded (1.99, 1.97, 1.94, and 1.87) respectively, the reason may be due to the genetic factor of the cultivars, these results are agreement with (Bilgin et al., 2016). The ash % decreased significantly in the supplemental irrigation treatment (2.27%) compared with rain-fed treatment (2.66%), the reason may be due to increased moisture % in grains these results are in agreement with (Aissaoui and Fenni, 2018). In the interaction between the two factors, the highest value of the ash % trait was (3.72%) in the interaction of (Saberbeak) cultivar with rain-fed Irrigation, while The lowest value was (1.78%) in the interaction of (Alaa) cultivar with supplementary Irrigation.

Table (2): Effect of cultivars and irrigation type on the Test weight ($Kg.hl^{-1}$)- (Telkaif)

Cultivars	SI	Rain-fed	Mean		Cultivars	SI	Rain-fed	Mean
Ezz-66	76.37	70.17	73.27		Adana-99	78.57	72.30	75.43
Rabia	76.30	70.20	73.25		Aladnaneyah	79.07	71.77	75.42
Jehan-99	76.20	70.27	73.23		Babal-113	78.37	72.10	75.23
Razkari	76.20	70.10	73.15		Lacelillotto	78.07	72.03	75.05
Koya-18	76.33	69.93	73.13		Sherwana	77.83	72.13	74.98
Barshalonah	76.03	70.20	73.12		Attilla-50	78.00	71.93	74.97
Arehane	76.00	69.97	72.98		Boora	77.93	71.93	74.93
Duncan	75.90	69.73	72.82		Almadaeen	77.93	71.77	74.85
Tamoz-2	76.50	68.97	72.73		Alaa	78.50	71.20	74.85
Alfatah	76.20	69.13	72.67		Almahmoodeyah	77.93	71.73	74.83
Soleimani-2	75.60	69.60	72.60		Dajlatolker	77.57	72.03	74.80
Baghdad-1	75.80	69.27	72.53		Koya-8	77.63	71.53	74.58
Koya-4	75.43	69.53	72.48		Bohouth-22	78.83	70.33	74.58
Azmar	75.70	68.90	72.30		Maroof	77.57	71.40	74.48
Aras	75.30	69.20	72.25		Tekin	77.63	71.23	74.43
Alrashed	75.17	69.17	72.17		Falado	77.80	71.03	74.42
Allatefeyah	75.17	68.87	72.02		Jarmo	78.13	70.67	74.40
Sofia	74.70	68.73	71.72		Alrashedeyah	77.57	71.17	74.37
Wafia	75.73	67.17	71.45		Cham-6	78.50	70.13	74.32
Beebaz	74.27	68.33	71.30		Albarakah	77.73	70.80	74.27
Noor	74.23	67.93	71.08		Erbil-4	77.30	71.20	74.25
Koya-20	73.97	68.13	71.05		Jawahery-1	77.10	71.23	74.17
Rayhana	74.77	67.33	71.05		Deary	77.20	71.10	74.15
Illico	75.07	66.50	70.78		Hasad	78.03	70.23	74.13
Bohouth-158	73.73	67.70	70.72		Khanaqin	76.87	70.80	73.83
Ipaa-99	73.70	67.33	70.52		Kalar-2	77.00	70.60	73.80

Bohouth-10	73.07	67.33	70.20		Mahdi	76.77	70.80	73.78
klaverto	73.43	66.27	69.85		Alfaris-1	76.57	70.60	73.58
Bohouth-4	72.80	66.50	69.65		Azadi	76.57	70.50	73.53
Saberbeak	71.43	65.77	68.60		Tal Afar-3	76.57	70.40	73.48
Average	**76.43**	**69.90**	**73.16**		Alkaed	76.40	70.43	73.42
LSD (0.05)					Erbil-2	76.40	70.43	73.42
Irrigation type			**0.1972**		Abu Ghraib-3	78.80	68.00	73.40
Cultivars			**0.8980**		Kalar-1	76.70	70.00	73.35
Irrigation type * Cultivars			**1.2633**		Wifi	77.23	69.40	73.32

Table (3): Effect of cultivars and irrigation type on the grain Ash (%)- (Tel kaif).

Cultivars	SI	Rain-fed	Mean		Cultivars	SI	Rain-fed	Mean
Deary	2.28	2.54	2.41		Wifi	2.91	3.43	3.17
Bohouth-22	2.14	2.65	2.40		Saberbeak	2.57	3.72	3.15
Bohouth-10	2.11	2.67	2.39		Falado	2.46	3.63	3.05
Tamoz-2	2.10	2.63	2.37		Sofia	2.65	3.44	3.05
Ezz-66	2.21	2.51	2.36		Aras	2.52	3.52	3.02
Jawahery-1	2.05	2.66	2.36		Ipaa-99	2.76	3.24	3.00
Alrashedeyah	2.26	2.44	2.35		Bohouth-158	2.74	3.25	2.99
Erbil-4	2.21	2.47	2.34		Dajlatolker	2.88	2.96	2.92
Tekin	2.24	2.43	2.34		Almahmoodeyah	2.55	3.12	2.83
Bohouth-4	2.04	2.59	2.32		Rayhana	2.33	3.29	2.81
Koya-4	2.08	2.53	2.31		Noor	2.47	3.15	2.81
Mahdi	2.03	2.53	2.28		klaverto	2.40	2.93	2.67
Lancelillotto	2.16	2.37	2.27		Alkaed	2.36	2.93	2.65
Cham-6	1.97	2.57	2.27		Baghdad-1	2.45	2.85	2.65
Sherwana	2.15	2.35	2.25		Wafia	2.15	3.14	2.65
Tal Afar-3	2.20	2.26	2.23		Rabia	2.51	2.75	2.63
Babal-113	2.00	2.43	2.22		Barshalonah	2.52	2.66	2.59
Azmar	2.08	2.34	2.21		Adana-99	2.45	2.74	2.59
Alfatah	2.12	2.21	2.17		Abu Ghraib-3	2.47	2.71	2.59
Maroof	1.88	2.46	2.17		Duncan	2.46	2.67	2.57
Attilla-50	1.82	2.53	2.17		Kalar-2	2.49	2.63	2.56
Arehane	1.94	2.34	2.14		Illico	2.29	2.81	2.55
Boora	2.06	2.21	2.14		Koya-20	2.54	2.54	2.54
Alfaris-1	1.99	2.25	2.12		Koya-18	2.55	2.53	2.54
Albarakah	1.95	2.14	2.05		Almadaeen	2.52	2.55	2.54
Jarmo	1.92	2.14	2.03		Khanaqin	2.45	2.63	2.54
Alaa	1.78	2.20	1.99		Kalar-1	2.43	2.65	2.54
Hasad	1.94	2.01	1.97		Erbil-2	2.43	2.62	2.52
Razkar	1.92	1.96	1.94		Koya-8	2.46	2.53	2.50
Aladnaneyah	1.84	1.90	1.87		Alrasheed	2.25	2.67	2.46
Average	**2.27**	**2.66**	**2.46**		Beebaz	2.46	2.45	2.45
LSD (0.05)					Allatefeyah	2.14	2.73	2.43
Irrigation type			**0.03694**		Azadi	2.21	2.66	2.43
Cultivars			**0.13312**		Jehan-99	76.70	2.63	2.43
Irrigation type * Cultivars			**0.18756**		Soleimani-2	77.23	2.52	2.41

Protein % : Through our observation of the average values of the cultivars in Table (4), protein % in grains ranged between (13.19-9.61%), the Saberbeak cultivar was significantly superior to the other cultivars in this trait its recorded (13.19%), and it was also observed that the lowest protein % was at the (Dajlatolker, Noor, Almahmoodeyah, Attilla-50, and Aladnaneyah) cultivars, which did not differ significantly among them as it was recorded (9.81, 9.73, 9.70, 9.66, 9.61%), respectively, the reason may be due to the genetic factor of the cultivars, and their different ability to absorb and transport nutrients, especially Nitrogen into the grain and these results are consistent with (Alnori and Naeef, 2013). That the protein % difference between wheat cultivars may be due to the genetic factor.

The irrigation factor showed a significant difference in the grain protein %, bread wheat cultivars treated with supplemental irrigation gave low values of grain protein % in (10.89%) compared with cultivars treated with rain-fed which gave the highest value in protein % (11.45%), the reason may be due to the drought stress that the plant was exposed during the grain filling period these results are consistent with (Ficco et al., 2020) reported that the exposure of the plant to drought stress has increased the protein % in the grains .In the interaction between the two factors, the highest value of the protein % trait was (13.28%) in the interaction of (Saberbeak) cultivar with rain-fed Irrigation, while the lowest value was (9.16%) in the interaction of (Dajlatolker) cultivar with supplementary Irrigation.

