Calculation of Water Requirement for Peanuts (*Arachis hypogaea* L.) Using IW:CPE Ratio

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Abstract

A field experiment was conducted during the spring of 2021 at the University of Fallujah. Three irrigation coefficients were adopted: The ratio of Irrigation Water to evaporation from the Cumulative Pan Evaporation has a value of 0.75, 1.0, and 1.25. The results showed that the irrigation interval had variable values and decreased with the increase in the experimental basin coefficient's value and with the growing season's progression. The treatment 1.25 achieved an advantage in results. It was found that the water requirement of peanut plants during the season was 519.74 mm on average when adopting the irrigation water to evaporation from the cumulative evaporation ratio as a treatments in irrigation scheduling. The results showed significant differences between irrigation treatments and the vegetative growth characteristics of peanut plants, such as the average plant height, the number of branches per plant, and the yield. The effect of irrigation treatments on the yield and its components of the peanut plants showed that the 1.25 treatment was superior to the yield, which amounted to 3.2 tons ha^{-1}. The results showed a clear trend in the relationship between irrigation treatments and water unit productivity. The treatment 1.25 was significantly superior to the 1.0 and 0.75 treatments in water unit productivity, which amounted to 7.04 kg m^{-3}, while the lowest value for water unit productivity was 4.78 kg m^{-3}. For the transaction, 0.75.

Keywords: water requirements, IW:CPE ratio, Peanuts.

حساب الاحتياجات المائية لفستق الحقل (*Arachis Hypogaea* L.) باستخدام نسبة IW:CPE

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المستخلص

نفذت تجربة حقلية خلال الموسم الربيعي 2021 في موقع الجامعي لجامعة الفلوجة. تم اعتماد ثلاثة معاملات للري وهي نسبة مياه الري الى التبخر من حوض التبخر التراكمي ذات قيمة 0.75 و 1.0 و 1.25. أظهرت النتائج أن فترات الري كانت ذات قيم متغيرة ومتناقصة مع زيادة قيمة معامل الحوض التجريبي ومع تقدم موسم النمو. حققت المعاملة 1.25 أفضلية في النتائج. وجد أن الاحتياجات المائية لنباتات فستق الحقل خلال الموسم بلغت 519.74 ملم كمتوسط لاعتماد نسبة مياه الري الى التبخر من حوض التبخر التراكمي كمعاملات في جدولة الري. أظهرت النتائج وجود فروق معنوية بين معاملات الري وصفات النمو الخضري لنباتات فستق الحقل مثل متوسط ارتفاع النبات وعدد الأفرع في النبات الواحد والمحصول. أظهرت النتائج تأثير معاملات الري في المحصول ومكوناته لنباتات فستق الحقل .تفوق المعاملة 1.25 في ناتج المحصول الذي بلغ 3.2 طن هكتار$^{-1}$. أظهرت النتائج وجود اتجاه واضح في العلاقة بين معاملات الري وإنتاجية وحدة المياه حيث تفوقت المعاملة 1.25 معنويا على المعاملة 1.0 و 0.75 في إنتاجية وحدة المياه والتي بلغت 7.04 كغم م$^{-1}$، في حين بلغت أقل قيمة لإنتاجية وحدة المياه 4.78 كغم م$^{-1}$ للمعاملة 0.75.

الكلمات المفتاحية: متطلبات مائية، نسبة IW:CPE، فستق الحقل.

Introduction

The peanut, *Arachis hypogaea* L, is a forage oil crop from the leguminous family. It is of great economic importance because its seeds contain a high percentage of oil, which ranges between 47-53% and a percentage of protein, which runs between 25-36% (P.V. et al.2010). Second, after olives (Nseef and Salmen 2015). It is grown in large areas in Iraq, where the Directorate of Agricultural Statistics in the Central Bureau of Statistics estimated the area cultivated with this crop to be 3,151 dunums in 2020, and its total production reached 1,797 tons (Central Statistical Organization. 2022). (Ross.1999). The peanut plant is divided into four stages of plant growth: vegetative growth, branching, flowering, formation of spurs, and maturity. Irrigation is part of the essential administrative processes for vegetable crops because of its role in determining the quantity and quality of the crop, especially in light of dry and semi-arid climatic conditions, which requires effective and efficient exploitation of water within optimal management planning to meet the water needs of crops (Tawfeek. 2006). Many researchers have relied on climate data to find water consumption and schedule irrigation as a ratio between added Irrigation Water and the Cumulative Pan Evaporation CPE (Pawar et al.

