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EFFECT OF IRRIGATION PERIODS AND SOIL COVERING ON THE GROWTH AND YIELD OF TWO CORN CULTIVARS (*ZEA MAYS* L.)

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Abstract

A field experiment was carried out during the autumn season 2020 in one of the agricultural fields in the Bida'a Al-Musayyab region, located north of Babil Governorate, at 45.49° longitude and 36.16° width, objective was to investigate the effect of irrigation periods and soil covering with plant residues on the growth and yield of two corn cultivars. A split- split plot design in the arrangement of randomized complete block design (RCBD) with four replicates was used. The main plots included two corn cultivars (Fajr1 and Baghdad3), while the irrigation periods (4, 8 and 12) days were placed in the sub-plots, two soil cover methods used (covering with straw and control) occupied the in sub-sub plots. The results showed that there was a significant difference between the three study factors, in addition, presence of significant differences for some tow way interactions. The irrigation every 4 days achieved the highest average of the plant height 195.12 cm, number of leafs 16.36, leaf area 696.0 cm2, chlorophyll index (SPAD) 62.98, number of ears. plant^{-1} 1.68, number of grains per ear 598.2 grains.ear^{-1} and grain yield 12.34 ton. ha^{-1} compared to irrigation every 12 days, which recorded the lowest averages for the same characteristics. The soil coverage treatment superior in all characteristics of this study which recording the highest average for plant height, number of leafs, leaf area, chlorophyll index, number of ears, number of grains per ear and total yield, which amounted 186.06 cm, 15.43 leaf. Plant^{-1}, 658.4 cm^2, 57.67 SPAD, 1.66 ear. Plant^{-1} and 11.32 ton. ha^{-1} respectively. While the two cultivars Fajr1 and Baghdad3 were differed in their results, the cultivar Fajr1 outperformed in plant height 184.57 cm, leaf area 648.1 cm^2, chlorophyll index (SPAD)57.72, number of ear. Plant^{-1} 1.68, number of grains. Ear^{-1} 573.1, and total yield 11.22 ton. ha^{-1}. compared to the Baghdad3 cultivar.
Keyword: Corn, cultivars, irrigation periods, soil covering

Introduction

The corn (*Zea mays* L.) is one of the most important cereal crops in the world and Iraq for its good nutritional value for human consumption and animal diets, after wheat and rice of area and production. The statistics indicated that the area planted with corn in the 2020 amounted 101000 hectares, it produced 419000.3 tons, with an average production of 4137.2 kg. ha^{-1} (Central Statistical Organization / Directorate of Agricultural Statistics, 2020). The agricultural sector all over the world today is faced to water deficit, not only because of the increased demand for water, but also because of climatic changes and frequent droughts, which significantly reduce the production in most basic agricultural crops. Homayonfar et al. (2014). Iraq is located in the arid and semi-arid region which lack of green a spaces due to great impact on climatic changes especially in the last decade. This requires serious thinking about how to rationing use of water in agriculture, especially for summer crops including corn, as it needs large quantities Quite big water. It is necessary to search for a way to reduce water consumption, in order to maintain production with the least amount of water possible (Al-Aboudi et al., 2014). Adaptive cultivars for better production and modern technologies resulted a significant improvement in agricultural production, however, the population increased and climatic changes in the recent few years that caused the depletion of soil and water resources which created new challenges most worrying is the lack of water needed for irrigation that caused a shortage of crop production with all these obstacles. A balance in yield can be achieved when using efficient management of soil and water resources through scheduling irrigation within a certain period of time, which is one of the matters related to the growth and productivity of the crop (Depar et al. 2014). The application of more than one method or/and efficient field practice to reduce water losses and consumption has become a priority for workers in the agricultural field. Covering the soil surface play role to modify its temperature that led to reducing water loss by evaporation. Furthermore, can be considered one of the efficient management practices that provide an appropriate environment that is reflected in the crop growth through its significant impact on the soil electrical conduction, composition, biological system, organic matter and its content of major and minor nutrients elements, thus, yield of crops increases. (Pakdel et al. 2013). Al-Roumi (2017) confirmed that exposing corn to irrigation periods (5 and 10) days had a significant effect on the vegetative growth characteristics and negatively affected on the yield components. Abd et al. (2014) found that the 5 and 10-day irrigation periods negatively affected on the number of grains in the ear, and weight of the grain which decreased total yield. Therefore, this study aimed to evaluate the yield of two cultivars of corn to prevent irrigation, soil covering and their effect on reducing water consumption in the central Iraqi regions.

