

(*Sorghum bicolor* L.)

Effect of different irrigation regimes on growth, grain yield and its components of grain sorghum (*Sorghum bicolor* L.) cultivars under Isfahan conditions

(*Sorghum bicolor* L.)

I₄ I₃ I₂ I₁

A

I₄ I₁

I₁

I₄

I₃

I₂

I₁

x

// :

() ()
()

.(Hajar *et al.*, 1997; Ibrahim, 1999)

(*Sorghum bicolor* L. Moench)

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.(Matthews *et al.*, 2004)
(Olufayo *et al.*, 1997)

.(Brun *et al.*, 1972)

.(Martin, 2002)

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.(Cho *et al.*, 2006)

(Lewis *et al.*, 2000)

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.(Eck *et al.*, 1972 ; Garrity *et al.*, 1982)

.(Seetharama *et al.*, 1995)

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I₄ I₃ I₂ I₁

A

(Smith *et al.*, 2005)

$$ea = \frac{(Fc - \theta).BD.D}{/} \times 100$$

$$Vw = (Fc - \theta).BD.A.D/ea$$

:Fc

:ea

:θ

:BD

:A

:V_w

:D

Table1. Number of irrigation and volume of irrigation in different irrigation treatments.

Irrigation treatment	No. of irrigation	Volume of irrigation (m ³ /ha)
I ₁	7	4685
I ₂	5	3500
I ₃	4	2720
I ₄	3	2050

(Water Use Efficiency)

W.U.E. :=

I₃

I₃

() I₁
(Olufayo *et al.*, 1994)

MSTATc

Excel

()

I₁

I₄ I₃ I₂

(Nwa, 1979)

(Abdolla *et al.*, 1996)

×

Table 2. Analysis of variance for some agronomic characters in different irrigation regimes in sorghum cultivars.

S.O.V	df	Mean square										
		W.U.E (kg/m ³)	Harvest index	Biological yield	Grain yield	100 grain Weight	No. grain per panicle	No. of panicle per plant	Plant height	Leaf area index	No. of leaves	Days to maturity
Replication	3	0.33 ^{ns}	13.5 ^{ns}	0.69 ^{ns}	4.66 ^{ns}	0.007 ^{ns}	64194 ^{ns}	0.050 ^{ns}	214.6 ^{ns}	0.581 ^{ns}	2.94*	165.2 ^{ns}
Irrigation (I)	3	4.30**	127.3**	8.24**	121.8**	3.22*	9895293**	0.154*	6536.7**	56.89**	0.33 ^{ns}	1860.2*
Error a	9	2.94	15.6	51.53	3.43	1.460	408870	0.006	590.9	4.623	4.32	67.65
Cultivar (C)	3	50.2**	2593**	50.53**	285**	25.9**	5603047**	0.0287**	20915**	49.176**	30.82**	1322**
I × C	9	17.7 ^{ns}	547.6*	3.26*	32.3*	0.0371	3246987*	0.0195*	4430*	30.386*	17.7*	1115.2*
Error b	36	20.8	70.37	7.35	24.55	3.221	4863392	0.009	2212.7	11.321	20.8	475.23
CV (%) (%)		10.2	12.3	11.1	10.1	7.2	9.5	5.1	8.7	9.3	6.8	8.0

*, **: Significant at 5% and 1 % of probability levels, respectively

ns: Non. significant

** *

:ns

Table 3. Mean comparison for agronomic characters in different irrigation regimes and sorghum cultivars

Treatment	Days to maturity	Plant Height (cm)	No. of leaves	Leaf area index	No. of panicle per plant	No. grain per panicle	100 grain Weight (g)	Grain yield (kg/ha)	Biological yield (kg/ha)	Harvest index (%)	W.U.E (kg/m ³)
Irrigation regime											
I ₁	127 a	137.2 a	10.8 a	5.70 a	1.22 a	1501 a	2.179 a	7140 a	21390 a	33.4 a	1.52 c
I ₂	125 a	128.5 b	10.4 a	5.28 b	1.20 a	1429 a	2.168 a	6380 b	19340 b	32.9 a	1.82 b
I ₃	119 b	113.0 c	9.9 a	3.91 c	1.10 b	1228 b	2.100 a	5120 c	17280 c	29.5 b	1.88 a
I ₄	113 c	100.1 d	9.8 a	3.03 d	1.02 c	1054 c	1.768 b	3560 d	13250 d	26.8 c	1.78 b
Cultivar											
Local Ardestan	126 b	220.0 a	12.5 a	5.52 a	1.00 c	1799 b	2.742 a	7490 a	20130 a	37.5 a	1.59 a
Payam	108 c	78.0 c	1.7 d	2.95 c	1.30 a	1221 d	2.181 b	5090 c	16110 c	31.8 c	1.08 c
Sepideh	120 b	97.7 b	8.7 c	3.39 b	1.20 b	1874 a	1.885 c	6480 b	18190 b	35.0 b	1.38 b
Kimya	133 a	99.3 b	11.3 b	5.57 a	1.13 b	1443 c	0.993 d	2950 d	18540 b	16.0 d	0.62 d

Means, in each column and for each treatment, followed by the same letter(s) are not significantly different at 5% of probability level- using Duncan's Multiple Range Test

Table 4. Simple correlation coefficients between yield components and grain yield in sorghum .