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1993) (Hussaini and Amans 2000) (Jakson 1973). The balance between Irrigation Water and the Cumulative Pan Evaporation IW: CPE can be called the perfusion factor or the experimental evaporation basin factor Ef. Increasing this factor above 1.0 means increased perfusion; when it decreases below 1.0, it means there is a state of moisture stress. (Pahalwan and Tripathi 1984) Found that beans require the highest frequency of irrigation scheduled during the pegging stage, to pod formation, then pod development, to maturity, and then to flowering. The highest pod yield and water use efficiency were obtained when irrigation was scheduled based on Irrigation water IW and collected evaporation from the cumulative pan evaporation CPE at a ratio of 0.5 Ef during the germination stage to flowering, a percentage of 0.9 Ef during the pegging stage to the pod formation stage, and a ratio of 0.7 Ef during the pod development stage to flowering. (Hussainy and Vaidyanathan 2019) found that providing irrigation with an IW:CPE ratio of 0.75 increased productivity, which led to achieving high productivity of intercrops compared to a single crop. (Lokhande et al. 2018) will conclude that the highest productivity of summer peanuts can be obtained when irrigating the crop with 15 irrigations, which was achieved at a ratio of 1.0 IW: CPE in different regions in India. (S.K. et al. 2022) used IW:CPE irrigation ratios of 0.6, 0.8 and 1.0, and the IW:CPE ratio of 1.0 gave high production characteristics such as the number of pods 24.7 plants^{-1} and the number of branches 10.5 plants^{-1}. (Chandini. et al. 2022) pointed out that for different irrigation scheduling, at the IW:CPE ratio of 1.0, the highest pod productivity of 3175 kg ha^{-1} and crop productivity of 4291 kg ha^{-1} were recorded, significantly superior to the IW:CPE ratio of 0.6. (Al-Dulimy 2016) the water requirement of cowpea plants grown during the spring season was 254.15 mm on average when a 1.2 IW:CPE ratio was adopted in scheduling irrigation.

This study aimed to determine the water requirements of the peanut crop using a ratio of The amount of water added to the cumulative pan evaporation.

Material and Methods

A field experiment was carried out during the spring of 2021 at the University of Fallujah's site at longitude 36°.47'—43" east and latitude 26°.21'.33" north in soil with a sandy loam texture. (Table 1) shows the soil's chemical and physical properties and a sample of irrigation water. Samples representative of the field soil were taken to a depth of 0-60 cm, air-dried, ground, and sieved through a sieve with a hole diameter of 2 mm. Some chemical and physical properties were estimated according to the standard methods mentioned in (Jakson 1973). A drip irrigation system was used, consisting of a control unit and a distribution network with a mainline that was 10 m long and branch lines that were 5 m long and 16 mm in diameter. The distance between one line and another was 0.8 m, and between one drip and another, 0.4 m with drainage—capacity of 4 litres.hour^{-1} at a pressure of 1 bar. Three irrigation coefficients were adopted: (Ef)0.75 IW: CPE, (Ef)1.0 IW: CPE, and (Ef)1.25 IW:CPE. The experimental parameters were arranged in a completely randomized block design with three replications. The data were analyzed using ANOVA using Duncan's test to compare means. The data were analyzed using the MSTAT-C program. The depths of water and the irrigation interval were calculated depending on the ready water, the difference between the field capacity and the wilting point, and in terms of the permissible

Table 1. Some chemical and physical properties of soil for a sample of irrigation water.

Depth(cm)	Texture	Bulk density (meg.m^{-3})	Wilting point (%)	Field capacity (%)	E.Ce (ds.m^{-1})	E.C for IW (ds.m^{-1})
0.0-0.20	Sandy loam	1.32	14.5	32.3	3.87	0.86
0.20-0.40					3.53	
0.40-0.60					3.26	

Limit of moisture depletion- Management Allowed Depletion MAD- of 30% for the peanut to a depth of 45 cm according to (Phocaides 2000). Planting took place on 1/4/2021. A depth of water equivalent to 42 mm was added after planting for all treatments for germination, depending on Equation No. 1 and in terms of initial soil moisture.

$$d = (\theta_{fc} - \theta_{bi}) \times D \ldots\ldots\ldots 1$$

whereas:

d = depth of water to be added cm.