Material and methods

A field experiment was carried out on corn crop during the autumn season 2020 in one of the agricultural fields in the Bida'a Al-Musayyab region located in the north of Babylon Governorate at 45.49º longitude and 36.16º width. The soil was plowed two orthogonal plowing using the inverter plow after adding 440 kg. ha^{-1} DAP fertilizer NPK (18.46.0) when soil preparing. Urea fertilizer was added at 690 kg. ha^{-1} in two batches, one of third amount when planting date and the rest after 45 days of planting (Hamdan and Bektas, .2011) after that breaking- up of soil and leveled before planting and the seeds were planted on 20/7/2020. The experimental had three replicates, the area of the experimental unit (4×3) m^2 with 12 experimental units in each replicate, with a distance between the rows of 75 cm and 25 cm between plants each unit had 5 rows, with 1.5 m distance between the experiments unit and 1.5 m between the replicates to avoid water leakage between the experimental during irrigation time. The complete randomized block design RCBD was used with split-split plot design. The main plots included the cultivars (Fajr1 and Baghdad3), while the irrigation periods (4, 8 and 12) days were placed in the sub-plots, two soil cover methods used (covering with straw and control) occupied the in sub-sub plots. Corn stem borer was controlled by granulated diazinon application when the plant reached the fifth true leaf.After corn maturated the ears were harvested, the yield and its components were calculated for ten plants taken at random from each experimental unit. Field soil samples were analyzed in the laboratories of the Soil and Water Resources Department of the College of Agriculture / Al-Qasim Green University as shown in Table (1).

Table (1): Some of the chemical and physical properties from experiment field soil.

Properties	**Value**
Sand (g. Kg^{-1})	304
Silt (g. Kg^{-1})	340
Clay (g. Kg^{-1})	356
Texture class	Silty clay
pH	7.2
EC (dSm^{-1})	3.0
Organic matter (g. Kg^{-1})	1.2
Available N (mg. Kg^{-1})	40.3
Available P (mg. Kg^{-1})	15.1
Available K (mg. Kg^{-1})	188

vegetative growth indicators

These indicators were measured when the plant population reached 50% tasseling growth stage in each experiment unit as follows:

- Plant height (cm)

The height of the plants was measured starting from the soil surface to up to the tip of the tassel of male flower (Al-Sahoki, 1990) by using a steel tape measure listed in centimeters.

- Number of leafs (leaf. $plant^{-1}$)

Mean number of leafs in plant has been calculated from 10 plants randomly chosen from each experiment unit.

- leaf area (cm^2)

The leaf area measured by calculating the leaf placed under the ear in each plant according to the equation approved by (EL-Sahooki, 1985) as follows:

Leaf area (cm^2) = Leaf length (cm) x Maximum leaf width (cm) x 0.75.

- chlorophyll content SPAD reading

The chlorophyll content was determined by using portable Chlorophyll meter type SPAD-502. The reading was taken form ten plants randomly chosen for each experimental unit, three readings for three leafs for each plant then according to the average based on the method used by (Jemison and Williams, 2006).

Yield and its components indicators

Yield indicators were measured at the harvest time with full plants maturity. A random 10 plants were taken from each experiment unite, the measurements as follows:

- Number of ears (ear. plant^{-1})

The number of ears were calculated randomly from means of 10 plants.

- Number of grains per ear (grain. ear^{-1})

Randomly 10 ears were taken from each experiment unit and calculate number of grain then according to the average.