Fat %: Through table (5) we observed that the fat % of wheat cultivars ranged between (2.58-1.36%), (Mahdi) cultivar achieves the highest value for the trait and did not differ significantly with the cultivars (Bohouth-158, Duncan and Sherwana), The (Babel-113) cultivar achieved the lowest fat % (1.36%) and did not differ significantly with the (Tamoz-2 and Abo-Ghraib-3) cultivars, the reason may be due to the genetic factor of the cultivars. These results are consistent with (Gebregewergis, 2020), who reported that the difference between wheat cultivars in fat % may be due to the genetic factor and environmental conditions when growing. Also found that the wheat cultivars grown under a rain-fed type achieved the highest fat % (2.14%) compared to wheat cultivars grown under supplementary irrigation, the reason may be due to the drought stress which reduced nutrients transfer to the grains, and the first part formed in the grain is the embryo which contains a large proportion of fat, so the percentage of this component increases at the expense of the other components (Mahdavi et al., 2022). In the interaction between the two factors, the highest value of the fat % trait was (2.98%) in the interaction of (Bohouth-22) cultivar with rain-fed Irrigation, while the lowest value was (1.31%) in the interaction of (Dajlatolker and Tekin) cultivars with supplementary Irrigation.

Total Carbohydrates %: Table (6) showed that there are significant differences between bread wheat cultivars, (Attilla-50) cultivar was superior to the other cultivars, its recording means 77.17%, while the Saberbeak cultivar gave the lowest percentage of Carbohydrates 72.07%, This is consistent with what was stated by (Rwubatse et al., 2021). The reason for this may be due to the difference between the other chemical components of the grain for example protein percentage which affected on percentage of Carbohydrates, this is consistent with what was stated by Seleiman et al. (2010) who found that the percentage of Carbohydrates increased with a decrease in the percentage of protein in the grain. Table (6) showed that supplementary irrigation achieved the highest percentage of carbohydrates in the grains (75.64%) compared to rain-fed irrigation, which reached (74.48%). The reason for this may be due to the availability of sufficient moisture, which was indirectly affected by increasing the grain period when it was filled with starchy materials, which constitute 80% approximately of the carbohydrate %. The interaction of the two factors showed the highest percentage of carbohydrates in the grains of the (Attilla-50) cultivar grown under the supplemental irrigation Type 77.68%, while the lowest of carbohydrates % was in the (Falado)cultivar grown under rain-fed Irrigation.

Wet Gluten %: The results in Table (7) showed that the wet gluten % in the bread wheat cultivars under study was between (27.52-19.92%). The highest mean gluten % was in the (Saberbeak) cultivar 27.52%, which did not differ significantly from the (Babel-113, Maroof and Azmar) cultivars. It was also found that the lowest wet gluten % was found in the (Dajlatolker) cultivar recording 19.92%, which did not differ significantly from (Jehan-99, Aladnaneyah, and Noor) cultivars. The reason for this may be due to the significant increase in the protein % of the superior cultivars compared to the non-superior cultivars, These results are consistent with Pekmez (2018), Who noticed that there were significant differences in the wet gluten % between the bread wheat cultivars that he studied, The reason for the difference was attributed to the genetic composition

of the cultivars and that there was a direct relationship between the wet gluten and the protein % in the grains. Table (7) showed that the cultivars grown under the supplemental irrigation type gave the highest mean of the wet gluten %, amounting to 24.04% compared to the cultivated cultivars under rain-fed irrigation which recorded 22.64%, These results are consistent with Jalali-Honarmand et al. (2016), Who showed that the cultivars that were treated with supplemental irrigation were superior to the cultivars treated with rain-fed irrigation in the wet gluten %. The interaction of two factors showed the highest wet gluten % was in the (Babel-113) cultivar grown under the supplemental irrigation Type at 27.80%, while the lowest of wet gluten % was in the (Aladnaneyah) cultivar grown under Rain-fed Irrigation which was recorded 18.98 %.

Table (4): Effect of cultivars and irrigation type on the grain Protein (%)- (Tel kaif).

Cultivars	SI	Rain-fed	Mean		Cultivars	SI	Rain-fed	Mean
Soleimani-2	9.98	11.47	10.73		Saberbeak	13.11	13.28	13.19
Rayhana	9.57	11.86	10.72		Babel-113	12.58	13.16	12.87
Khanaqin	9.95	11.34	10.65		AZmar	12.37	13.16	12.76
Lancelillotto	9.89	11.41	10.65		Maroof	12.58	12.87	12.73
Alrashedeyah	10.10	11.17	10.63		Barshalonah	12.36	12.96	12.66
Azadi	10.47	10.76	10.61		Koya-8	12.41	12.44	12.42
Bohouth-158	9.51	11.57	10.54		Erbil-4	12.34	12.49	12.41
Adana-99	10.06	10.90	10.48		Bohouth-10	12.08	12.17	12.13
Boora	10.16	10.81	10.48		Falado	11.25	12.77	12.01
Rabea	10.47	10.48	10.47		Jarmo	11.04	12.94	11.99
Duncan	10.31	10.58	10.45		Alaa	11.26	12.68	11.97
Erbil-2	10.11	10.78	10.44		Arehan	11.64	12.26	11.95
Almadaeen	9.39	11.43	10.41		Wafia	11.28	12.58	11.93
Ezz-66	10.09	10.63	10.36		Hasad	11.33	12.41	11.87
Kalar-2	9.66	10.94	10.30		Wifi	10.82	12.56	11.69
Jawahery-1	9.60	10.93	10.27		Koya-18	11.55	11.71	11.63
Illico	9.19	11.26	10.23		Aras	10.90	12.37	11.63
Alrashed	9.27	11.01	10.14		Bohouth-4	11.07	12.10	11.59
Ipaa-99	10.11	10.17	10.14		Razkari	10.72	12.22	11.47
Kalar-1	9.27	10.86	10.07		Sherwana	11.14	11.79	11.47
Sofia	10.10	10.04	10.07		Deary	11.21	11.67	11.44
Abu Ghraib-3	9.97	10.09	10.03		Koya-4	10.90	11.91	11.41
Alfatah	9.87	10.18	10.03		Mahdi	11.12	11.62	11.37
Bohouth-22	9.63	10.21	9.92		Alkaed	11.23	11.43	11.33
Jehan-99	9.67	10.10	9.88		Koya-20	10.97	11.58	11.27
Dajlatolker	9.16	10.46	9.81		Tal Afar-3	11.05	11.36	11.20
Noor	9.70	9.77	9.73		Alfaris-1	10.88	11.40	11.14
Almahmoodeyah	9.63	9.77	9.70		Tekin	10.86	11.26	11.06
Attilla-50	9.43	9.89	9.66		Beebaz	10.15	11.96	11.06
Aladnaneyah	9.36	9.87	9.61		Albarakah	9.95	12.15	11.05
Average	**10.59**	**11.45**	**11.02**		Allatefeyah	10.69	11.38	11.03
LSD (0.05)					Tamoz-2	10.44	11.43	10.94
Irrigation type			**0.1093**		Baghdad-1	10.23	11.39	10.81
Cultivars			**0.2069**		Klaverto	10.38	11.24	10.81
Irrigation type * Cultivars			**0.2947**		Cham-6	10.64	10.95	10.79

Table (5): Effect of cultivars and irrigation type on the grain Fat (%)- (Tel kaif).

Cultivars	SI	Rain-fed	Mean		Cultivars	SI	Rain-fed	Mean
Aladnaneyah	1.79	1.79	1.79		Mahdi	2.51	2.65	2.58
Alfatah	1.79	1.79	1.79		Bohouth-158	2.28	2.78	2.53
Khanaqin	1.35	2.23	1.79		Duncan	2.30	2.71	2.50
Lancelillotto	1.48	2.09	1.78		Sherwana	2.15	2.82	2.49
Kalar-1	1.53	2.01	1.77		Kalar-2	2.10	2.82	2.46
Saberbeak	1.74	1.74	1.74		Koya-18	2.25	2.66	2.45
Beebaz	1.43	2.05	1.74		Noor	2.18	2.71	2.45
Ipaa-99	1.55	1.84	1.70		Falado	2.16	2.74	2.45
Baghdad-1	1.70	1.69	1.69		Bohouth-22	1.86	2.98	2.42
Alfaris-1	1.55	1.82	1.68		Solymani-2	2.18	2.62	2.40
Cham-6	1.39	1.95	1.67		Adana-99	1.87	2.67	2.27
Aras	1.36	1.96	1.66		Koya-4	1.71	2.81	2.26
Koya-20	1.48	1.80	1.64		Barshalonah	1.55	2.94	2.24
Azmar	1.39	1.90	1.64		Maroof	1.97	2.35	2.16
Almahmoodeyah	1.24	2.02	1.63		Koya8	1.65	2.65	2.15
Jarmo	1.52	1.71	1.62		Arehan	1.96	2.35	2.15
Erbil-2	1.49	1.74	1.61		Almadaeen	2.09	2.09	2.09
Jehan-99	1.43	1.80	1.61		Erbil-4	1.40	2.75	2.07
Wifi	1.37	1.83	1.60		Deary	1.73	2.42	2.07
Albarakah	1.59	1.58	1.59		Rayhana	1.71	2.37	2.04
Allatefeyah	1.37	1.81	1.59		Ezz-66	1.92	2.14	2.03
Alrashed	1.54	1.56	1.55		Rabea	1.59	2.45	2.02
Bohouth-10	1.41	1.69	1.55		Wafia	2.01	2.01	2.01
Alaa	1.50	1.50	1.50		Alkaed	1.62	2.32	1.97
Attilla-50	1.30	1.69	1.50		Azadi	1.44	2.49	1.97
Hasad	1.35	1.61	1.48		Dajlatolker	1.31	2.60	1.95
Illico	1.34	1.57	1.46		Razkari	1.47	2.39	1.93
Abo Ghrab-3	1.41	1.41	1.41		Tal Afar-3	1.60	2.26	1.93
Tamoz-2	1.35	1.40	1.37		Klaverto	1.61	2.23	1.92
Babel-113	1.32	1.40	1.36		Bohouth-4	1.78	2.06	1.92
Average	**1.66**	**2.14**	**1.90**		Tekin	1.31	2.45	1.88
LSD (0.05)					Jawahery-1	1.87	1.87	1.87
Irrigation type			**0.0290**		Boora	1.73	1.99	1.86
Cultivars			**0.0927**		Alrashedeyah	1.44	2.26	1.85
Irrigation type * Cultivars			**0.1308**		Sofia	1.84	1.84	1.84

