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SAVING IRRIGATION WATER AND REDUCING MINERAL FERTILIZATION FOR MAIZE USING RICE STRAW COMPOST

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ABSTRACT

Two field experiments were carried out at Sakha Agricultural Research Station, Kafr El-Sheikh Governorate, during two successive seasons of 2007 and 2008. The objectives of the present study are increasing maize yield, decreasing the applied mineral fertilizer and saving irrigation water. Maize (hybrid single cross 10) was evaluated in a split plot design with four replicates. The main plots were assigned to three irrigation intervals, irrigation every (10 (I_1), 15 (I_2) and 20 days (I_3)). The sub plots were assigned to three fertilization treatments of F_1 (application of the recommended dose of mineral NPK fertilizer ,120, 30 and 48 unit/fed. for N, P and K, respectively). F_2 (5 ton/fed. Rice straw compost augmented with organic activator + 75% of the recommended mineral fert. 90, 22.5 and 36 unit/fed. NPK). F_3 (10 ton/fed. rice straw compost augmented with organic activator + 50% of the recommended mineral fert. 60, 15 and 24 for N P K, respectively).

The results can be summarized as follows:

1. Irrigation treatment I_3 was the best treatment since it saved water irrigation of about 19.8% (497 m^3) and had no significant decrease in maize grain yield compared to the traditional irrigation treatment (I_2)
2. The highest maize yield value of 4113.43 kg/fed. was obtained with I_2F_3 treatment, while the lowest one was with I_1F_2.
3. The highest water productivity (WP) of 1.92 kg/m^3 was obtained with I_3F_3 treatment.

Keywords: Saving irrigation water, Maize yield, Rice straw compost, Water productivity.

INTRODUCTION

In semiarid regions, irrigation is one of the most important inputs to increase crop productivity. The good management of water means application of water at the limited time of actual need of crop, with just enough water to refill the effective root zone. The interval between two irrigations should be as will as possible to save irrigation water without any adverse effect on the growth and yield (Majumder, 2002).

Mahfouz , (2003), Oraby *et al.*,(2005), indicated that water stress (irrigation every 25 days) caused sever reduction in yield and yield components of hybrids 10. Grain yield of maize was significantly increased with the decrease in irrigation period (Kamara *et al.*, 2003 and Ibrahim *et al.*, 2005). Seif *et al.*, (2005) found that the highest yield was obtained when maize plants were irrigated at 40% of available soil moisture depletion, whereas the lowest yield was recorded at 80% of the available soil moisture depletion where the irrigation role in corn production arises from crop sensitivity to drought

Nagy (1995, 1997) have indicated that irrigation improves the efficiency of fertilization and there is a strong correlation between fertilizer utilization and the water supply of a plant. In irrigated treatments – which means a higher yield level – economic fertilizer doses are greater, due to the positive correlation of irrigation x fertilization, than in unirrigated treatments. In irrigated treatments, the effect of year is moderate and yield fluctuation decreases. The favorite effect of fertilization increases with optimal water supply and decreases when harmful water excess is reached (Nagy, 2001)

Soil organic matter is a key component of soil fertility because it consider as a source of plant nutrients, energy for micro-organisms and soil fauna. It also enhances a stable and friable soil structure that increased aeration, water holding capacity, improved root development, nutrient uptake, decline in soil erosion and nutrient leaching losses. This means that less water and fertilizer have to be applied and that these smaller amounts are then available for a longer period. Although saving on water and fertilizer there is better plant growth due to less stress in-between watering. The decline in soil organic matter content, in the arid regions, is considered as one of the main problems in maintaining soil fertility.

The objectives of the present study are: increasing maize yield, saving irrigation water, reducing mineral fertilization, decreasing the environmental pollution by using the straw rice as organic fertilizer and appropriate irrigation interval.

