Estimate water use efficiency (WUE) and determining the period of irrigation in corn plant

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Abstract: in order to examine the effect of drought stress in different periods of plants grow on process factor along with four levels as Main plot (**I_0** : Full irrigation point of FC, control, without water stress, **I_1** : 75% of the amount of irrigation treatments I_0, mild stress, **I_2** : 50% of the amount of irrigation treatments I_0, severe stress, I_3 : 25% of the amount of irrigation treatment I_0, very severe stress and point of PWP and Sub-plots: Different growth phases: S_0: growing phase, the establishment of the plant stem to the emergence, S_1: natal phase: to stem the rise of coffee being resilient and end silk pollination, S_2: grain filling phase: the end of pollen grain maturity and the emergence of black layer) in research farm of Islamic Azad University. although the frequency difference between irrigation treatments and amounts of irrigation I_0 & I_1 , 6 times water (6 = 16-22) and also in terms of grain yield in two different irrigation treatments Performance 1.5 ton per hectare there and Duncan test time difference performance meaningful shown so should be treated I_0 as the best irrigation, the number of irrigated 22 times during the growing season be introduced but if precise will be investigated is observed I_1 that 75 percent of the treated water FC state farm yield acceptable 12.8 ton in ha plots managed in a 1502 liter (26460-27962) that consume less water, saving the farm level is very valuable and Due to water shortage and drought phenomenon can be considered and it should be used now in Khuzestan IRAN irrigation takes place between 20-21 times in the same treatment that I_0 is using treatment I_1 with some loss of performance seed-saving high water is done, on the other hand WUE in these two treatments (I_0 & I_1) of Duncan test at 1% level statistics has been that this can also cause other using treatment I_1 is.

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1. Introduction

Movement of water from the soil to the roots of plants due to osmotic movement defining a mass flow in slow and fast mode is sweating. Thus the activity is called osmotic share a little water absorption compared to transpiration. Buoyancy forces result in tension or negative pressure sap wood they are. Forces related to water absorption can be as follows(1,16):

$$A = \frac{(\psi_m = \psi_o)_{Soil} - (\psi_p + \psi_o)_{root}}{r_{soil} + r_{root}}$$

That this formula:

ψ_m Levels of metric potential,

ψ_o Osmotic potential,

ψ_p Pressure potential (MPa all the units are expressed)

The resistance r in soil water and roots is based on scm^{-1}. Water absorption by roots can be by force, osmotic (active), or be passive.

Corn plant with annual growth is very high, stem height was also relatively high and the other hand, growth and production of sufficient need and warm temperate areas planted, the purpose of important issues and significant in corn the required water supply and irrigation as well as different stages of the plant. In areas where the growth period, the rainfall to supply the full amount of water that this plant requires falling is no pupil corn field to be timely irrigation. Field Irrigation depending on atmospheric conditions such as environmental and soil moisture in the soil and with regard to temperature every 7 to 12 days once the corn must be irrigated. When the irrigation process and the amount of water carefully to avoid surgery and to provide enough water to corn root NO, thirsty plant residue and if this situation continues to plant wilting point water reached and if the time coincided with the flowering Candy and this continues for 2 days to yield 22 percent deficit if it finds and to continue for 6 days decreased the amount of product will be 50 percent. The most important and most sensitive stages of maize irrigation include (Arkel, Van H. 1978) (1):

1 - Bud stage production.
2 - Stem elongation stage.
3 - Male flower emergence stage.
4 - Female flower emergence stage.
5 - Grain filling stage.
6 - Milky stage.

Thus, in temperate zones and in the spring months, corn every 8 to 12 days in the summer and every 7 to 10 days and temperate climates and in spring every 7 to 10 days in the summer and every 5 to 7 days once a pupil can be irrigated (9,17).

2. Materials and methods

in order to examine the effect of drought stress in different periods of plants grow on process factor along with four levels as Main plot (**I_0** : Full irrigation point of FC, control, without water stress, **I_1** : 75% of the amount of irrigation treatments I_0, mild stress, **I_2** : 50% of the amount of irrigation treatments I_0, severe stress, I_3 : 25% of the amount of irrigation treatment I_0, very severe stress and point of PWP and Sub-plots: Different growth phases: S_0: growing phase, the establishment of the plant stem to the emergence, S_1: natal phase: to stem the rise of coffee being resilient and end silk pollination, S_2: grain filling phase: the end of pollen grain maturity and the emergence of black layer) in research farm of Islamic Azad University.