θfc = volumetric soil moisture at field capacity cm.cm^{-3}

θbi = volumetric soil moisture before irrigation cm.cm^{-3}

D = soil depth cm.

Irrigation scheduling began according to the experimental parameters after the completion of the emergence of the seedlings, starting from 10/4/2021 to 30/8/2021. Fertilization was done by adding ammonium nitrate, 1595 mg L^{-1}, phosphoric acid, 348 mg L^{-1}, and potassium sulfate, 1984 mg L^{-1}, and through a fertilization irrigation system. Equation No. 2 was adopted in calculating the Cumulative Pan Evaporation -CPE- in terms of Ef =IW/CPE, assuming ratios of 0.75, 1.0, and 1.25 Ef, where IW=AM×AMD.mg L^{-1}

$$AW = (F.C - WP) \times \rho b \ldots\ldots\ldots 2$$

CPE=AW ×MAD/Ef ………3

$$Ef = \frac{IW}{CPE} \ldots\ldots\ldots 4$$

Whereas:

AW = Actual ready water depth mm

F.C = field capacity

WP = wilting point

ρb = bulk density

CPE = Evaporation from Collective Pan Evaporation mm

MAD = Management Allowed Depletion, which is equal to 30% according to the organization's description (FAO 1984)

IW = permissible limit of exhaustion multiplied by the actual ready water depth

EF = Experimental Evaporation Basin Factor 0.75, 1.0 and 1.25 represents irrigation coefficients and expresses the ratio between IW CPE.

(Table 2) shows the CPE values for the coefficients Ef 0.75, 1.0, and 1.25 for April through equations 2, 3, and 4 and the same way for the rest of May, June, July, and August.

Table 2 CPE values for coefficients 0.75, 1.0, 1.25 (Ef) for April

months	IW:CPE (Ef)	AW	MAD	Ready water as equivalent depth	CPE
April	0.75 IW:CPE	25.49	0.3	≈115	46
	1.0 IW:CPE				34.5
	1.25 IW:CPE				27.6

irrigation interval was calculated by adopting the following equation No. 5

$$\text{Irrigation interval} = \frac{CPE}{ET_{pan}} \ldots\ldots\ldots 5$$

whereas**:**

CPE= Cumulative Pan Evaporation mm

ETpan=Evaporation from evaporation pan mm

Then, the volume of applied water (equivalent water depth) was calculated depending on the equation No. 6

$$IW = \frac{CPE \times Kc \times Kp \times Kr}{Ea} \ldots\ldots\ldots 6$$

Since**:**

IW = amount of water added as depth mm

CPE = Collective pan evaporation mm

Kc = yield coefficient 0.8 according to (FAO 1984)

Kp = basin coefficient 0.85 according to (FAO 1984)

Ea = Addition efficiency. 0.85 has been adopted for hot, dry climates

Kr= distortion or reduction factor according to what was suggested by the organization (FAO 1984)

Result and Discussion

Irrigation interval and depth of irrigation water added according to irrigation treatments.

(Table 3) indicated that the irrigation interval decreased with the increase in the IW:CPE ratio and also decreased with the progression of the growing season, as the value of the irrigation interval for the 0.75 Ef treatment was 9, 7, 5, 5, and 6 for April, May, June, July, and August, respectively. An irrigation interval of 5, 4, 3, 3, and 4 for the treatment of 1.25 Ef and the same months in succession. While the values of the irrigation interval decreased as the growing season progressed, it was 9, 6, and 5 for April, compared to 6, 5, and 4 for August for irrigation treatments of 0.75, 1.0, and 1.25 Ef, respectively. The highest value for the irrigation interval was 9 days for the 0.75 Ef treatment. For April, the lowest value was 3 days for a transaction of 1.25 Ef for July. Increasing the irrigation interval reduces the number of irrigations -irrigation frequency-, energy, and work costs. Still, on the other hand, it may limit the concept of drip irrigation, which depends on repeated irrigation. Therefore, adopting a treatment with an appropriate irrigation interval, as in treatment 1.25, achieved the concept of drip irrigation. The total number of irrigations for approximately 150 days was 28, compared to the number of irrigations that were lower than that for treatments below 1.0 Ef. In both cases, when the interval was increased, irrigation reduced the frequency of irrigation -the number of irrigations-which may save energy and the work cost, as mentioned above. However, a decrease in the irrigation interval results in an increase in the number of irrigations, which increases the cost of work and energy. Referring to the calculation of the irrigation interval in terms of irrigation coefficients resulting from dividing the CPE by the ET_{pan}, this was later reflected in the number of irrigations according to the months and in determining the depth of water added in each irrigation and the monthly and total water depth, as will become clear later in (Table 4). As is known, and about what was stated In Table 3, it is clear that adopting the concept of the ratio between IW:CPE led to determining irrigation intervals and achieved the concept of irrigation based on ready water in light of depletion rates (in this experiment a 30% depletion rate was adopted). This concept IW:CPE also determines the frequency of irrigation and the depth of water added in each irrigation, which changes monthly with the change in ET_{pan}.