Characters	Grain yield	No. grain per panicle	100 grain Weight	No. of panicle per plant	Biological yield	Harvest index	Plant height	Leaf area index	Days to maturity
Grain yield	1								
No.grain per panicle	0.832**	1							
Weight of 100grain	0.541*	-0.391 ^{ns}	1						
No.of panicle per plant	0.210 ^{ns}	-0.220 ^{ns}	-0.320 ^{ns}	1					
Biological yield	0.791**	0.692**	0.571*	0.391 ^{ns}	1				
Harvest index	0.870**	0.586*	0.430 ^{ns}	0.081 ^{ns}	-0.570*	1			
Plant height	0.519*	0.362 ^{ns}	0.428 ^{ns}	0.642**	0.744**	0.085 ^{ns}	1		
Leaf area index	0.728**	0.571*	0.236 ^{ns}	0.272 ^{ns}	0.671**	0.115 ^{ns}	0.544*	1	
Days to maturity	-0.342 ^{ns}	0.483 ^{ns}	-0.512 ^{ns}	0.128 ^{ns}	0.483 ^{ns}	-0.413 ^{ns}	0.382 ^{ns}	0.592*	1

*, **: Significant at 5% and 1 % of probability levels, respectively.

ns: Non. significant

** *

ns

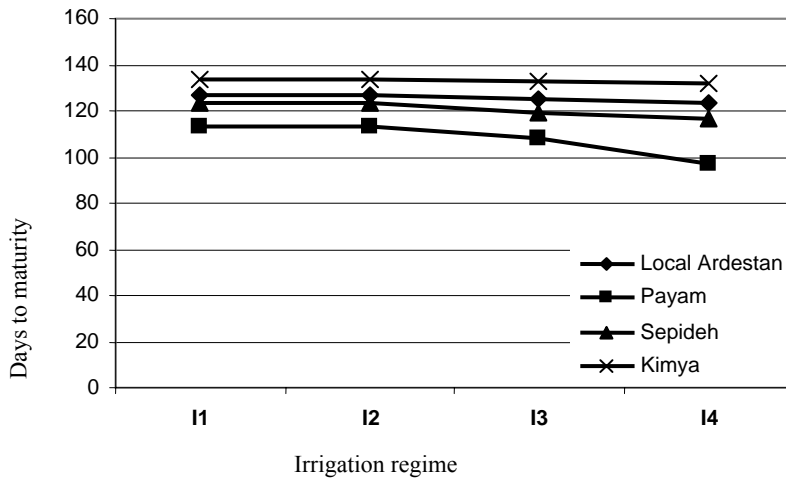


Fig. 1. Means of interaction effect between irrigation regimes \times cultivars on days to maturity

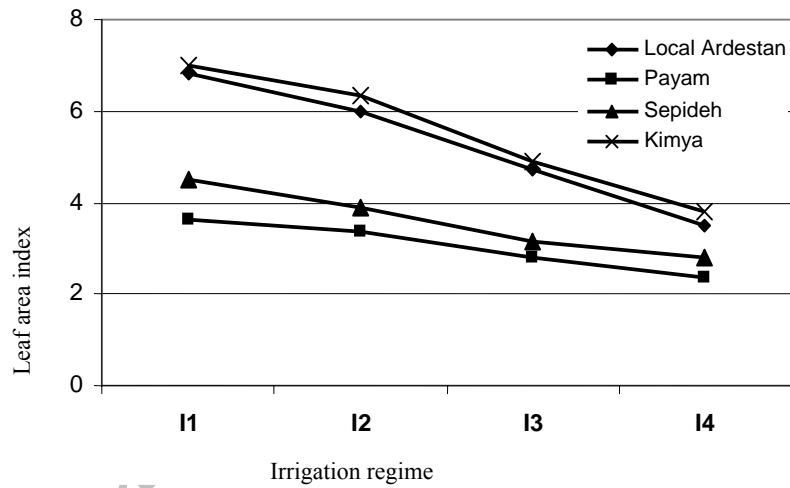


Fig. 2. Means of interaction effect between irrigation regimes \times cultivars on leaf area index