Table (6): Effect of cultivars and irrigation type on the total Carbohydrate (%)- (Tel kaif).

Cultivars	SI	Rain-fed	Mean		Cultivars	SI	Rain-fed	Mean
Hasad	75.11	74.89	75.00		Attilla-50	77.68	76.66	77.17
Razkari	75.99	73.77	74.88		Aladnaneyah	76.96	76.38	76.67
Jarmo	75.70	74.05	74.88		Alfatah	76.71	76.54	76.63
Bohouth-4	75.66	74.09	74.88		Abo Ghraib-3	76.66	76.34	76.50
Tekin	75.57	74.15	74.86		Almahmoodeyah	77.04	75.58	76.31
Duncan	74.97	74.72	74.85		Boora	76.73	75.80	76.27
Klaverto	75.58	74.09	74.83		Jehan-99	76.44	76.02	76.23
Rayhana	76.32	73.10	74.71		Illico	77.22	75.20	76.21

Soleimani-2	75.53	73.84	74.68		Alrashed	76.94	75.36	76.15
Alkaed	75.00	74.31	74.66		Kalar-1	76.79	75.46	76.12
Adana-99	75.95	73.36	74.65		Erbil-2	76.08	76.0	76.04
Bohouth-158	75.95	73.36	74.65		Tamoz-2	76.46	75.49	75.98
Koya-4	75.46	73.81	74.63		Alrashedeyah	76.38	75.43	75.91
Deary	74.72	74.20	74.46		Jawahery-1	76.50	75.29	75.89
Bohouth-10	74.62	74.29	74.45		Lancelillotto	76.77	74.88	75.82
Arehane	74.91	73.79	74.35		Almadaeen	76.63	74.99	75.81
Aras	75.21	73.09	74.15		Cham-6	76.22	75.21	75.71
Koya-18	73.84	74.32	74.08		Dajlatolker	76.52	74.71	75.62
Mahdi	74.60	73.44	74.02		Ezz-66	76.05	75.18	75.62
Wafia	74.84	73.00	73.92		Bohouth-22	76.66	74.49	75.57
Sherwana	74.45	73.37	73.91		Allatefeyah	76.13	74.97	75.55
Babel-113	74.34	73.27	73.81		Rabea	75.99	75.09	75.54
Erbil-4	74.31	73.24	73.77		Albaraka	76.58	74.48	75.53
Wifi	75.11	72.40	73.75		Noor	75.91	75.11	75.51
Maroof	73.91	73.58	73.75		Ipaa-99	75.72	75.31	75.51
Azmar	74.07	73.05	73.56		Baghdad-1	76.11	74.83	75.47
Barshalonah	74.14	72.30	73.22		Khanaqin	76.38	74.53	75.45
Koya-8	73.28	72.95	73.11		Koya-20	75.78	75.09	75.43
Falado	74.44	71.20	72.82		Azadi	75.74	75.06	75.40
Saberbeak	72.32	71.81	72.07		Sofia	75.24	75.54	75.39
Average	**.7564**	**74.48**	**75.06**		Beebaz	76.09	74.59	75.34
LSD (0.05)					Alfaris-1	75.12	75.17	75.15
Irrigation type			**0.0315**		Tal Afar-3	75.10	75.17	75.13
Cultivars			**0.3217**		Kalar-2	75.77	74.49	75.13
Irrigation type * Cultivars			**0.4516**		Alaa	75.58	74.49	75.03

Table (7): Effect of cultivars and irrigation type on the Wet Gluten (%)- (Tel kaif).

Cultivars	SI	Rain-fed	Mean		Cultivars	SI	Rain-fed	Mean
Alrashed	23.78	21.89	22.83		Saberbeak	27.70	27.34	27.52
Khanaqin	23.73	21.70	22.71		Babel-113	27.80	26.68	27.24
Soleimani-2	23.39	21.92	22.66		Maroof	27.48	26.59	27.04
Lanceillotto	23.82	21.40	22.61		Azmar	27.69	26.32	27.01
Duncan	22.79	22.41	22.60		Erbil-4	26.40	26.37	26.39
Adana-99	23.38	21.80	22.59		Koya-8	26.46	25.36	25.91
Boora	22.87	22.10	22.48		Hasad	26.70	24.46	25.58
Albarakah	23.41	21.39	22.40		Wafia	26.70	24.39	25.54
Almahmoodeyah	23.31	21.29	22.30		Bohouth-10	25.54	25.53	25.53
Bohouth-158	23.17	21.36	22.27		Alaa	26.90	24.04	25.47
Almadaeen	23.19	21.29	22.24		Arehan	25.87	24.96	25.42
Ezz-66	22.63	21.71	22.17		Barshalonah	26.02	23.95	24.99
Rabia	22.06	22.25	22.15		Jarmo	26.38	23.36	24.87
Kalar-2	23.08	20.91	22.00		Aras	25.84	23.62	24.73
Jawahery-1	23.20	20.80	22.00		Falado	26.05	23.36	24.71
Rayhana	23.61	20.19	21.90		Bohouth-4	25.58	23.84	24.71
Erbil-2	22.09	21.66	21.88		Koya-18	24.77	24.61	24.69
Alfatah	21.91	21.60	21.76		Alkaed	24.84	24.46	24.65
Ipaa-99	21.69	21.22	21.45		Alfaris-1	24.46	24.55	24.51

Sofia	21.53	21.29	21.41	Deary	24.24	24.70	24.47
Kalar-1	22.34	20.46	21.40	Sherwana	24.97	23.95	24.46
Alrashed	22.54	20.06	21.30	Mahdi	24.86	23.91	24.39
Bohouth-22	21.84	20.56	21.20	Razkari	25.65	23.11	24.38
Illico	22.97	19.27	21.12	Koya-20	24.70	23.58	24.14
Abo Ghraib	21.53	20.45	20.99	Wifi	25.35	22.83	24.09
Attilla-50	21.53	20.25	20.89	Koya-4	24.95	23.20	24.08
Jehan-99	20.46	19.99	20.23	Allatefeyah	24.55	23.07	23.81
Aladnaneyah	21.12	18.98	20.05	Tamoze-2	24.28	22.83	23.55
Noor	20.39	19.57	19.98	Tal Afar-3	23.89	22.74	23.32
Dajlatolker	20.70	19.14	19.92	Tekin	23.32	23.32	23.32
Average	**24.04**	**22.64**	**23.34**	Beebaz	24.35	22.17	23.26
LSD (0.05)				Baghdad-1	23.93	22.30	23.12
Irrigation type			**0.1333**	Klaverto	24.00	21.99	22.99
Cultivars			**0.5243**	Cham-6	23.16	22.80	22.98
Irrigation type * Cultivars			**0.7383**	Azadi	23.29	22.45	22.87

Fayda location: The average of the cultivars has been arranged in descending order to facilitate reading and explanation, and for all tables.