- 500 grain weight (gm)

A sample of 500 grain randomly was taken from each experiment unit then weighted by a sensitive scale after seeds dried and the moisture stability at 15.5% (Al-Sahoki, 1990).

- Grain yield (tons. ha^{-1})

The grain yield weight calculated after adjusting the humidity of seeds at 15.5% by multiplying the yield of one plant by the plant population in each experiment unit area.

- Statistical analysis

The data were statistically analyzed by using the randomized complete block design (RCBD) in the order of the split-split plot design. Means were compared using the least significant difference (L.S.D) test at the 5% level (Steel and Torrie, 1980) using the Genstat program edition 6.

Results and discussion

Plant height (cm)

The results of data analysis showed that there is a significant effect of the cultivars on plant height, the Fajr1 cultivar reached average of 184.57 cm plant height compare to Baghdad3 cultivar with lower plant height 181.62 cm table (2). In similar, irrigation periods had a significant effect on plant height, irrigation period every 4 days have achieved 195.12 cm, lower plant height was 167.90 cm at 12 days irrigation period treatment. in the same way, soil covering showed a significant effect on plant height 186.06 cm compared to non-covering treatment which recorded lowest plant height 180.13 cm. Plant heights reduction due irrigation period spaced 4 to 12 days as a result of the lack of nutrients needed for cell elongation and increase in their number (Dawood, 2016). These results agree with Hameedi and others (2015). Soil coverage had a role in increasing plant height by preserving fertilizers especially the nitrogen that found in the surface soil layer, which has an essential role of these fertilizers in elongating cells and increasing their number (Yi et al. 2010). The table (2) also shows that there are no significant differences for the two and three way interactions between the experimental factors in plant height.

Table (2). Effect of cultivar, irrigation periods (days), soil covering and their interactions on plant height (cm).

		Soil covering		
Cultivars	Irrigation periods	Covering	Control	Cultivars X Irrigation periods
Fajr1	4	197.67	193.59	195.63
	8	190.67	185.30	187.98
	12	173.07	167.00	170.04
Baghdad3	4	196.20	192.97	194.58
	8	188.37	180.70	184.53
	12	170.40	161.07	165.73
	L.S.D 0.05		NS	NS
	Means of Soil covering	186.06	180.13	
	L.S.D 0.05		3.65	
				Means of Cultivars
Cultivars X Soil covering	Fajr1	187.13	182.01	184.57
	Baghdad3	184.99	178.24	181.62
	L.S.D 0.05		NS	NS
				Means of irrigation periods
Irrigation periods X Soil covering	4	196.93	193.32	195.12
	8	189.52	183.00	186.26
	12	171.73	164.07	167.90
	L.S.D 0.05		NS	4.11

Number of leafs (leaf. plant-1)

The results of Table (3) indicate that there is no significant effect of the cultivars on the number of leafs per plant. In other hand, there was a significant difference in irrigation periods, as irrigation every 4 days was superior in achieving the greatest number of leafs 16.36 leaf. plant^{-1}, and it differed significantly from irrigation periods every 8 and 12 days which recorded the lowest average number of leafs per plant 15.35 and 13.30 leaf. plant^{-1} respectively. Moreover, the soil covering treatment also had a significant effect in leafs number per plant which recorded 15.43 leaf. plant^{-1} compared to non-covering soil 14.57 leaf. plant^{-1}. Two-way interaction was a significant between irrigation periods with soil covering, greatest number of leafs per plant achieved at irrigation every 4 days with soil covering 16.59 leaf. plant^{-1}. While lowest number of leafs per plant was at irrigation every 12 days with non-covering soil treatment 12.82 leaf. plant^{-1}. The reduction of number of leafs per plant may due to the lack of water in the leaf cells that needed to new tissues and cells synthesis. Also, the soil covering maintains balanced temperatures which that accelerates cell growth and development thus accelerates cells differentiation (Bu et al. 2013).