Table 3. Irrigation intervals and depths of added irrigation water, according to irrigation treatments and months of the peanut growing season.

Months	(Ef) IW:CPE	CPE	ET_{pan} ($mm.d^{-1}$)	interval (day)	Number of irrigations	Depth water per irrigation (mm)	Depth water per month (mm)
	0.75IW:CPE	46		8.51≈9	≈2	36.8	84.8
April	1.0 IW:CPE	34.5	5.40	6.38≈6	≈3	27.6	82.8
	1.25IW:CPE	27.6		5.11≈5	≈4	22.08	91.2
	0.75IW:CPE	46		6.57≈7	≈3	21.71	65.13
May	1.0 IW:CPE	34.5	7.00	4.92≈5	≈4	16.28	65.12
	1.25IW:CPE	27.6		3.94≈4	≈5	13.02	65.1
	0.75IW:CPE	46		5.34≈5	≈4	30.17	120.68
June	1.0 IW:CPE	34.5	8.60	4.01≈4	≈5	22.63	113.15
	1.25IW:CPE	27.6		3.20≈3	≈7	18.1	126.7
	0.75IW:CPE	46		5.18≈5	≈4	30.17	120.68
July	1.0 IW:CPE	34.5	8.87	3.88≈4	≈5	22.63	113.15
	1.25IW:CPE	27.6		3.11≈3	≈7	18.1	126.7
	0.75IW:CPE	46		5.93≈6	≈3	31.28	93.84
August	1.0 IW:CPE	34.5	7.75	4.45≈5	≈4	23.46	7038
	1.25IW:CPE	27.6		3.56≈4	≈5	18.76	93.8

Applied water depths

Irrigation water depths included those added depths based on irrigation scheduling and determining irrigation intervals, in addition to the germination water for all experimental treatments, which amounted to 42 mm. As in Table 4, the germination water contributed by percentages of 7.96, 8.63, and 7.69% to the average total depth of water added to the 0.75 Ef and 0.75 Ef treatments. 1.0 Ef and 1.25 Ef, respectively. Table 4 shows the number of irrigations according to the months of the growing season of the peanut crop, calculated based on the irrigation intervals mentioned in Table 3, as well as the depths of water added in each irrigation and the total number of irrigations during the growing season according to the experimental parameters. It is clear from the table, in general, that the average number of irrigations increased as the growing season progressed, then began to decrease at the end of the season, with the IW:CPE ratio also growing, as it was 2, 3, and 4 irrigations for April, compared to 6, 5, and 4 irrigations for August, and the experimental parameters were 0.75 Ef, 1.0 Ef, and 1.25 Ef. Respectively, this resulted in the total number of irrigations being 16, 21, and 28 for the experimental treatments, 0.75 Ef, 1.0 Ef, and 1.25 Ef. On the other hand, the depths of irrigation water added per irrigation decreased with an increase in the IW:CPE ratio for all months of cultivation, and the depths of irrigation water added also differed according to the growth stages of the peanut crop, as the values ranged between the lowest value of 486.6 mm for the 1.0 Ef treatment and the highest value of 545.5 mm for the 1.25 Ef treatment, with an average of 519.74 mm. These values did not produce a specific trend, except that the two closest values for the average were for the 0.75 Ef and 1.25 Ef treatments, where the value for the 1.25 treatment was higher than the average, while the 1.0 Ef treatment was lower than the average. The lack of a clear trend in the effect of the IW:CPF ratio on the total water depth results from the interference of other factors, such as irrigation intervals and the number of irrigations. Mulching is an essential factor created by plants that balance water, maintain soil, and reduce water evaporation. Increasing the size of plant growth and its branches led to a precise coverage of the soil surface, which helped reduce the unit area and water evaporation from the soil surface.