Test weight (Kg.hl^{-1}): The results of Table (8) showed that there were significant differences between the means of the test weight of the grains of the cultivars under study, as they ranged between 65.75 kg.hl^{-1} for the (Attilla-50) cultivar and 59.81 kg.hl^{-1} for the (Ipaa-99) cultivar, The (Attilla-50) cultivar did not differ significantly with the (Alaa, Aladnaneyah, Lancelillotto, Bohuth-4, Noor, Ezz-66, Al Madaeen, Beebaz, Almahmoodeyah, Koya-8, and Maaroof) cultivars, It was also found that the (Ipaa-99) cultivar also did not differ significantly with (Illico, Saberbeak, and Claverto) cultivars. These results are consistent with Erekul et al. (2012) and Pekmez (2018), whom reported a significant difference between wheat cultivars in test weight traits. It was also noted that there were significant differences between the irrigation types, The means of the cultivars grown under the supplementary irrigation type were significantly superior to the cultivars grown under rain-fed irrigation, recording (66.21, 60.91 kg.hl^{-1}), respectively. These results are consistent with (Dizlek et al., 2013), Those who showed that in hot and dry climatic conditions, especially in the period of grain filling, the percentage of small-sized, atrophied grains increases due to the short ripening period, which leads to obtaining a low specific weight of grains and an increase in the ash percentage. The interaction of two factors showed the highest test weight was in the (Attilla-50) cultivar grains grown under the supplemental irrigation Type 68.49 Kg.hl^{-1} while the lowest test weight was in the (Ipaa-99) cultivar grown under rain-fed Irrigation which was recorded 57.32 Kg.hl^{-1}.

Ash %: Table (9) showed that the mean values of the ash % for grains in the cultivars under study differed significantly between them, as they ranged between (3.37-2.20%). The (Wifi) cultivar recorded the highest ash % in the grains, which amounted to 3.37%, which did not differ significantly from the values of (Adana-99, Erbil-2, and Falado) cultivars, While the (Aladnaneyah) cultivar recorded the lowest ash % in the grains, which amounted to 2.20%, which did not differ significantly with the values of (Alaa and Hasad) cultivars. The reason for this may be due to the genetic factor of the cultivars in terms of grain size, shape, and thickness, the weight of 1000 grains, and the thickness of the outer layers of the grain in which minerals and fatty acids are concentrated (Ficco et al., 2020). These results are consistent with Amir et al. (2020), who indicated that the ash % in grain varies from one to another cultivar due to genetic factors and environmental conditions. It was observed in Table (9) that the irrigation types differed significantly in the ash % in the grains. The cultivars grown in the rain-fed irrigation type achieved the highest values, amounting to 2.97%, compared to the cultivars grown in the supplemental irrigation type, which amounted to 2.55%. These results are consistent with [9], Who showed that rain-fed irrigation of plants resulted in a significant increase in the ash % in grain compared to the use of supplementary irrigation. The interaction of two factors showed the highest ash % was in the (Adana-99) cultivar grains

grown under the supplemental irrigation type at 3.91%, while the lowest ash % was in the (Attilla-50) cultivar grown under Rain-fed Irrigation which was recorded 2.12 %. From the foregoing, we note that the ash % in the grains was high, especially when irrigated by rain-fed irrigation, due to the lack of rainfall 216.2 mm, and thus the production of incomplete grains, which caused an increase in ash %. It was also noted that some cultivars such as (Wifi and Falado) cultivars were not affected by the site, which indicates that the influence of the genetic factor on them was stronger.

Protein %: Table (9) showed that the values of the Protein % for grains in the cultivars under study differed significantly between them as they ranged between (13.57-10.14%), Saberbeak cultivar grains achieved the highest protein % while (Noor) cultivar grains achieved lowest protein % which did not differ significantly with the values of (Attilla-50, Aladnaneyah and Almahmoodeyah) cultivars, These results are consistent with Asim et al. (2018) and Amir et al. (2020), Whom found that the protein % differs from one cultivar to another depending on the genetic factor of the cultivar and the environmental conditions, and that there is an inverse relationship between the protein % in grains and their test weight. This is what we found in Table (8) of the test weight. The reason for the increase in the protein % may also be attributed to the high ash % in the grains These results are consistent with (Mahdavi et al., 2022), who indicated that the protein % increased with the increase in the ash % of the grains. It was also observed in Table (10) that the protein % value of grains produced from cultivars grown under the rain-fed irrigation type were significantly superior, recording 11.83%, compared to cultivars grown under the supplementary irrigation type, which recorded 11.38%. These results are consistent with Aydogan and Soylu (2017) and Karaman (2018), whom indicated that the protein % increased with rain-fed compared to Supplementary irrigation type. The interaction of two factors showed the highest protein % was in the (Saberbeak) cultivar grains grown under the rain-fed irrigation Type 13.71%, while the lowest protein % was in the (Noor) cultivar grown under Supplementary Irrigation which recorded 10.09%.

Fat %: It was noted from Table (11) that the fat % in grains differed significantly among them according to the different cultivated cultivars. The percentage of fat in grains ranged between (1.9-3.16%). It was found that the (Falado) cultivar recorded the highest values and did not differ significantly from the (Adana-99) cultivar, while the lowest fat % in grains was found by (Alaa) cultivar, which did not differ significantly from (Illico) cultivar, These results are consistent with his findings Iqbal et al. (2015), who found that the fat % in grains differed significantly according to the cultivars under study, and the reason for this was attributed to the fact that this characteristic is affected by the genetic factors of the cultivar and the environmental conditions when growing. It was observed from the same table that irrigation types had a significant effect on the fat % of grains. It was found that the cultivars treated with the rain-fed irrigation type recorded a mean of 2.64%, which outperformed the cultivars treated under supplemental irrigation, which recorded 2.34%. The two-way interaction showed that the grains of (Adana-99 and Barshalonah) cultivars grown under rain-fed irrigation had the highest fat % in the grains amounting to 3.25%, compared to the (Wifi) cultivar grown under the supplemental irrigation type, whose grain percentage reached 1.76%.

Table (8): Effect of cultivars and irrigation type on the Test weight (Kg.hl^{-1})- (Fayda).

Cultivars	SI	Rain-fed	Mean		Cultivars	SI	Rain-fed	Mean
Cham-6	66.44	61.12	63.78		Attilla-50	68.49	63.01	65.75
Razkari	66.40	61.09	63.75		Alaa	68.33	62.86	65.59
Kalar-1	66.29	60.99	63.64		Aladnaneyah	68.30	62.83	65.57
Arehane	66.27	60.97	63.62		Lancelillotto	68.24	62.78	65.51
Koya-18	66.24	60.94	63.59		Bohouth-4	68.23	62.77	65.50
Duncan	66.07	60.79	63.43		Noor	68.14	62.69	65.41
Soleimani-2	65.92	60.65	63.29		Ezz-66	68.13	62.68	65.41
Koya-4	65.87	60.60	63.23		Almadaeen	67.99	62.55	65.27
Wifi	65.74	60.48	63.11		Beebaz	67.97	62.53	65.25
Baghdad-1	65.61	60.36	62.98		Almahmoodeyah	67.95	62.51	65.23
Aras	65.55	60.30	62.93		Koya-8	67.75	62.33	65.04

Dajlatolker	65.53	60.29	62.91		Maroof	67.65	62.24	64.94
Alfatah	65.49	60.25	62.87		Tekin	67.49	62.09	64.79
Tamoz-2	65.33	60.10	62.72		Jawahery-1	67.47	62.07	64.77
Azmar	65.26	60.04	62.65		Erbil-4	67.44	62.04	64.74
Allatefeyah	65.25	60.03	62.64		Sherwana	67.44	62.05	64.74
Sofia	65.11	59.90	62.50		Alrashedeyah	67.41	62.02	64.72
Falado	64.72	59.54	62.13		Deary	67.33	61.94	64.64
Koya-20	64.54	59.37	61.95		Babal-113	67.26	61.88	64.57
Abu Ghraib-3	64.42	59.27	61.84		Albarakah	67.07	61.71	64.39
Boora	64.36	59.21	61.78		Khanaqin	67.07	61.70	64.38
Bohouth-158	64.15	59.02	61.58		Mahdi	67.06	61.70	64.38
Alrashed	63.80	58.69	61.24		Jarmo	66.93	61.58	64.25
Rayhana	63.78	58.68	61.23		Kalar-2	66.87	61.52	64.19
Bohouth-10	63.77	58.67	61.22		Alfaris-1	66.86	61.51	64.19
Wafia	63.60	58.52	61.06		Azadi	66.78	61.44	64.11
Illico	63.00	57.96	60.48		Alkaed	66.72	61.38	64.05
Saberbeak	62.99	57.95	60.47		Erbil-2	66.72	61.38	64.05
klaverto	62.76	57.74	60.25		Tal Afar-3	66.68	61.34	64.01
Ipaa-99	62.30	57.32	59.81		Bohouth-22	66.61	61.28	63.94
Average	**66.21**	**60.91**	**63.56**		Jehan-99	66.56	61.23	63.89
LSD (0.05)					Hasad	66.52	61.20	63.86
Irrigation type			**0.4680**		Rabia	66.50	61.18	63.84
Cultivars			**0.7832**		Barshalonah	66.48	61.16	63.82
Irrigation type * Cultivars			**1.1202**		Adana-99	66.46	61.15	63.81

Table (9): Effect of cultivars and irrigation type on the Ash (%)- (Fayda).