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(Hall *et al.*, 1968)

(Matthews *et al.*, 2004)

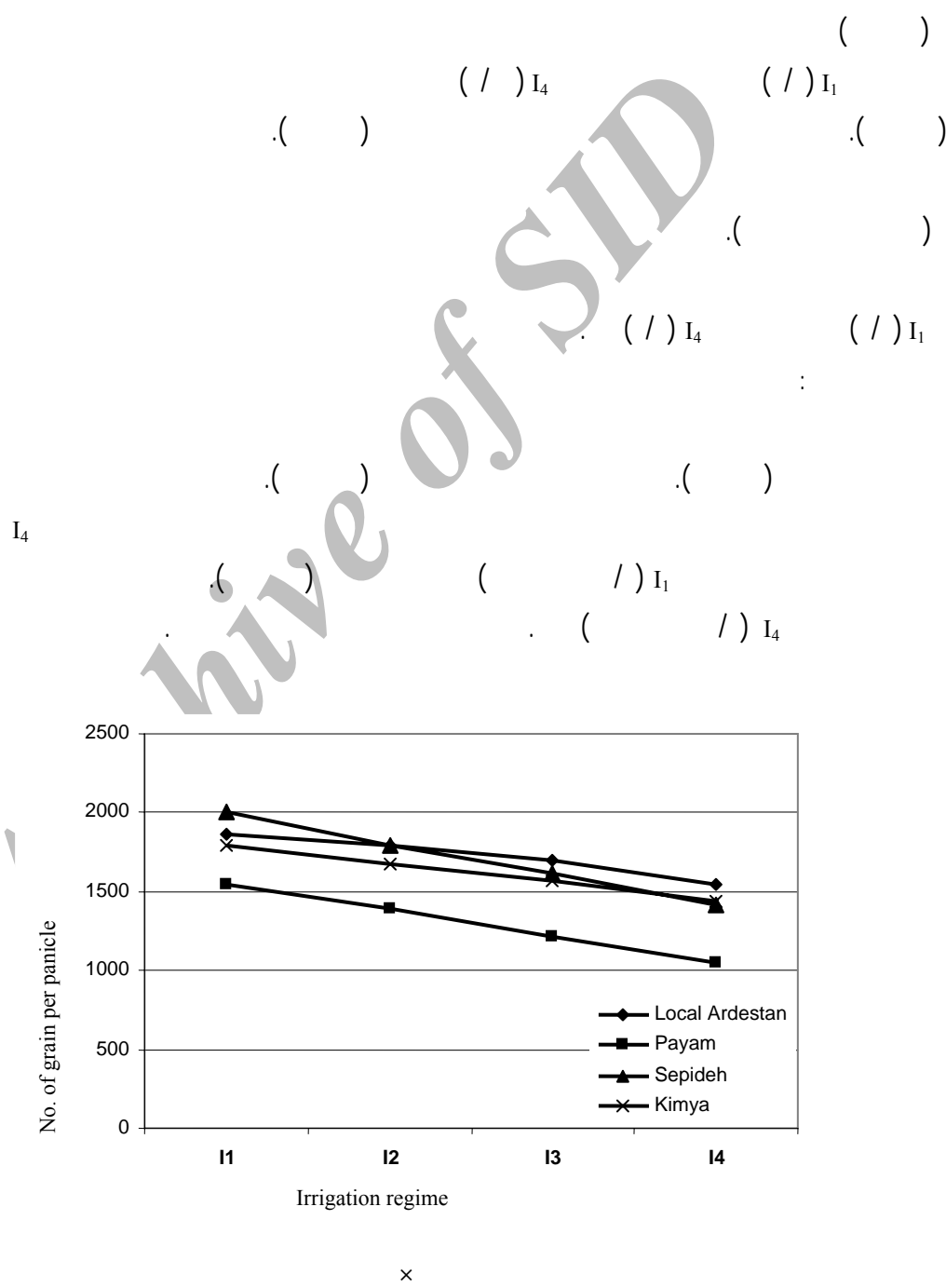


Fig. 3. Means of interaction effect between irrigation regimes \times cultivars on number of grain per panicle