Table (3). Effect of cultivar, irrigation periods (days), soil covering and their interactions on Number of leafs (leaf. plant-1)

		Soil covering		Cultivars X Irrigation periods
Cultivars	Irrigation periods	Covering	Control	
Fajr1	4	16.56	16.06	16.31
	8	15.86	14.59	15.23
	12	13.69	12.87	13.29
Baghdad3	4	16.63	16.19	16.41
	8	16.00	14.94	15.47
	12	13.86	12.77	13.31
	L.S.D 0.05		NS	NS
	Means of Soil covering	15.43	14.57	
	L.S.D 0.05		0.27	
				Means of Cultivars
Cultivars X Soil covering	Fajr1	15.37	14.51	14.94
	Baghdad3	15.50	14.63	15.07
	L.S.D 0.05		NS	NS
				Means of irrigation periods
Irrigation periods X Soil covering	4	16.59	16.13	16.36
	8	15.93	14.77	15.35
	12	13.78	12.82	13.30
	L.S.D 0.05		0.42	0.32

Leaf area (cm2)

The results in table (4) illustrated that there is a significant effect of cultivars on leaf area. The Fajr1 cultivar recorded great leaf area valued 648.1 cm^2 while the Baghdad3 cultivar recorded lowest leaf area 643.5 cm^2. Soil covering with wheat straw also showed a significant effect on plant leaf area reached up to cm^2 compare to non-covering which recorded 633.2 cm^2. Water stress at the growth stages prevent cells elongation that cause negatively affected the leaf area as well as this is one of the plants mechanism to face of non-biotic stresses to reduce water loss from the plant by the transpiration pathway (Prasad et al., 2008). These results are in agreement with what was found by Al-Mohammadi et al. (2015). Soil with no covering would enhance water loss due the evaporation with high soil temperature thus led to decrease leaf expansion and increased aging process. This was confirmed by Bu and others (2013) that soil covering with wheat straw especially at vegetative growth stages significantly increased the leaf area and leaf area index for corn resulted increase in crops biomass and yield. Only two-way interaction between irrigation periods with soil covering was significant in leaf area, irrigation every 4 days with soil covering maximized leaf area 701.5 cm^2 while the lowest leaf area was 569.0 cm^2 at irrigation every 12 days with non-covering soil.

Table (4). Effect of cultivar, irrigation periods (days), soil covering and their interactions on Leaf area (cm2).

		Soil covering		Cultivars X Irrigation periods
Cultivars	Irrigation periods	Covering	Control	
Fajr1	4	703.4	692.5	697.9
	8	666.5	643.4	655.0
	12	611.7	571.1	591.4
Baghdad3	4	699.7	688.4	694.1
	8	662.8	637.0	649.9
	12	606.3	567.0	586.6
L.S.D 0.05			NS	NS
Means of Soil covering		658.4	633.2	
L.S.D 0.05			10.96	
				Means of Cultivars
Cultivars X Soil covering	Fajr1	660.5	635.7	648.1
	Baghdad3	656.3	630.8	643.5
L.S.D 0.05			NS	4.23
				Means of irrigation periods
Irrigation periods X Soil covering	4	701.5	690.5	696.0
	8	664.7	640.2	652.4
	12	609.0	569.0	589.0
L.S.D 0.05			12.11	6.43