Cultivars	SI	Rain-fed	Mean		Cultivars	SI	Rain-fed	Mean
Beebaz	2.70	2.76	2.73		Wifi	3.14	3.61	3.37
Azadi	2.48	2.96	2.72		Adana-99	2.81	3.91	3.36
Erbil-4	2.45	2.95	2.70		Erbil-2	2.89	3.75	3.32
Jehan-99	2.47	2.94	2.70		Falado	2.75	3.75	3.25
Deary	2.53	2.85	2.69		Dajlatolker	3.11	3.25	3.18
Bohouth-22	2.43	2.95	2.69		Aras	2.76	3.60	3.18
Alrashedeyah	2.50	2.85	2.68		Rayhana	2.73	3.54	3.14
Tamoz-2	2.40	2.94	2.67		Alkaed	2.79	3.40	3.10
Mahdi	2.39	2.92	2.66		Ipaa-99	2.99	3.20	3.10
Jawahery-1	2.32	2.96	2.64		Bohouth-158	2.97	3.20	3.09
Maroof	2.23	3.04	2.63		Baghdad-1	2.75	3.35	3.05
Tekin	2.49	2.74	2.62		Almahmoodeyah	2.79	3.29	3.04
Bohouth-4	2.29	2.89	2.59		Saberbeak	2.66	3.38	3.02
Lancelillotto	2.41	2.68	2.55		Noor	2.69	3.24	2.96
Tal Afar-3	2.45	2.57	2.51		Koya-18	2.79	3.09	2.94
Alfatah	2.37	2.64	2.51		Rabia	2.75	3.13	2.94
Atilla-50	2.12	2.90	2.51		Klaverto	2.68	3.19	2.94
Cham-6	2.25	2.77	2.51		Duncan	2.70	3.15	2.92
Arehane	2.32	2.65	2.49		Kalar-2	2.73	3.02	2.87
Azmar	2.33	2.65	2.49		Barshalonah	2.76	2.96	2.86
Babel-113	2.25	2.64	2.45		Wafia	2.40	3.33	2.86
Boora	2.31	2.53	2.42		Bohouth-10	2.43	3.27	2.85
Sherwana	2.40	2.44	2.42		Alrashed	2.50	3.17	2.83

Razkar	2.28	2.55	2.41		Ezz-66	2.46	3.21	2.83
Jarmo	2.23	2.46	2.34		Illico	2.53	3.11	2.82
Alfaris-1	2.24	2.44	2.34		Abo Ghraib-3	2.71	2.90	2.81
Albarakah	2.20	2.46	2.33		Almadaeen	2.76	2.86	2.81
Alaa	2.13	2.40	2.27		Kahanaqin	2.69	2.93	2.81
Hasad	2.19	2.33	2.26		Kalar-1	2.67	2.95	2.81
Aladnaneyah	2.17	2.23	2.20		Sofia	2.67	2.92	2.80
Average	**2.55**	**2.97**	**2.76**		Soleimani-2	2.60	2.93	2.77
LSD (0.05)					Koya-20	2.78	2.75	2.77
Irrigation type			**0.0318**		Koya-8	2.70	2.84	2.77
Cultivars			**0.1128**		Allatefeyah	2.59	2.88	2.73
Irrigation type * Cultivars			**0.1590**		Koya-4	2.52	2.93	2.73

Table (10): Effect of cultivars and irrigation type on the Grain protein (%)- (Fayda).

Cultivars	**SI**	**Rain-fed**	**Mean**		**Cultivars**	**SI**	**Rain-fed**	**Mean**
Tamoz-2	11.02	11.82	11.42		Saberbeak	13.43	13.71	13.57
Alrashed	11.00	11.80	11.40		Azmar	12.80	13.39	13.10
Tekin	11.22	11.54	11.38		Babel-113	12.92	13.19	13.05
Allatefiah	11.06	11.66	11.36		Maroof	12.92	13.11	13.01
Adana-99	11.18	11.41	11.30		Wafia	12.88	13.10	12.99
Almadaeen	11.02	11.59	11.30		Barshalonah	12.71	13.20	12.96
Illico	10.94	11.65	11.29		Koya-8	12.65	13.07	12.86
Khanaqin	10.94	11.62	11.28		Jarmo	12.53	13.06	12.80
Kalar-2	10.75	11.52	11.14		Erbil-4	12.68	12.74	12.71
Erbil-2	10.81	11.45	11.13		Falado	12.32	13.02	12.67
Cham-6	11.01	11.24	11.13		Hasad	12.39	12.83	12.61
Jawahery-1	10.96	11.22	11.09		Alaa	12.32	12.83	12.58
Alrashedeah	10.51	11.45	10.98		Aras	12.27	12.81	12.54
Azady	10.85	11.05	10.95		Wifi	12.18	12.81	12.50
Kalar-1	10.77	11.09	10.93		Razkari	12.09	12.78	12.43
Dajlatolkr	10.79	11.05	10.92		Arehan	12.00	12.52	12.26
Rabia	10.70	11.03	10.87		Bohouth-10	12.05	12.43	12.24
Boora	10.54	11.10	10.82		Bohouth-4	11.74	12.61	12.18
Duncan	10.69	10.88	10.78		Albarakah	11.71	12.41	12.06
Ezz-66	10.47	10.93	10.70		Baghdad-1	11.82	12.13	11.97
Ipaa-99	10.44	10.73	10.58		Koya-18	11.90	11.98	11.94
Alfatah	10.36	10.76	10.56		Sherwanah	11.51	12.32	11.91
Bohouth-22	10.12	10.73	10.43		Beebaz	11.54	12.22	11.88
Sofia	10.37	10.44	10.41		Bohouth-158	11.60	11.98	11.79
Abo Ghraib-3	10.36	10.40	10.38		Koya-4	11.27	12.24	11.76
Jehan-99	10.16	10.56	10.36		Dearey	11.58	11.94	11.76
Attilla-50	10.13	10.40	10.27		Alkaed	11.59	11.91	11.75
Aladnaneyah	10.21	10.27	10.24		Koya-20	11.34	12.15	11.75
Almahmoodeyah	10.12	10.31	10.22		Mahdi	11.48	11.89	11.69
Noor	10.19	10.09	10.14		Soleimani-2	11.37	11.85	11.61
Average	**11.38**	**11.83**	**11.60**		Klaverto	11.46	11.77	11.61
LSD (0.05)					Rayhana	11.13	11.96	11.55
Irrigation type			**0.2631**		Tal Afar-3	11.42	11.64	11.53

Cultivars	**0.1994**		Lancelillotto	11.34	11.69	11.51
Irrigation type * Cultivars	**0.3088**		Alfaris-1	11.25	11.68	11.47

Total Carbohydrate %: It was observed in Table (12) that there was a significant effect of the cultivars on the percentage of total carbohydrates, as the (Attilla-50) cultivar outperformed the other cultivars, recording the highest average of 75.97%, while the lowest average percentage of carbohydrates was recorded in the (Saberbeak) cultivar 71.49%, and the reason may be due to this to the inverse relationship between the two main components in the bean protein and carbohydrates. It was also noted that the supplemental irrigation type increased the percentage of carbohydrates in the grain, as it recorded 74.18% compared to the supplementary irrigation, which amounted to 73.60%, Due to the reason for this may be that when there is a lack of water, the grain filling is weak as a result of the decrease in the process of transporting photosynthetic products due to the decrease in enzymatic activity that contributes to the accumulation of carbohydrates in the grain, and this is in line with what Fan et al. (2018), who found that water and heat stress causes limited transfer of photosynthetic products, which causes a decrease in grain fullness as a result of a decrease in the activity of enzymes involved in the accumulation of starch in grains, which represents more than 80% of carbohydrates. The interaction between the irrigation type and the cultivars was also significant, as it was found that the percentage of carbohydrates in the grains of (Attilla-50) cultivar grown under supplemental irrigation gave the highest values recorded at 76.24% compared to the lowest values of 70.64% for the (Saberbeak) cultivar grown with rain-fed irrigation.

Wet gluten %: The results of Table (13) showed the superiority of the (Azmar) cultivar over the other cultivars in the wet gluten % amounted to 25.29%, which did not differ significantly with the (Saberbeak and Babel-113) cultivars, while it was found that the (Aladnaneyah) cultivar recorded the lowest percentages for the mean of this trait amounted to 18.24% Which did not differ significantly with the (Noor, Illico and Dajlatolker) cultivars. The reason for this may be due to the difference in the percentage of protein in grains, which is directly proportional to the wet gluten %, and to the difference in the genetic makeup of the cultivars. These results are consistent with his findings of Bilgin et al. (2016). It was found through Table (13) that the wet gluten % in the supplemental irrigation type was significantly superior, recording 21.79% compared to the rain-fed irrigation type, which amounted to 21.19%. The reason for this may be due to the same reasons that were mentioned on the Tel-Kaif site for the same trait. The interaction of two-way showed that the (Azmar) cultivar treated with the supplementary irrigation type achieved the highest value of the wet gluten % in the grain flour dough, which amounted to 25.44%, while the (Dajlatolker) treated with rain-fed irrigation achieved the lowest wet gluten %, which amounted to 17.65%.