MATERIALS AND METHODS

Site:

Two field experiments were conducted during two growing seasons 2007 and 2008 at Sakha Agricultural Research Station farm, Kafr El-Sheikh Governorate. Some physical and chemical properties of the experimental soils are presented in Table (1). The experimental site is located near to the main open drain and was served by tile drainage established since 1989. The title drainage system consists of subsurface, 10 cm inner diameter, PVC pipes spas at 20 m apart and buried at 1.65 m depth. Soil texture of the experimental site was clayey and contained 46.5% clay, 29.8% silt and 23.7% sand. The average of electrical conductivity of the irrigation water was 0.48 dSm^{-1}.

Experimental layout:

Maize (*Zea maize* L.) of hybrid single cross 10 was sown at 1 and 3 jully in 2007and 2008 respectively. Dates of harvesting were Oct., 24,2007and Oct., 26, 2008.

All agronomic practices were the same as recommended for the studied area, except the two study factors which i.e. irrigation interval and fertilization treatments. The plot area was 90 m^2, the distance between ridges was 70 cm and the seeds were sown at 25 cm between hills within the ridge. The compost materials were incorporated into soil surface, 15 days before planting.

Table (1):Some soil physical and chemical properties of the experimental site

Soil Depth cm	Hydro physical properties				Chemical properties					
	Bulk density Mgm^{-1}	Field capacity W %	PWP W %	Available water W %	pH	EC dSm^{-1}	SAR	Available nutrients		
								N ppm	P ppm	K ppm
0-15	1.14	47.20	25.38	21.82	8.15	1.5	2.46			
15-30	1.15	40.50	21.85	18.85	8.0	1.57	2.29	14.0	5.5	200.
30-45	1.24	39.00	21.19	17.81	8.0	1.65	4.29			
45-60	1.26	38.50	20.81	17.69	7.9	2.78	4.67			

Split plot design was used with four replicates. The main plots were assigned to three irrigation intervals i.e. (10 (I_1), 15 (I_2) and 20 days(I_3)) . While the sub treatments (F_1, F_2 and F_3) were assigned to compost application rates.F_1 was applicated as the recommended dose of the mineral nutrients (100% NPK + 0 compost). F_2 was 5 ton/fed. organic fertilizer (rice straw compost) + 75% of the recommended NPK dose of the mineral nutrients.F_3 was 10 ton/fed. Of organic fertilizer rice straw compost + 50% of the recommended NPK dose of the mineral nutrients. The treatments of mineral fertilizer were applied at the rates of 120, 30 and 48 unit/fed. for N, P_2O_5, and K_2O, respectively. The used mineral fertilizers were $(NH_4)_2$ SO_4 (20% N), ordinary super phosphate (15.5% P_2O_5) and K_2SO_4 (48% K_2O) .The used compost in this study was prepared from the rice straw, and some of its properties are given in Table (2).

Table 2: The characteristics of rice straw compost:

Bulk density, $Mg\ m^{-3}$	Moisture content%	EC dS/m	pH (1:2.5)	Organic carbon%	Total nitrogen%	C/N ratio	Available nutrients.			Fulvic acid g/kg	Humic acid g/kg	Zn ppm	Mn ppm	Cu ppm
							N g/kg	P g/kg	K g/kg					
o.521	23.27	4.11	7.22	24.02	1.897	12.66	1.165	0.991	1.836	20.19	39.73	256	195	9.3

Irrigation water applied (Wa):

Submerged flow orifice with fixed dimension was used to convey and measure the irrigation water applied, as the following equation (Michael, 1978).

$$Q = CA\sqrt{2gh}$$

Where

Q = Discharge through orifice, ($cm^3\ sec^{-1}$).

C = Coefficient of discharges (0. 61).

A = Cross sectional area of orifice, cm^2.

g = Acceleration due to gravity, cm/sec^2 (980cm/sec).

H = Pressure head, over the orifice center, cm.