Table 4. Depths of irrigation water added monthly and total depth mm according to irrigation parameters (Ef)

Irrigation treatments	Total number of irrigations in season	water added in germination stag	Total water added in April	Total water added in May	Total water added in June	Total water added in July	Total water added in August	Total water added in season
0.75 IW:CPE	16	42*	84.8	93.84	120.68	120.68	65.13	527.13
1.0 IW:CPE	21	42	82.8	7038	113.15	113.15	65.12	486.6
1.25 IW:CPE	28	42	91.2	93.8	126.7	126.7	65.1	545.5
								Rate:519.74

*Irrigation scheduling began as of 4/10/2021

Therefore, it is observed in April that a small percentage of coverage is almost ineffective. Hence, the depths of added irrigation water increased compared to the following month, especially with adopting the reduction factor Kr in calculating the IW with one value. As the diameter of the coverage increased due to the growth of the plant and its branches, which constituted a coverage percentage of 15, 70, 82, and 85% for May, June, July, and August, respectively, it affected the depths of added water with an increase in the value of ET_{pan}, due to the contribution of the importance of Kr in reducing the IW. Evaporation is affected by several factors, the most important being solar radiation, air temperature, relative humidity, and atmospheric pressure. Suppose the evaporation surface is the same as the soil surface. In that case, the crop's exposure to the soil surface and the amount of water available at the evaporation surface are other factors that affect the increase or decrease of evaporation (Allen et al. 1998). When linking the depths of irrigation water added according to the months of growth of Peanut to the plant growth stage, which represents the period in days from the start of planting until harvesting the crop, which is variable according to the plant variety, the prevailing environmental conditions, and the date of planting, therefore, it is preferable, through field experience, to determine the stages of crop growth according to the prevailing local conditions. By simple calculations of the depths of water added according to the growth stages of Peanuts, four steps were distinguished: the vegetative growth stage, 30 days. The branching growth stage - flowering 45 days. The flowering stage - spur formation- is 45 days, and the maturity stage is 30 days. It is clear from the results of (Table 5) that the depths of irrigation water added in the vegetative growth stage were lower than in the branching stage. They increased in the flowering, and spur formation stages, and their values were lowest in the maturity stage. This is because this late stage represents the last stage of the plant's life, an extended stage. For one month, with a decrease in the number of leaves and leaf area compared to the vegetative growth stage 30 days, the reduction in water depth values added in the last step - maturity - is because this stage represents less sensitivity to water, with the leaves turning yellow, stiffening, and falling (Al-Shamary 2013) Given that the total irrigation water depths added during the peanut crop season, according to Table 4, it is clear that the average water requirement for Peanut was 519.74 mm, and that the lowest water requirement achieved with the 1.0 IW:CPE treatment was 486.6 mm, and this value was close to what was obtained (Rame et al. 2022) which is 500 - 700 mm for Peanut, as well as (S.K. et al. 2022) the value was 410 mm, and also (Shrief et al. 2020)was 468.5 mm, much less than what (Al-Shamary 2013) obtained, which was 1494.18 mm. These differences in the values of water needs of Peanut, which are natural differences, are due to, firstly, the circumstances local and environmental conditions of the experiment, secondly: the type of crop and the date of planting, and thirdly, the type of soil and its characteristics, especially concerning its ability to retain water. The decrease in water needs compared to what was reported by the above sources may also be due to the efficiency of the drip irrigation system and its achievement of the principle of accuracy and precision with minimal water losses.

Table 5 Depths of added irrigation water according to plant growth stages and irrigation treatments (Ef)

Treatments Ef(IW:CPE)	Germination and vegetative growth stage	Branching stage	Flowering and spur formation stage	Maturity stage	Total depth of water in season (mm)
	1-4 to 1-5	1-5 to 15-6	15-6 to 31-7	31-7 to 31-8	
0.75	129.8	150.5	142.4	104.4	527.13
1.0	125.7	134.8	123.3	102.8	486.6
1.25	131.7	157.6	147.8	108.4	545.5

(Table 6) shows the effect of irrigation treatments on the vegetative growth characteristics of the peanut plants under the influence of different irrigation treatments, namely dry weight ($gm.plant^{-1}$), number of branches per plant, and plant height.