Culture as wet ground do and do so before planting and irrigation land after getting proper soil moisture, and the disk began plowing, preparing the ground conducted in late June with propagation land, plow, disk, Fertilizer sprayed (before planting of ammonium phosphate fertilizer when planting of urea (nitrogen fertilizer and 200 net phosphor (P2O5) 90 kg per ha) was applied) and a disc and re-trowel handling test was performed and plots based on test design and implementation were plan for New Water the field of poly ethylene tubes were used to install water Parshal Flume was measured. Seed planted by the hand and two seeds in each hole in the first half of August (August 3, conducted in cultures and the first irrigation was on August 5 that recent history, on 5 August as planting was considered) were considered to high heat 50 ° C in August two farm surface irrigation interval of 3 to 4 days to prevent Hardpan and dry ground was to emergence and establishment of plants in farm fields as well be done.

After field planting process was performed as follows:
1 - Method for elimination of weeds from mechanical weeding was used three times in the weeding was done.
2 - Irrigation Based on the experimental treatment was conducted in the field.
3 - Half of nitrogen fertilizer at stem elongation stage of corn crop land as fertilizer roads was.
4 - Pests and disease was found in the field, did not receive a result of fighting convention.
On all results, analysis of variance was performed

That the results tables (ANOVA) are presented and then using the Duncan test, comparison has had results with charts, Excel 2007 was conducted and analyzed data Two statistical program SPSS was performed and Mini tab.

3. Result

Examining Table1 So it seems that although the frequency difference between irrigation treatments and amounts of irrigation I_0 & I_1 , 6 times water (6 = 16-22) and also in terms of grain yield in two different irrigation treatments Performance 1.5 ton per hectare there and Duncan test time difference performance meaningful shown so should be treated I0 as the best irrigation, the number of irrigated 22 times during the growing season be introduced but if precise will be investigated is observed 1I that 75 percent of the treated water FC state farm yield acceptable 12.8 ton in ha plots managed in a 1502 liter (26460-27962) that consume less water, saving the farm level is very valuable and Due to water shortage and drought phenomenon can be considered and it should be used now in Khuzestan irrigation takes place between 21-20 times in the same treatment that I0 is using Treatment I1 with some loss of performance seed-saving high water is done, on the other hand WUE in these two treatments (I0 and I1) of Duncan test at a level statistics has been that this can also cause other using Treatment I1 is (Table No. 1 & 2).

Table 1: No. irrigation (A), water consumed in one plot (B) and water in a total plot (A * B)

water in a total plot (A * B)	water consumed in one plot (B) (Liters)	No. irrigation (A)	Treatment
27962	1271	22	**I_0**
26460	1653	16	**I_1**
20880	2320	9	**I_2**
15200	3040	5	**I_3**

Table 2: Analysis of variance WUE

S.O.V	Irrigation (I)	growth phase (S)	interaction (I * S)	CV%
-	7.09**	0.87ns	4.52**	14

Duncan test different values of treated irrigation water use efficiency in relation to three nodes, but can the average separation between treatment plant growth and there was no difference in the levels were statistically similar (Table 3).

4. Discussion

Usually leaves stage development, pollination and seed formation, which often occurs in the hot summer months, corn requires a lot of water. Frequency of irrigation depends on soil conditions, climate and ... Is between 2 to 15 times is variable. Maize cultivation in areas where annual precipitations 250 to 2500 mm are also a homebred is possible (18).

Smith (2001) as the maximum water use efficiency can be obtained when the amount of irrigation water is equal to evaporate transpiration in other words, the exact amount needed to plant the plant must be calculated (34).

Brodsky (2000) announced that the distances great impact on the efficiency of irrigation water use and should not affect these intervals so that the convention is more efficient water use reduced by 20 percent because the trend reduction in maize yield drops shows (5).

Unlike corn grain (wheat and barley) requires high heat and heat is the sun. Regions the hot summer sun and light enough to have the best performance from the point of view are produced. If the minimum temperature of 60-10 over the earth turning corns sprouts and the best growth in the normal temperature is 20-30 degrees. After corn emergence temperature of about zero tolerance and it does not hurt you see severe. Some varieties Serotinous within 90 days to produce, but primarily during the period of growth for production of 110 - 130 days. During the growing need for moisture and rainfall rate mm 600-700 needs. One kilogram of dry matter of corn requires about 315 liters of water. In different latitude, except in areas that were too cold or shorter growth period comes to action. Because corn is done in the summer to provide sufficient moisture for land preparation operations beginning wet ground field is necessary. Of course to be determined during the interval boundaries to be established. Then with heavy irrigation to wet all parts of the same field (14, 38).

The first farm irrigation immediately after planting is done that determines the planting dates is 72 hours after the first irrigation 60 to 70 percent seed grown and are outside the territory. Second irrigation for green field and achieve full moisture to seeds that are cultivated in more depth should be within 3 to 5 days after the first irrigation to be done. The third to final irrigation fertilization, irrigation 7-6 days to be considered in the late growing season and irrigation interval can be fulfilled 13-11 days.