Total number of irrigation were events 10, 7 and 5 for treatment I_1, I_2 and I_3, respectively including sowing irrigation.

consumptive use (CU):

Water consumptive use was calculated using the following equation (Hansen *et al.,* 1979).

$$Cu = \sum_{i=1}^{i=4} D_i \times D_{bi} \times \frac{PW_2 - PW_1}{100}$$

CU = Water consumptive use (cm) in the effective root zone (60 cm).
D_1 = Soil layer depth (15 cm each).
D_{b1} = Soil bulk density, (g/cm^3) for this depth.
PW_1 = Soil moisture percentage before irrigation (on mass basis, %).
PW_1 = Soil moisture percentage, 48 hours after irrigation (on mass basis, %).

i = Number of soil layers each (15 cm) depth.

Water productivity (WP):

It was calculated according to (Ali *et al.,* 2007).

WP = GY/ET.

Where WP (kg/m^3), GY is grain yield (kg/fed).

and ET total water onsumption of the growing season (m^3/fed.)

Productivity of irrigation water (PIW)

was calculated as (Ali *et al.,* 2007)

PIW= GY/I

Where I is irrigation water applied (m^3/fed.).

Grain samples from each plot were analyzed for protein and oil percent by standard A.O.A.C. methods. The obtained data were statistically analyzed according to Gomez and Gomez, 1984.

RESULTS AND DISCUSSION

Irrigation water applied (Wa):

As shown in table(3) the total number of irrigation events were 10 , 7 and 5 for I_1 , I_2 and I_3 respectivily, including sowing irrigation. Amounts of irrigation water applied (Wa) throughout the two seasons for different treatments, are tabulated in Table (3). Mean values of applied water (means of 2 seasons) were 3123, 2504 and 2007 m^3/fed. for I_1, I_2 and I_3 treatments respectively. Irrigation water for I_3 treatment was the lowest, and the amount for I_1 treatment was the highest. These data indicate that using I_3 irrigation treatment saved water by about 19.8%(497m^3) compared with irrigation treatment I_2(the conventional irrigation), while I_1 treatment consumed exess water by about 24.7% (619m^3) relative to the conventional irrigation I_2

Water consumptive use (CU):

The obtained results in Table (4) show that seasonal CU values were greatly affected by irrigation intervals, where CU values decreased with increasing the irrigation intervals. Seasonal average values of CU during the two seasons were 65.3, 44.0, and 36.0 cm for I_1, I_2 and I_3 treatments respectively. The values of CU during the two seasons were 35.0 cm and 67.0 cm respectively for the driest (F_1I_3) and wettest (F_3I_1) treatments. These results indicate that consumptive use decreased as the available soil moisture decreased in the root zone. These results are in agreement with those obtained by El-Tantawy *et al.*, (2007)

The effect of applied fertilizer on CU data show that slightly clear evidence of fertilizer treatment on value of this trait under fixed irrigation interval. Values of CU were 47.3, 48.3 and 49.7 cm during the two seasons which addressed to F_1, F_2 and F_3, respectively. Values of CU increased with increasing addition of rice straw compost due to the highest moisture condition. These results are in good agreement with those given by Kanany *et al.* (2004).

Table (3): Date of irrigation events and Irrigation water applied m^3/.fed for maize under different irrigation treatments during the two seasons of 2007and2008.

Data	Season 2007			Data	Season 2008			Mean of two seasons		
	10 days	15 days	20 days		10 days	15 days	20 days	I_1	I_2	I_3
30/6	504	504	504	1/7	500	500	500	502	502	502
10/7	252	-	-	10/7	240	-	-	246	-	-
15/7	-	274	-	15/7	-	260	-	-	267	-
20/7	280	-	280	20/7	270	-	270	275	-	275
30/7	290	300	-	30/7	280	290	-	290	245	-
10/8	300	-	320	10/8	280	-	310	290	-	315
15/8	-	340	-	15/8	-	330	-	-	335	-
20/8	320	-	-	20/8	340	-	-	330	-	-
30/8	360	380	470	30/8	350	390	470	355	285	470
10/9	320	-	-	10/9	300	-	-	310	-	-
15/9	-	400	-	15/9	-	240	-	-	410	-
20/9	280	-	450	20/9	270	-	440	275	-	445
30/9	260	320	-	30/9	250	300	-	255	310	-
Irrig.no.	10	7	5	Irrig.no.	10	7	5	10	7	5
Water quantity	3166	25818	2024	Water quantity	3080	2490	1990	3123	2504	2007

Table (4): Average values of Seasonal consumptive use in cm during the two growing season 2007 and 2008.