Table 6 The effect of irrigation treatments on the vegetative growth characteristics of the peanut plants

Treatments Ef (IW:CPE)	Dry weight rate (gm.plant^{-1})	Average number of branches.plant	Plant height rate (cm)
0.75	124.7c	11.43c	45.62c
1.0	135.5b	12.7b	48.15b
1.25	143.8a	14.7a	49.15a

The results of (Table 6) indicate significant differences in the average plant height, average number of branches per plant, and dry weight between all treatments. The 1.25 Ef treatment outperformed the rest of the medicines in average dry weight, average number of branches, and average plant height; these rates were 143.8 grams. Plant^{-1}, 14.7 grams, and 49.15 cm, respectively, while the lowest values of these characteristics for the treatment were 0.75 Ef and reached 124.7 grams. Plant^{-1}, 11.43, and 43.55 cm, respectively.

(Table 7) shows the effect of irrigation treatments on seed yield, weight of 100 seeds, seed weight, number of sources, pod weight, and number of pods. The results indicate significant differences in the importance of 100 grains. The lowest value was 43.2 grams for the 0.75 Ef treatment, and the highest was 51 grams for the 1.25 Ef treatment. The highest seed weight value was 33.5 for the 1.25 Ef treatment, a significant difference from the rest. Significant differences also appeared in the number of seeds per pod values, and the highest value was 52.6 for the 1.25 Ef treatment.

Meanwhile, the highest weight of pods was 44.6 for the 1.25 Ef treatment, a significant difference from the rest of the treatments. Looking at the seed yield results, it is clear that the lowest value was 2.1 tons.ha^{-1} for the 0.75 Ef treatment, and the highest value was 3.2 tons.ha^{-1} for the 1.25 Ef treatment, with significant differences. In general, it can be said that the 1.25 Ef treatment was distinguished in the characteristics listed in (Table 7), indicating a trend in the relationship between the increase in the value of the experimental basin parameters Ef and the importance of the attributes mentioned in Table 6. The difference in the basin parameters is a function linked to the irrigation interval, from which the number of irrigations and water depths is determined Added irrigation.

Table 7. Effect of irrigation treatments on seed yield of the peanut and its components.

treatments	Yield (tons.ha^{-1})	Weight of 100 seeds (g)	Seed weight gm.plant^{-1}	Number of seeds per plant^{-1}	Weight of pods gm.plant^{-1}	Number of pods
0.75	2.1c	43.2c	24.4c	48.9c	34.8c	36.4c
1.0	2.8b	45.8b	28.2b	50.2b	36.5b	39.1b
1.25	3.2a	51.0a	33.5a	52.6a	43.0a	44.6a

(Table 8) shows the productivity per unit of water for pistachio plants in the field due to the influence of irrigation treatments, as no specific trend appears for the relationship between them. The cowpea plant's highest productivity per unit of water, when treated with 1.25 Ef, reached 7.04 kg.m^{-3}. At the same time, the irrigation treatment 0.75 Ef gave the lowest productivity per unit of water, amounting to 4.78 kg.m^{-3}. This may be due to the superiority of the 1.25 Ef treatment over the rest because it excelled. Initially, the value of the yield of the peanut plants reflects the effect of the factors that determined the value of the experimental basin factor Ef, including the irrigation interval, which led to determining the number of irrigations during the season and the depth of water added in each irrigation. Thus, the total depth of water was added. The irrigation interval rate for this treatment was less. From the first treatment, 0.75 Ef, the irrigation interval was large, and the number of irrigations per season was much less than in the 1.25 Ef treatment.

Table 8. Unit water productivity of peanut crop.

Treatments (Ef)	Water unit productivity kg/m^{-3}
0.75	4.78c
1.0	6.85b
1.25	7.04a

Conclusion

According to the current study's findings, peanut plants' water requirement was 545.5 mm during the season. The best irrigation treatment is a ratio Ef(IW:CPE) 1.25 that of 28 irrigation during the season, gave the highest production, which amounted to 3.2 tons ha^{-1} of Peanuts and the highest value for water unit productivity, which amounted to 7.04 kg m^{-3}. Moreover, the 1.25 Ef treatment outperformed the rest of the treatments in average dry weight, average number of branches, and average plant height; these rates were 143.8 grams. Plant-1, 14.7 grams, and 49.15 cm, respectively, while the lowest values of these characteristics for the treatment were 0.75 Ef and reached 124.7 grams. Plant-1, 11.43, and 43.55 cm, respectively.

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