Chlorophyll content SPAD reading

Table (5) shows the superiority of Fajr1 cultivar in the mean of chlorophyll SPAD reading scored 57.72, and it differed significantly from Baghdad3 cultivar which achieved 57.72 SPAD. The irrigation period every 4 days scored highest SPAD reading was 62.98 SPAD, in other hand, irrigation every 12 days recorded lowest SPAD reading was 48.84. The data analysis showed a significant effect of soil covering on SPAD reading, highest SPAD achieved with soil covering 57.67, compared to non-covering treatment which recorded the lowest average of 54.85 SPAD. This is reduction may be due the plant under water stress affected on the chlorophyll synthesis and cell shrinkage as a result of dehydration that led to increases the enzymes activity that responsible for rupture of the grana and plastids membranes inside the cell and accelerates their aging which caused a decrease in the chlorophyll content in leaves (Elgamaal and Maswada, .2013). Furthermore, water stress had an effect in reducing the leaves relative water content which caused inhibition of the carbon metabolism process as a result of partial or total stomata closure and lack of carbon dioxide exchange that reflected in the growth of chloroplasts and the reduction of pigment concentrations, including chlorophyll (Ahmed, 2007). This result agreed with Al-Qaisi (2017) who reported that a decrease in chlorophyll content due to the effect of irrigation periods.

In the same way, the soil covering have a role to maintained soil structure and composition and increased the percentage of organic carbon in the soil led to improve percentage of leaf chlorophyll (Jordan et al, 2010). Concluded from the data of table (5) that there are no significant differences for the two-way and three-way interactions of this trait in all study parameters.

Table (5). Effect of cultivar, irrigation periods (days), soil covering and their interactions on Chlorophyll content SPAD reading.

		Soil covering		
Cultivars	Irrigation periods	Covering	Control	Cultivars X Irrigation periods
Fajr1	4	64.70	62.66	63.68
	8	59.43	57.23	58.33
	12	53.46	48.83	51.14
Baghdad3	4	62.79	61.76	62.28
	8	57.39	53.83	55.61
	12	48.23	44.80	46.52
	L.S.D 0.05		NS	NS
Means of Soil covering		57.67	54.85	
	L.S.D 0.05		2.34	
				Means of Cultivars
Cultivars X Soil covering	Fajr1	59.19	56.24	57.72
	Baghdad3	56.14	53.47	54.81
	L.S.D 0.05		NS	1.60
				Means of irrigation periods
Irrigation periods X Soil covering	4	63.75	62.21	62.98
	8	58.41	55.53	56.97
	12	50.84	46.83	48.84
	L.S.D 0.05		NS	4.10

Number of ears (ear. plant^{-1})

Two corn cultivars had a significant effect on number of ears per plant, the Fajr1 cultivar recorded great number of ears was 1.68 ear. plant^{-1} while the Baghdad3 cultivar had the lowest averaged 1.53 ear. plant^{-1} table (6). The result in same table showed that there is a significant difference as a result of the effect of irrigation periods and soil covering on the two corn cultivars, irrigation period every 12 days caused a significant decrease in number of ears per plant recorded lowest average 1.39 plant. ear^{-1}, compared to irrigation every 4 days treatment which achieved the highest average of 1.79 plant. ear^{-1}. Water stress under spaced of irrigation 4 to 12 days may be attributed to directly or indirectly effect of leaf area and thus affect the Photosynthesis efficiency process and some other physiological processes (Al-Alusi, 2006), these results agreed with Al-Roumi (2017) found. The soil covering had an effect on the superiority of the number of ears per plant recorded as 1.66 plant. ear^{-1} compared non-covering treatment scored lowest ears per plant 1.58 plant. ear^{-1}. this results agreement with what was indicated by Xu et al. (2015) that the soil covering significantly increased the number of ears per hectare. When there are no significant differences for the interaction between the three characteristics of the study in this trait.

Table (6). Effect of cultivar, irrigation periods (days), soil covering and their interactions on number of ears (ear. plant-1).

		Soil covering		Cultivars X Irrigation periods
Cultivars	Irrigation periods	Covering	Control	
Fajr1	4	1.93	1.83	1.88
	8	1.77	1.62	1.70
	12	1.51	1.41	1.46
Baghdad3	4	1.72	1.66	1.69
	8	1.64	1.50	1.57
	12	1.39	1.25	1.32
	L.S.D 0.05		NS	NS
	Means of Soil covering	1.66	1.58	
	L.S.D 0.05		0.06	
				Means of Cultivars
Cultivars X Soil covering	Fajr1	1.74	1.62	1.68
	Baghdad3	1.59	1.47	1.53
	L.S.D 0.05		NS	1.40
				Means of irrigation periods
Irrigation periods X Soil covering	4	1.83	1.75	1.79
	8	1.71	1.56	1.63
	12	1.45	1.33	1.39
	L.S.D 0.05		NS	0.08