Irrig. T / Fert.t	I_1	I_2	I_3	Mean
F_1	64.0	43.0	35.0	47.3
F_2	65.0	44.0	36.0	48.3
F_3	67.0	45.0	37.0	49.7
Mean	65.3	44.0	36.0	48.4

Irrig. t= Irrigation treatment Fert. t =Fertilization treatment

Grain yield

Effect of irrigation interval:

Regarding the main effect of irrigation intervals, grain yield was highest under I_2 water regime as compared with the other two regimes. This occurred in both seasons. The mean grain yields for the two seasons obtained by I_1, I_2 and I_3 water regimes are 3666.83, 3906.49 and 3726.30

kg/fed.respectively .(Table 5). The increase caused by the I_2 regime in relation to I_1 regime was 6.5% and the increase over I_3 regime was 4.8%. The greater yield given by the I_2 regime over the other water regimes occurred with all fertilizer treatments. With F_1 mean yields (over the two seasons) were 3639.33, 3861.97 and 3647.70 kg/fed. for the I_1, I_2 and I_3 water regimes respectively. With superiority of I_2 regime over the I_1 regime was 6.11%and the increase over I_3 regime was5.8 %. With the F_2 the mean yields were 3609.77, 3744.07 and 3635.60 kg/fed. for I_1, I_2 and I_3, respectively with a superiority of the I_2 regime over I_1 regime of 3.7%.and slightly increase over I_3 regime .with the F_3, the mean yields were 3751.40, 4113.43 and 3895.60kg/fed. for I_1, I_2 and I_3 water regimes respectively.; with a superiority of I_2 regime over I_1 regime of 9.6%.and the increase over I_3 regime 5.6%

Effect of fertilizer:

Regarding the effect of fertilizer treatments, grain yield was greater with F_3 treatment than the other two fertilizer treatments. This occurred under each of the irrigation intervals regimes since the interaction between the fertilizer treatment and irrigation intervals was significant (Table 5). Mean yields for the two seasons due to fertilization treatments of F_1, F_2 and F_3 are 3716.33, 3663.14 and 3920.14 kg/fed., respectively. Thus the F_3 treatment gave the highest yield. The percent of increase in yield given by this treatment was 5.2% as compared with F_1 and 6.4% as compared with F_2, treatment.

The highest grain yield was obtained by I_2F_3 treatment which gave 4113.43 kg/fed. The lowest yield was obtained by the I_1F_2 treatment which gave 3609.77 kg/fed.

It worth to mention that the obtained yield of treatment I_3F_3(3895.6 kg/fed) was about the same yield of treatment I_2F_1(3861.97 kg/fed),which represent the traditional irrigation and the recommended mineral fertilization for the studied area , i.e the control treatment. In other hand, yield of treatment I_3F_3 was slightly little than treatment I_2F_3, which had the highest yield (table, 5) , by about 5.0% . Therefore, treatment I_3F_3 could be considerd the best treatment and could be recommended for thje management of maize crop under the condition of the studied area, since this treatment saved water by about 19.8% (497 m^3) and had no significant decrease in grain yield compared to that I_2F_3 which had the highest yield.

Table (5): Average values of grain yield of maize as affected by irrigation interval and fertilizer treatments in combined analysis of 2007 and 2008 seasons.