Table (11): Effect of cultivars and irrigation type on the Fat (%)- (Fayda).

Cultivars	SI	Rain-fed	Mean		Cultivars	SI	Rain-fed	Mean
Rayhana	2.12	2.67	2.40		Falado	3.10	3.23	3.16
Abo Ghraib-3	2.27	2.49	2.38		Adana-99	2.93	3.25	3.09
Klaverto	2.14	2.59	2.36		Arehane	2.95	3.15	3.05
Tamoz-2	2.30	2.40	2.35		Barshalonah	2.70	3.25	2.97
Bohouth-4	2.20	2.47	2.33		Azady	2.80	3.11	2.96
Babel-113	2.28	2.35	2.32		Sherwana	2.81	3.06	2.94
Lancelillotto	2.18	2.45	2.32		Koyah-8	2.76	3.05	2.90
Koya-20	2.22	2.36	2.29		Bohouth-158	2.71	3.09	2.90
Kalar-1	2.11	2.46	2.28		Koya-18	2.75	3.01	2.88
Saberbeak	2.24	2.27	2.26		Soleimani-2	2.69	3.00	2.85
Beebaz	1.96	2.55	2.26		Ezz-66	2.75	2.95	2.85
Alfath	2.16	2.31	2.23		Duncan	2.66	3.04	2.85
Baghdad-1	2.21	2.24	2.22		Mahdi	2.75	2.95	2.85

Sofia	2.14	2.27	2.21		Razkari	2.60	3.08	2.84
Alfaris-1	2.13	2.23	2.18		Bohouth-22	2.51	3.17	2.84
Erbil-2	2.10	2.23	2.17		Tal Afar-3	2.60	3.05	2.83
Almahmoodeyah	1.89	2.42	2.16		Kalar-2	2.60	3.06	2.83
Cham-6	1.91	2.39	2.15		Boora	2.73	2.89	2.81
Allatefeyah	1.97	2.32	2.14		Noor	2.55	3.03	2.79
Jawahery-1	2.04	2.24	2.14		Aladnaneyah	2.55	2.85	2.70
Albarakah	2.09	2.17	2.13		Rabia	2.43	2.95	2.69
Azmar	1.91	2.34	2.12		Koya-4	2.34	3.01	2.68
Bohouth-10	2.00	2.23	2.12		Dajlatolker	2.46	2.88	2.67
Alrashed	1.98	2.10	2.04		Ipaa-99	2.40	2.88	2.64
Wifi	1.76	2.28	2.02		Aras	2.41	2.85	2.63
Jarmo	1.90	2.13	2.02		Khanaqin	2.55	2.68	2.62
Hasad	1.90	2.15	2.02		Deary	2.40	2.76	2.58
Attella-50	1.90	2.04	1.97		Maroof	2.44	2.72	2.58
Illico	1.82	2.07	1.95		Erbil-4	2.22	2.90	2.56
Alaa	1.81	1.99	1.90		Jehan-99	2.46	2.66	2.56
Average	**2.34**	**2.64**	**2.49**		Wafia	2.51	2.54	2.52
LSD (0.05)					Alkaed	2.28	2.64	2.46
Irrigation type			**0.0556**		Tekin	2.11	2.78	2.45
Cultivars			**0.0672**		Alrashedeyah	2.26	2.62	2.44
Irrigation type * Cultivars			**0.0979**		Almadaeen	2.44	2.44	2.44

Table (12): Effect of cultivars and irrigation type on the Total Carbohydrate (%)- (Fayda).

Cultivars	SI	Rain-fed	Mean		Cultivars	SI	Rain-fed	Mean
Bohouth-4	74.54	73.20	73.87		Attilla-50	76.24	75.69	75.97
Dejlatolkaer	73.77	73.81	73.79		Alfatah	75.93	75.27	75.60
Rayhana	74.53	73.06	73.79		Almahmoodeyah	75.94	74.71	75.33
Koya-4	74.27	73.17	73.72		Abo Ghraib-3	75.42	75.06	75.24
Jarmo	73.91	73.49	73.70		Sofia	74.93	75.55	75.24
Koya-20	74.07	73.24	73.66		Aladnaneyah	75.31	74.87	75.09
Alkaed	73.94	73.34	73.64		Jehan-99	75.43	74.67	75.05
Koya-8	73.91	73.36	73.64		Alrashedeyah	75.14	74.67	74.90
Bohouth-10	74.04	73.20	73.62		Jawahery-1	75.01	74.80	74.90
Deary	73.61	73.56	73.59		Cham-6	75.11	74.56	74.83
Baghdad-1	73.97	72.96	73.46		Kalar-1	74.78	74.78	74.78
Mahdi	74.03	72.77	73.40		Boora	75.07	74.37	74.72
Soleimani-2	73.61	73.16	73.39		Alfaris-1	74.40	74.99	74.70
Wifi	73.99	72.59	73.29		Bohouth-22	75.52	73.86	74.69
Koya-18	73.01	73.41	73.21		Allatefeyah	74.60	74.73	74.67
Arehane	73.48	72.90	73.19		Illico	75.00	74.34	74.67
Sherwana	73.32	73.02	73.17		Tamoz-2	74.87	74.26	74.56
Adana-99	73.65	72.62	73.14		Almadaeen	74.63	74.46	74.55
Bohouth-158	73.44	72.66	73.05		Rabia	74.98	73.95	74.47
Erbil-4	73.17	72.65	72.91		Erbil-2	74.77	74.12	74.44
Razkari	73.44	72.20	72.82		Lancelillotto	74.58	74.18	74.38
Babel-113	73.08	72.36	72.72		Noor	74.52	74.17	74.34
Azmar	73.10	72.34	72.72		Ipaa-99	74.59	74.04	74.31
Maroof	72.87	72.54	72.71		Alrasheyd	74.81	73.80	74.30

Wafia	72.72	72.11	72.41		Ezz-66	74.88	73.66	74.27
Aras	72.82	71.97	72.40		Tekin	74.57	73.60	74.08
Barshalonah	72.54	71.81	72.17		Duncan	74.27	73.89	74.08
Klaverto	71.98	71.91	71.95		Beebaz	74.32	73.79	74.05
Falado	71.92	71.79	71.85		Alaa	74.12	73.96	74.04
Saberbeak	72.34	70.64	71.49		Azadi	73.94	74.11	74.02
Average	**74.18**	**73.60**	**73.89**		Khanaqin	74.21	73.75	73.98
LSD (0.05)					Albarakah	74.32	73.59	73.95
Irrigation type			**0.299**		Hasad	73.88	73.96	73.92
Cultivars			**0.286**		Kalar-2	74.21	73.59	73.90
Irrigation type * Cultivars			**0.426**		Tal Afar-3	73.75	74.00	73.88

Table (13): Effect of cultivars and irrigation type on the Wet Gluten (%)- (Fayda).

Cultivars	**SI**	**Rain-fed**	**Mean**		**Cultivars**	**SI**	**Rain-fed**	**Mean**
Baghdad-1	21.43	20.90	21.17		Azmar	25.44	25.13	25.29
Rabia	21.36	20.85	21.11		Saberbeak	24.94	24.85	24.90
Boora	21.42	20.70	21.06		Babel-113	24.93	24.82	24.88
Adana-99	21.12	20.75	20.93		Erbil-4	24.58	24.54	24.56
Klaverto	21.29	20.58	20.93		Maroof	24.41	24.12	24.27
Ezz-66	21.29	20.30	20.80		Bohouth-10	24.19	23.96	24.08
Soleimani-2	20.85	20.74	20.79		Arehan	23.83	23.64	23.74
Albarakah	21.27	20.21	20.74		Koya-8	23.71	23.51	23.61
Khanaqin	20.91	20.38	20.65		Wafia	23.69	23.06	23.38
Erbil-2	20.90	20.25	20.57		Alfaris-1	23.36	23.09	23.23
Mahmoodeyah	21.06	19.87	20.46		AlKaed	23.46	22.83	23.15
Lancelillotto	20.84	20.07	20.45		Hasad	23.24	22.87	23.06
Bohouth-158	20.72	20.01	20.37		Deary	23.13	22.73	22.93
Alfatah	20.41	20.19	20.30		Koya-18	22.99	22.79	22.89
Almadaeen	20.50	19.96	20.23		Barshalonah	23.31	22.41	22.86
Sofia	20.31	19.87	20.09		Alaa	23.00	22.70	22.85
Ipaa-99	20.25	19.57	19.91		Mahdi	23.05	22.57	22.81
Jawahery-1	20.11	19.36	19.74		Bohouth-4	23.06	22.49	22.78
Kalar-2	19.76	19.54	19.65		Sherwanah	22.93	22.60	22.77
Kalar-1	19.96	19.13	19.55		Aras	22.99	22.26	22.63
Alrashed	20.33	18.70	19.51		Koya-20	22.71	22.23	22.47
Abo Gharib-3	19.91	19.11	19.51		Jarmo	22.66	22.00	22.33
Bohouth-22	19.54	19.11	19.33		Koya-4	22.73	21.90	22.31
Rayhana	19.49	18.99	19.24		Falado	22.49	22.13	22.31
Attilla-50	19.18	18.65	18.91		Wifi	22.62	21.52	22.07
Jehan-99	19.21	18.53	18.87		Tekin	22.18	21.96	22.07
Noor	19.13	18.09	18.61		Razkari	22.30	21.74	22.02
Illico	19.02	17.98	18.50		Allatefeyah	22.32	21.70	22.01
Dajlatolker	19.02	17.65	18.34		Tamoz-2	21.96	21.49	21.73
Aladnaneyah	18.69	17.79	18.24		Cham-6	22.01	21.41	21.71
Average	**21.79**	**21.19**	**21.49**		Azadi	21.81	21.06	21.43
LSD (0.05)					Tal Afar-3	21.50	21.36	21.43
Irrigation type			**0.1015**		Beebaz	21.87	20.87	21.37
Cultivars			**0.4985**		Duncan	21.63	21.02	21.32