Number of grains per ear (grain. ear^{-1})

The results of table (7) shows that there is no significant effect of cultivars on number of grain per ear. While the irrigation periods treatment had a significant effect on number of grain per ear, the highest number of grain per ear recorded 598.2 grain. ear^{-1} in irrigation every 4 days compared to irrigation every 12 day treatment which scored lowest valued 532.5 grain. ear^{-1}. The lack of water during or/and before flowering period cause a disturbance in the plant physiological processes resulted affect the readiness of pollen grains for ovaries fertilization subsequently reduces the number of grains in the ear due to the failure of fertilization (Setter et al., 2001). This agrees with what was reached by Marino et al. (2004) they are indicated that water stress in the flowering stage affects the process of flowering. The soil covering with straw resulted greatest number grain per ear averaged 579.8 grain. ear^{-1} compared to non-covering treatment which recorded lowest number of grains 558.9 grain. ear^{-1}. The superiority of soil covering treatment due to role in inhibiting the evaporation of moisture from the soil surface which increased the accumulation of biomass in the early stages and benefiting from it in the later stages, this is what was found by Xu et al. (2015) who confirmed that covering the soil in dry seasons increased the number of grains per ear. Tow-way interaction between irrigation periods with soil covering was significant, the irrigation every 4 days with soil covering recorded the highest number of grain per ears 604.0 grain. ear^{-1} while irrigation every 12 days with non-covering treatment scored lowest grain number 514.5 grain. ear^{-1}.

Table (7). Effect of cultivar, irrigation periods (days), soil covering and their interactions on number of grains per ear (grain. ear-1).

		Soil covering		Cultivars X Irrigation periods
Cultivars	Irrigation periods	Covering	Control	
Fajr1	4	608.7	596.6	602.7
	8	588.2	573.9	581.0
	12	554.5	516.8	535.7
Baghdad3	4	599.3	588.4	593.8
	8	581.5	565.6	573.5
	12	546.5	512.3	529.4
	L.S.D 0.05		NS	NS
	Means of Soil covering	579.8	558.9	
	L.S.D 0.05		7.36	
				Means of Cultivars
Cultivars X Soil covering	Fajr1	583.8	562.4	573.1
	Baghdad3	575.8	555.4	565.6
	L.S.D 0.05		NS	NS
				Means of irrigation periods
Irrigation periods X Soil covering	4	604.0	592.5	598.2
	8	584.8	569.7	577.3
	12	550.5	514.5	532.5
	L.S.D 0.05		8.14	4.78

500 grain weight (gm)

The analysis of data for 500 grain weight showed there is a significant difference between cultivars, the highest 500 grain weight 147.33 g obtained for Fajr1 cultivar compared to lowest weight recorded 144.80 g for Baghdad3 cultivar table (8). In contrast, there were no significant differences of irrigation periods and soil covering on 500 grain weight and this is contrary to what was found by Yi et al. (2011) that soil covering with straw caused a significant difference in weight grain which directly affected the grain yield and is compatible with what was found by Kong et al. (2020) who found that covering the soil increased the weight of 100 grains compared to non-covering soil. In the same way, the table (8) show that there are no significant differences for two-way and three-way interactions in 500 grain weight, no effect presence may be because the compensation condition that occurs between the yield components.

Table (8). Effect of cultivar, irrigation periods (days), soil covering and their interactions on 500 grain weight (gm).