Fert.t / Irrig.t	100% NPK F_1 RSC (0 ton)	75% NPK F_2 RSC (5 ton)	50% NPK F_3 RSC (10 ton)	Mean
I_1 (10 days)	3639.33	3609.77	3751.40	3666.83
I_2 (15 days)	3861.97	3744.07	4113.43	3906.49
I_3 (20 days)	3647.70	3635.60	3895.60	3726.30
	3716.33	3663.14	3920.14	
L.S.D. 5%	55.71			
L.S.D. 1%	78.04			

RSC = Rice straw compost. Fert.t =Fertilization treatment. Irrig.t= Irrigation treatment

Oil percentage:

As shown in table (6) , oil percentage has highest with the 20 days intervals as compared with the two other irrigation intervals regimes. This occurred in both seasons. The mean oil percentage for the two seasons due to I_1, I_2 and I_3 water regime were 4.367, 4.497 and 4.543% for each of thus regime respectively (Table 6). Under all fertilizer treatment, the oil percentage of the treatment I_3 was higher than those of I_1 or I_2 irrigation treatment. The means that by increasing irrigation intervals oil percentage increased. With the F_1 fertilization treatments average values of oil percentage were 4.033, 4.150 and 4.180% for I_1, I_2 and I_3 water regime, respectively. Superiority of I_3 water regime over I_1 was 3.6% and was 1.0% when compared with the I_2 water regime. With the F_2 treatment the average values of oil percentage were 4.367, 4.550 and 4.590% for I_1, I_2 and I_3, regimes, respectively. Superiority of I_3 regime over I_1 was 5.1% and was 0.8% when compared with I_2 water regime. With the F_3 means of oil percentage were 4.700, 4.790 and 4.860% for the 3 tested water regimes, respectively, with superiority of I_3 over the I_1 and I_2 of 3.4 and 1.4%, respectively. The highest oil percentage of 4.860% (mean over 2 seasons) was obtained by I_3F_3 treatment and the lowest of 4.033% was obtained by I_1F_1 treatment. Similar results were obtained by Khalil *et al.* (2000); Zein *et al.* (2000) and Khalil and Aly (2004).

Table (6): Average values of Oil percentage of maize as affected by irrigation interval and fertilizer treatment in combined analysis of 2007 and 2008 seasons.

Fert.treat. / Irrig. intervals	100% NPK F_1 RSC(0 ton)	75% NPK F_2 RSC (5 ton)	50% NPK F_3 RSC (10 ton)	Mean
I_1 (10 days)	4.033	4.367	4.700	4.367
I_2 (15 days)	4.150	4.550	4.790	4.497
I_3 (20 days)	4.180	4.590	4.860	4.543
	4.121	4.502	4.783	
Comparison	L.S.D. 5%		L.S.D. 1%	
2-0 min.	0.099		0.134	
2-0 min.	0.057		0.080	

RSC=Rice straw compost Fert.treat.= Fertilization treatment Irrig. Intervals=Irrigation intervals

Protein percentage:

Regarding the effect of irrigation intervals regimes Table (7) protein percentage has highest with 15 days intervals as compared with the two other irrigation intervals mean protein percentage for the two seasons due to I_1, I_2 and I_3 water regimes were 7.53, 8.53 and 8.23% for each of thus regime respectively. Under all condition of irrigation interval I_2 were higher than those I_1 or I_3 irrigation intervals. With the F_1 fertilization treatments means of protein percentage were 6.90, 7.30 and 7.46% for I_1, I_2 and I_3 water regime, respectively, by increasing irrigation intervals protein percentage increased. Superiority of I_3 water regime over I_1 was 8.1% and was 2.1% when compared with I_2 water regime. With the F_2 the means of protein percentage were 7.40, 8.00 and 7.86% for I_1, I_2 and I_3, regimes, respectively; superiority of 1_2 over I_1 was 8.1%; it was 1.7% over I_3. With the F_3 means of protein percentage were 8.30, 10.31 and 8.36% for each of the 3 irrigation intervals regimes I_1, I_2 and I_3, respectively; superiority of the I_2 over I_1 was 24.2%; it was 2.3% over I_3.