Table 3: Comparison of average water use efficiency (WUE) using Duncan test at 1%

Treatments	WUE (g / lit)
I0	A8.51
I1	A8.1
I2	B6.7
I3	C5.2
S1	A7.45
S2	A7.88
S3	A7.91
I0 S1	A7.91
I0 S2	A7.01
I0 S3	A7.11
I1 S1	A7.11
I1 S2	A7.16
I1 S3	A 7.31
I2 S1	B6.82
I2 S2	B6.41
I2 S3	B6.88
I3 S1	C5.02
I3 S2	C5.32
I3 S3	C5.22

For advancing novel bore water should be set. Irrigation time period should be four times the water is advancing. Example: If the input water to track along the track during the 2.5 hour cover. Duration of irrigation for 10 hours is sufficient. Time 10 = 4 × 2.5

In examining reports received from around the world by Simit (2001) two important factors limiting maize production in Asia include: stress and water deficiency Nitrogen uptake by plants during drought stress and methods to combat the increasing resistance of maize germplasm and as was following points can be investigated in this report: countries, Angola, Lesotho, Malawi, Mozambique, Tanzania, and Zimbabwe due to drought Zambia an average of 4 million tons of corn grain yield reduction has been met. Drought and the reduction factor of 10 5 percent annual yield of maize in South Africa declared. Gambols Vambola (2000) ,corn root weight between 3150 to 5070 kg per hectare in a silt loam soils are mature, the high volatility or measurement of the yen due to different amounts in different parts of soil moisture, soil compaction or mechanical pressure and different amounts of fertilizer as can be. Weight change root directly affects their performance thoracic (1999) most serious drought in 92 years in 1991 due to drought symmetry with maize flowering period decreased 4.5 million tons of grain yield respectively. (Amides et al (1999)) emergence of stress from the male flower and pistil silk increased considerably increased, causing sterility are a number of grains per panicle and seed number correlated with the flowering period showed a positive regression (Bvlans and Admydas (1996)).

Water stress reduced the number of pollen grains are well formed pollen tube less power their survival will be decreased. And drought in the calving period decreased the number of spikelet's that this reduction is due to a drop in yield has been. Spikelet differentiation rate is calculated from the following formula (Hall et al (1982)).

Period of physiological maturity (maximum dry weight) water potential of corn and wheat grains between 6/1- and 2 - Mega Pascal fluctuate and decrease water potential of this remarkable range of force matrix is increased, which has stopped growing seed search.

Eagle and single Rooney (1997) and Vrtvsy (1989)) very minor changes in water potential or osmotic potential of seeds of drought stress on dry matter accumulation stop are. (Barlow et al (1980), West Gate (1994)) effect of drought stress on enzyme activity during grain filling was studied and reported that the nitrogen and carbohydrate metabolic enzymes caused by drought that diminish

Krmvdv (1989) the lack of enzyme activity related to stopping matched DNA and mRNA copy was compared. (Boilers (1989)) little effect of drought stress on grain filling rate affect corn, although high temperatures associated with drought stress, grain filling rate increases,

Jones, baby Stone (1987) and West Gate (1994)) Molly Lea and colleagues (2001) both ends, both as part of the effective temperature and water stress, followed by early grain maturity, and the quick, stop photosynthesis parameters such as aging of leaves, endosperm cells are involved in reduction potential. And water stress, the most important components of the plant growth in maize leaf area index, and decreases in LAI decreasing trend growth stages differentiated pistil, pollination and grain filling more than other stages of plant growth as they and reduced leaf stage, internodes elongation them know not significant.

Cimarron and colleagues (2002) research in India on the effects of drought stress on corn growth period were asked to evaluate and stated that if water stress, 7-2 days after silk emergence and start 22-16 days after emergence Silk to an end, yield components, seed number, is gaining significant decrease Tine ear and will be expanded. Also, in an article in America Magazine published in completely Agriculture announced that during the irrigation experiment in different periods; 30-20, 50-40, 70-60, 90-80, the percentage of usable soil moisture content, yield and its components in corn studied and which were reported at the time of irrigation use 30-20 percent moisture content of soil, increased ear length, number of grains, grain weight, grain yield per plant, grain yield per unit level and harvest index will be.

Gracious and colleagues (2004) had reported the effect of drought stress at flowering stage decreased or stable harvest index of corn is the harvest index increased from 0.44 in the optimal irrigation conditions, to 0.54 in irrigation regimes showed undesirable, harmful effects of drought on biomass production during the vegetative growth stages and crop increased harvest index, this work helps fill harmful, although never fully compensated if does not.

Saki nejad and colleagues (2002) state that relationship with grain yield per plant, ear number 0.94 (r2 =, seed weight (0.74 = r^2) and number of grains (0.89 = r^2) has a positive correlation is, the lowest correlation with grain weight has been reported, but the correlation between grain yield and the period of emergence of flower male to female signs (ASI) 3 negative and what the gap further, the grain yield than is the effect of drought stress during Also, vegetative and flowering, the number of ear and plant water stress during drought ASI, and increased negative effect on grain yield leaves.

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