Cultivars	Irrigation periods	Soil covering: Covering	Soil covering: Control	Cultivars X Irrigation periods
Fajr1	4	147.00	146.60	146.80
	8	146.14	147.39	146.77
	12	148.18	148.17	148.42
Baghdad3	4	143.87	143.42	143.64
	8	144.54	144.96	144.75
	12	145.71	146.33	146.02
	L.S.D 0.05		NS	NS
Means of Soil covering		145.90	146.23	
	L.S.D 0.05		NS	
				Means of Cultivars
Cultivars X Soil covering	Fajr1	147.10	147.55	147.33
	Baghdad3	144.70	144.90	144.80
	L.S.D 0.05		NS	1.29
				Means of irrigation periods
Irrigation periods X Soil covering	4	145.43	145.01	145.22
	8	145.34	146.18	145.81
	12	146.94	147.50	147.32
	L.S.D 0.05		NS	NS

Grain yield (ton. ha-1)

The Fajr1 cultivar achieved highest grain yield of 11.22 ton. ha^{-1} compare to lowest grain yield 10.82 ton. ha^{-1} recorded by Baghdad3 cultivar table (9). The same table results indicated that there is a significant differences of irrigation periods treatments which irrigation every 4 days maximized grain yield 12.34 ton. ha^{-1} while irrigation every 12 days recorded lowest grain yield 9.34 ton. ha^{-1}. Yield reduction mainly come from reduce of yield components due to water stress, high temperature, and low relative humidity during the flowering and fertilization and ovaries formation growth stage consequently insufficiency of photosynthesis products led to less number of grain and small grain size with grain shrinkage thus affects grain weight then total yield. These results were in agreement with the results of Desoky et al. (2021) and Al Shubr (2021) they recorded that the spacing of irrigation periods significantly affected the decrease in grain yield per unit area. Soil covering treatment obtain highest grain yield 11.32 ton. ha^{-1} contrast to non-covering soil treatment which recorded lowest yield 10.73 ton. ha^{-1}. Soil covering have essential role in increasing yield may be due to maintaining soil moisture at the critical growth stages and decrease water loss pathway with benefit of water availability during reproductive stages which led to increase yield components and reflected on the total yield, this was confirmed by Li et al. (2013) that soil coverage increased the grain yield by 20- 30% compared to non-covering soil. A significant difference was showed in two-way interaction between irrigation periods and soil covering, irrigation every 4 days with soil covering maximized yield 12.48 ton. ha^{-1} while lowest yield 9.07 ton. ha^{-1} achieved in irrigation every 12 days with non-covering soil treatment. No significant differences in other interactions.

Table (9). Effect of cultivar, irrigation periods (days), soil covering and their interactions on Grain yield (tons. ha^{-1}).

		Soil covering		Cultivars X Irrigation periods
Cultivars	Irrigation periods	Covering	Control	
Fajr1	4	12.72	12.38	12.55
	8	12.00	11.07	11.54
	12	9.84	9.29	9.57
Baghdad3	4	12.24	12.01	12.13
	8	11.66	10.75	11.21
	12	9.42	8.83	9.13
	L.S.D 0.05		NS	NS
Means of Soil covering		11.32	10.73	
	L.S.D 0.05		0.22	
				Means of Cultivars
Cultivars X Soil covering	Fajr1	11.52	10.92	11.22
	Baghdad3	11.11	10.53	10.82
	L.S.D 0.05		NS	0.29
				Means of irrigation periods
Irrigation periods X Soil covering	4	12.48	12.19	12.34
	8	11.84	10.92	11.37
	12	9.63	9.07	9.35
	L.S.D 0.05		0.35	0.28

Conclusion

In summary, this study concludes that there is an evidence soil covering with plant residue such as wheat straw resulted decrease in water loss with high water use efficiency mainly at vegetative growth stages subsequently modifying soil environment and increasing production. In addition, irrigation periods showed great impact in all vegetative and reproduction parameters, irrigation every 12 days decrease all corn parameters in this study compare to irrigation every 4 days which maximized growth and productive parameters, less impact with 8 days irrigation period. Based on the foregoing, soil covering can be provided resilience to spacing irrigation periods due less water losing and high water use efficiency especially at early growth stages.

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