Irrigation type * Cultivars	**0.7011**		Alrashedeyah	21.85	20.48	21.17

Conclusion

We conclude that the bread wheat cultivars varied among themselves in their response to irrigation types and their impact on the quality traits, especially since the planting season was of limited rain and for both locations, as the (Saberbeak) cultivar gave the highest percentage of protein, wet gluten, and ash when it was under rain-fed irrigation, as the (Atila-50) cultivar excelled when it was under supplementary irrigation in the percentage of total carbohydrates in grains, The irrigation types affected significantly in all the qualitative traits that were studied, it is possible to adopt the cultivation of the above cultivars in areas similar to the conditions of the study.

Appendixes

Attached are two appendixes for the grain yield ($gm.M^{-2}$) for the 65 Bread Wheat cultivars at the Fayda and Telkaif Locations.

References

Seleiman, M.F., M.E. Ibrahim, S.M. Abdal-Aal, and G.A. Zahran (2010). Effects of seeding rates on productivity, technological and rheological characteristics of bread wheat (*Triticum aestivum* L.). Emir International Journal of Current Research. 4:75-81.

Amr, A.S. (1988). Effect of growing season, location and cultivar on the quality of the commercially-grown durum wheats in Jordan [chemical and physical quality parameters; test weight; one thousand kernel weight; milling weight; falling numbers]. Dirasat (Jordan).

Dizlek, H., Ozer, M.S.., Gul, Dizlek, E. and Ozkan, H. (2013). Determination of qualitative proparties of 24 different wheat cultivars grown by Cukurova University Field Crops department plots in 2002-2003 product year. Electronic Journal Of Food Technologies, 8(3): 34-50.

Antar, S.H. and M.M. Aziz (2021). Statistical analysis of agricultural experiments using the program Genstat, University of Mosul, College of Agriculture and Forestry - Department of Field Crops.

AACC, (2000). American Association of Cereal Chemists. Approved Method of the AACC, 10th ed., Methods 54-30. The Association: St. Paul, M.N. USA.

Yabwalo, D.N., Berzonsky, W.A., Brabec, D., Pearson, T., Glover, K.D., and Kleinjan, J.L. (2018). Impact of grain morphology and the genotype by environment interactions on test weight of spring and winter wheat (*Triticum aestivum* L.). Euphytica, 214: 1-16.

Jalali-Honarmand, S., Saeidi, M., Rasaei, A., and Peik, E. (2016). Effects of supplemental irrigation and source limitation on grain quality of Iranian bread wheat genotypes. Plant Knowledge Journal, 5(1): 9-12.

Bilgin, O., Guzmán, C., Başer, İ., Crossa, J., and Korkut, K.Z. (2016). Evaluation of grain yield and quality traits of bread wheat genotypes cultivated in Northwest Turkey. Crop Science, 56(1): 73-84.

Aissaoui, M.R., and Fenni, M. (2018). Grain yield and quality traits of bread wheat genotypes under Mediterranean Semi-arid conditions. Scholar Journal of Agriculture and Veterinary Sciences, 5(3): 166-171.

Alnori, M., and J. Naeef, A. (2013). Effect of Seed Size and Plant Population on Growth and Grain Physiochemical Properties of threee Bread Wheat Cultivars (*Triticum aestivum* L.). Kirkuk University Journal For Agricultural Sciences, 4(2): 34-49.

Ficco, D.B., Beleggia, R., Pecorella, I., Giovanniello, V., Frenda, A.S., and Vita, P.D. (2020). Relationship between seed morphological traits and ash and mineral distribution along the kernel using debranning in durum wheats from different geographic sites. Foods, 9(11): 1523.

Gebregewergis, A. (2020). Review on the protein of different wheat cultivars. American Journal of Agricultural Research 5(88):1-4.

Mahdavi, S., Arzani, A., Maibody, S. M., and Kadivar, M. (2022). Grain and flour quality of wheat genotypes grown under heat stress. Saudi Journal of Biological Sciences, 29(10): 103417.

Rwubatse, B., Okoth, M.W., Andago, A.A., Ngala, S., Kimonyo, A. and Bitwayiki, C. (2021). Effect of selected Rwandan wheat cultivars on the physicochemical characteristics of whole wheat flour. Acta agriculturae Slovenica, 117(1): 1-9.

Pekmez, H. (2018). Physicochemical characteristics and flourgraph properties of wheat cultivars (*Triticum aestivum* L.) used in flat bread (Gaziantep pita). CyTA-Journal of Food, 16(1): 965-971.

Erekul, O., Gotz, K.P., and GÜRBÜZ, T. (2012). Effect of supplemental irrigation on yield and bread making quality of wheat (*Triticum aestivum* L.) cultivars under the Mediterranean climatically conditions. Turkish Journal of Field Crops, 17(1): 78-86.

Amir, R.M., Hussain, M.N., Ameer, K., Ahmed, A., Ahmad, A., Nadeem, M. and Kausar, R. (2020). Comprehensive assessment and evaluation of selected wheat cultivars for their relationship to chapatti quality attributes. Food science and technology, 40: 436-443.

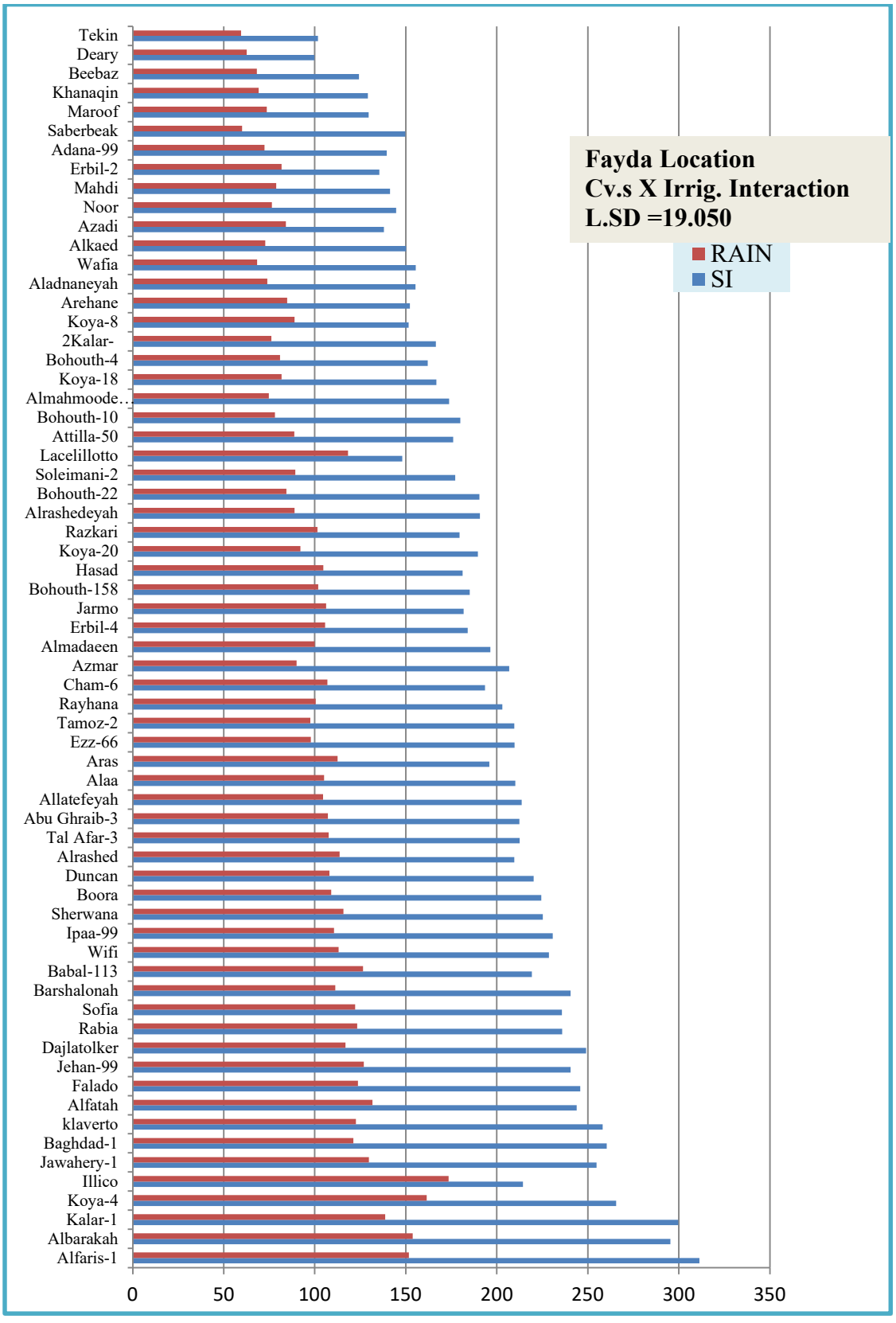
Asim, S.M., Ahmed, A., Amir, R.M., and Nadeem, M. (2018). Comprehensive identification and evaluation of selected wheat cultivars for their relationship to pan bread quality. Journal of Food Processing and Preservation, 42(7): e13670.