Concerning, the effect of rice straw compost the protein percentage was greatest with F_3. The means of protein percentage (over the two seasons) due to F_1, F_2 and F_3 were 7.27, 7.75 and 9.32%, respectively. Thus the 10 ton rice straw compost + 50% mineral NPK F_3 gave greater percentage of protein in comparison with the other two fertilization treatments. The percent of increase in protein percentage given by F_3 over F_2 and F_1 being 20.3% and 28.1%, respectively. The highest protein percent are 10.31% was obtained by I_2F_3. The lowest 6.9% was obtained by I_1F_1. These results are in agreement with those obtained by Khalil *et al.* (2000) and Khalil *et al.* (2004).

Table (7): Average values of Protein percent of maize as affected by irrigation interval and fertilizer treatment in combined analysis of 2007 and 2008 seasons.

RSC NPK	I_1	I_2	I_3	Mean
F_1 0 + 100% NPK	6.90 c	7.30 c	7.46 c	7.27
F_2 5 ton + 75%NPK	7.40 b	8.00 a	7.86 b	7.75
F_3 10 ton + 50%NPK	8.30 a	10.31 a	8.36 a	9.32
Mean	7.53	8.53	8.23	
In rows L.S.D. 5%	0.155			
In rows L.S.D. 1%	0.217			

RSC= rice straw compost

Water productivity (WP)

Regarding the effect of water regimes (Table 8) WP was highest with the I_3 as compared with the other treatments. The mean WP (over the two seasons) due to I_1, I_2 and I_3 water regimes were 55.73, 87.60 and 102.60 kg/cm respectively. The increase due to I_3 regime in relation to I_2 regime was 17.12% and the increase over I_1 was 57.7%. Under condition of F_1 treatment mean WP values for I_1, I_2 and I_3 were 56.54, 88.36 and 103.34 kg/cm respectively indicating a superiority of I_3 regime over the others. It gave increases of 17.12% and 57.7% relative to I_2 and I_1, regimes respectively With F_2, the pattern was rather similar to that with F_1 and the mean values of (WP were 55.11, 84.37 and 100.23 kg/cm for the I_1, I_2 and I_3 respectively, indicating increase due to I_3 over I_2 and I_1 of 18.78 and 81.87%, respectively. With F_3 mean values of WP were 55.55, 90.18 and 103.81 kg/cm for I_1, I_2 and I_3 water regimes, indicating that I_3 gave increases in WP of 15.11% and 86.87% over I_2 and I_1, respectively. The highest WP was obtained by the I_3F_3 treatment which gave 103.81 kg/cm. The lowest WP was obtained by the I_1F_1 treatment which gave 56.54 kg/cm. The results indicate that increasing the irrigation intervals as well as the addition of rice straw compost enhanced the WP of maize crop under the condition of the studied area.

Table (8): Average values of grain yield (kg/fed.), consumptive use (Cu) cm/fed. Water applied (Wa) m^3/fed. Crop water productivity (WP) kg/cm and productivity of irrigation water (PIW) kg/m^3(average of two seasons 2007 and 2008).

Irrigation treatment	Fertilization treatment	Grain yield kg/fed.	Wa m^3/fed.	Cu cm/fed.	PW kg/cm	PIW kg/m^3
	F_1	3639.33	3123	64.0	56.54	1.16
I_1	F_2	3609.77	3123	65.0	55.11	1.15
	F_3	3751.40	3123	67.0	55.55	1.20
Mean		3666.83		3123	55.73	1.17
	F_1	3861.97	2504	43.0	88.36	1.54
I_2	F_2	3744.07	2504	44.0	84.37	1.49
	F_3	4113.43	2504	45.0	90.18	1.64
Mean		3906.49		2504	87.6	1.56
	F_1	3647.70	2007	3530	103.34	1.80
I_3	F_2	3635.60	2007	36.0	100.23	1.81
	F_3	3895.60	2007	37.0	103.81	1.94
Mean		3726.30		2007	102.46	1.85