Karaman, M. (2018). Evaluation of bread wheat genotypes in irrigated and rainfed conditions using biplot analysis. Applied Ecology and Environmental Research 17(1): 1431-1450.

Aydogan, S., and Soylu, S. (2017). Ekmeklik buğday çeşitlerinin verim ve verim öğeleri ile bazı kalite özelliklerinin belirlenmesi. Tarla Bitkileri Merkez Araştırma Enstitüsü Dergisi, 26(1): 24-30.

Iqbal, Z., Pasha, I., Abrar, M., Masih, S., and Hanif, M. S. (2015). Physico-chemical, functional and rheological properties of wheat cultivars. Journal of Agricultural Research (03681157): 53(2).

Fan, Y., Ma, C., Huang, Z., Abid, M., Jiang, S., Dai, T., and Han, X. (2018). Heat priming during early reproductive stages enhances thermo-tolerance to post-anthesis heat stress via improving photosynthesis and plant productivity in winter wheat (*Triticum aestivum* L.). Frontiers in plant science, 9: 805 .


Fayda Location
Cv.s X Irrig. Interaction
L.SD =19.050
RAIN
SI
Tekin
Deary
Beebaz
Khanaqin
Maroof
Saberbeak
Adana-99
Erbil-2
Mahdi
Noor
Azadi
Alkaed
Wafia
Aladnaneyah
Arehane
Koya-8
2Kalar-
Bohouth-4
Koya-18
Almahmoode…
Bohouth-10
Attilla-50
Lacelillotto
Soleimani-2
Bohouth-22
Alrashedeyah
Razkari
Koya-20
Hasad
Bohouth-158
Jarmo
Erbil-4
Almadaeen
Azmar
Cham-6
Rayhana
Tamoz-2
Ezz-66
Aras
Alaa
Allatefeyah
Abu Ghraib-3
Tal Afar-3
Alrashed
Duncan
Boora
Sherwana
Ipaa-99
Wifi
Babal-113
Barshalonah
Sofia
Rabia
Dajlatolker
Jehan-99
Falado
Alfatah
klaverto
Baghdad-1
Jawahery-1
Illico
Koya-4
Kalar-1
Albarakah
Alfaris-1
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150
200
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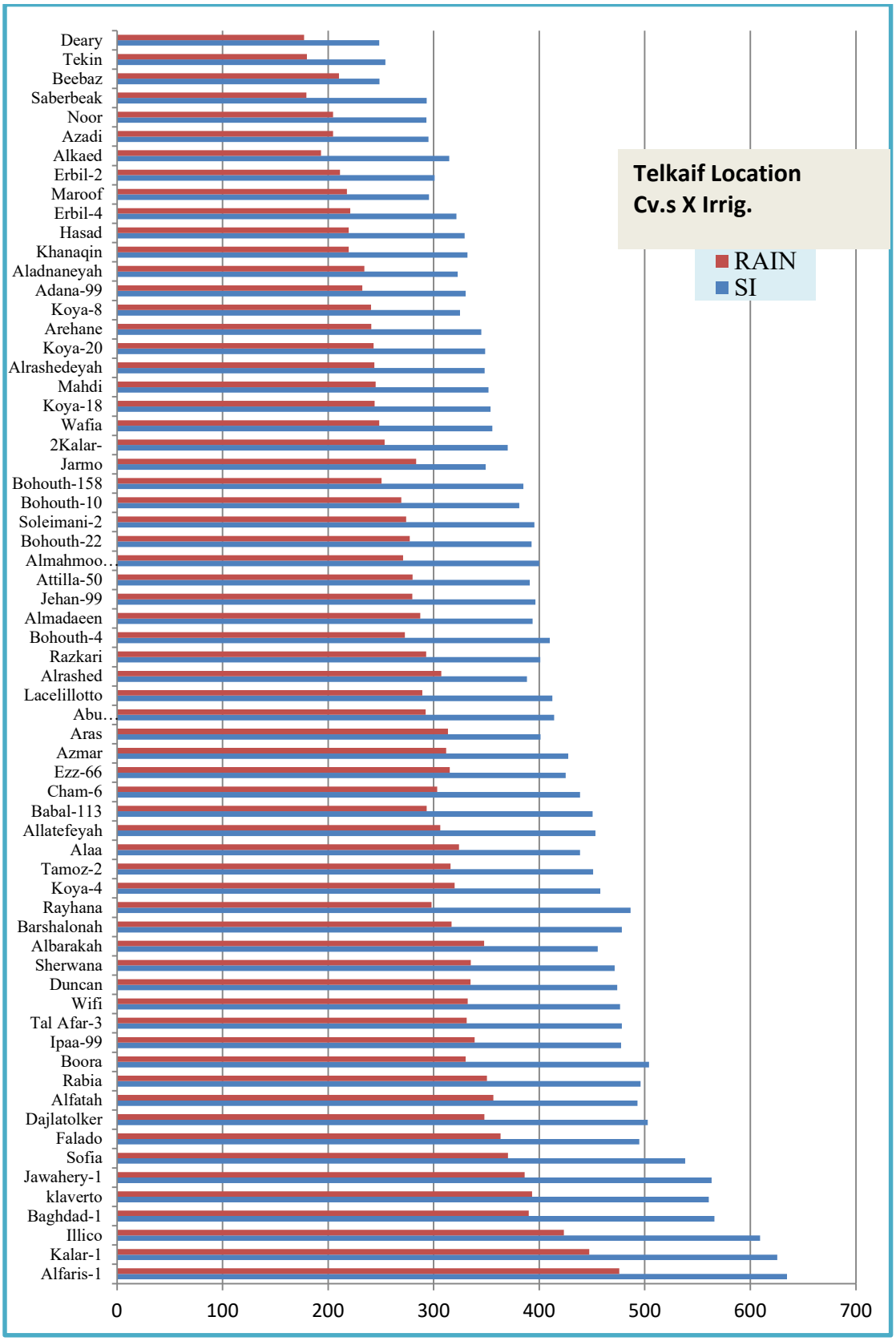
300
350


Telkaif Location
Cv.s X Irrig.
RAIN
SI
Deary
Tekin
Beebaz
Saberbeak
Noor
Azadi
Alkaed
Erbil-2
Maroof
Erbil-4
Hasad
Khanaqin
Aladnaneyah
Adana-99
Koya-8
Arehane
Koya-20
Alrashedeyah
Mahdi
Koya-18
Wafia
2Kalar-
Jarmo
Bohouth-158
Bohouth-10
Soleimani-2
Bohouth-22
Almahmoo…
Attilla-50
Jehan-99
Almadaeen
Bohouth-4
Razkari
Alrashed
Lacelillotto
Abu…
Aras
Azmar
Ezz-66
Cham-6
Babal-113
Allatefeyah
Alaa
Tamoz-2
Koya-4
Rayhana
Barshalonah
Albarakah
Sherwana
Duncan
Wifi
Tal Afar-3
Ipaa-99
Boora
Rabia
Alfatah
Dajlatolker
Falado
Sofia
Jawahery-1
klaverto
Baghdad-1
Illico
Kalar-1
Alfaris-1
0
100
200
300
400
500
600
700