Productivity of irrigation water (PIW)

As shown in (Table 8), PIW values were highest with I_3 as compared with the other two treatments. This was particularly true under conditions of F_3.The average of PIW (over the two seasons) due to I_1, I_2, and I_3 water regimes were 1.17, 1.56 and 1.85 kg/m^3 respectively. The increase due to I_3 regime in relation to I_1 regime was 58.1 % the increase over I_2 was 18.6 %. Concerning the effect of fertilization treatment, PIW values were highest with F_3. The average values of PIW (over the two seasons) due to F_1 , F_2 and F_3 were 1.50 , 1.48 and 1.59 kg/m^3 respectively . The increase due to F_3 treatment in relation to F_1 was 6.0 % and the increase over F_2 was7.4 % .The highest PIW value was obtained by the I_3 F_3 treatment which gave 1.94 kg/ m^3. while the lowest one was obtained by the I_1F_2 treatment which gave 1.15 $kg/m^3$of irrigation water applied.

Conclusion:

Treatment I_3F_3 , i.e. irrigation maize every 20 days with 10 ton rice straw compost+50% recommended mineral fertilizer, could be recommended for the management of maize crop under the condition of the studied area.

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توفير مياة الرى والحد من الاسمدة المعدنيه للذره باستخدام كمبوست قش الأرز

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أجريت هذه الدراسه بمزرعة محطة البحوث الزراعية بسخا محافظه كفر الشيخ عامى ٢٠٠٧ و ٢٠٠٨ بهدف زيادة محصول الذرة وتقليل الاسمدة المعدنية وتوفير مياه الرى استخدم محصول الذرة صنف هجين فردى ١٠ كما استخدم تصميم القطع المنشقه مرة واحده فى اربع مكررات حيث خصصت القطع الرئيسيه لمعا ملات فترات الرى حيث كانت(I_1)الرى كل١٠ يوم، (I_2) الرى كل ١٥ يوم و(I_3)الرى كل ٢٠ يوم.

والقطع تحت رئيسيه معاملات التسميد حيث كانت التسميد المعدنى(بالمعدل الموصى به – ٧٥% من معدل التسميد المعدنى الموصى به + ٥ طن كمبوست قش الارز – ٥٠ % من معدل التسميد المعدنى الموصى به + ١٠ طن كمبوست قش الارز).

ويمكن تلخيص النتائج كالاتى

١– معاملة الرى كل ٢٠ يوم مع اضافة ٥٠ % من الاسمدة المعدنيه الموصى بها و١٠ طن كمبوست قش الارزهى أفضل معامله وفرت ٤٩٧ م^3 (١٩,٨%)من مياه الرى مع نقص غير معنوى فى محصول حبوب الذره(٤%) مقارنه بمعاملة الرى التقليدىكل ١٥ يوم(I_2) تحت نفس معاملة التسميد.

٢– اعلى انتاج لمحصول الذره كان ٤٠٥٨,٤٤ كجم/فدان وامكن الحصول عليه من معاملة الرى كل ١٥ يوم و٥٠ % من السماد المعدنى الموصى به + ١٠ طن كمبوست قش الارز(I_2F_3) .

٣– اعلى انتاجيه للماء ١,٩٢ كجم/م^{3}من مياه الرى المضاف و١٠٣,٨ كجم/سم ماء مستهلك بواسطة المحصول وامكن الحصول عليه من المعامله الرى كل ٢٠ يوم واضافة ٥٠ % من السماد المعدنى الموصى به + ١٠ طن كمبوست قش الارز.

٤– ري الذره كل ٢٠ يوم وتسميده ب٥٠% من السماد المعدنى الموصى به +١٠ طن كمبوست قش الارز المعاملة (I_3 F_3) يمكن التوصية بها لادارة محصول الذره تحت ظروف منطقة الدراسه.

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