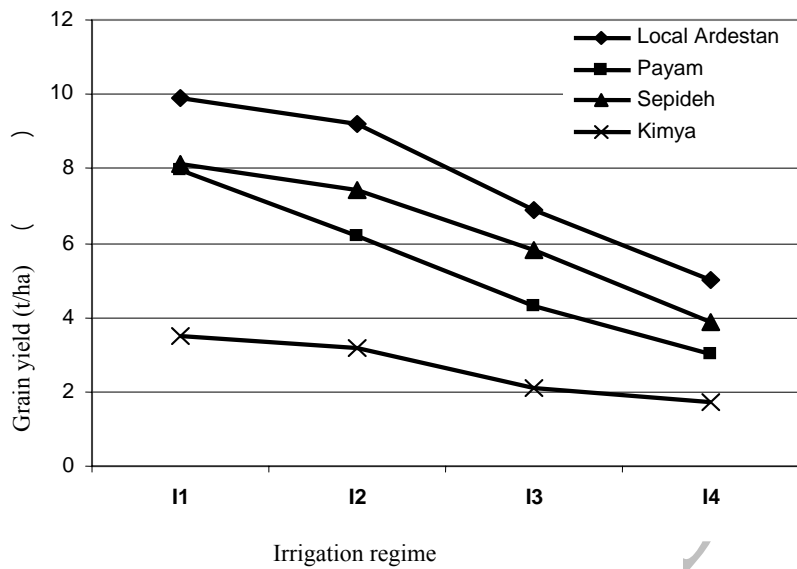


Fig 4. Means of interaction effect between irrigation regimes × cultivars on grain yield

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(Sankarapandian & Bangarusamy, 1996)

I_4 I_1 / I_3, I_2, I_1
 I_1 I_4 I_3 I_2 ()

(/) (/) (Blum *et al.*, 1997)

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I₁

$$I_2 .(\text{ })$$

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I₄ I₃

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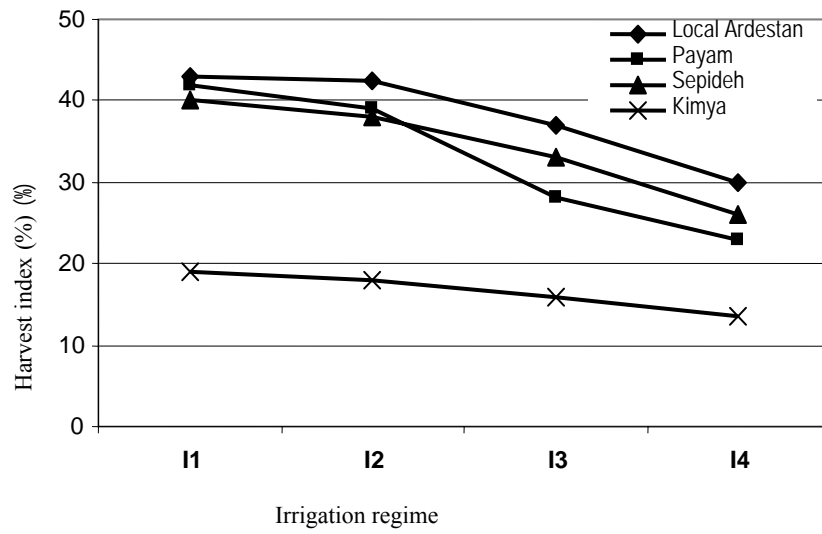


Fig 5. Means of interaction effect between irrigation regimes × cultivars on harvest index

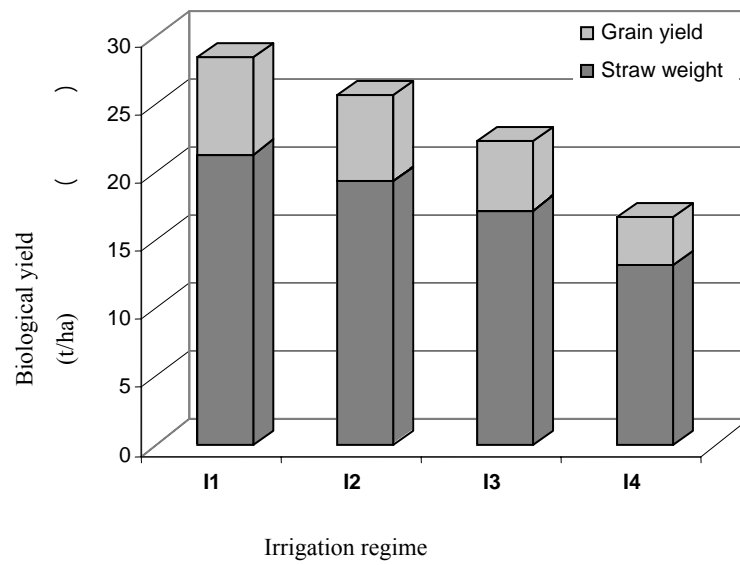


Fig 6. Means of interaction effect between irrigation regimes × cultivars on biological yield

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Effect of different irrigation regimes on growth, grain yield and its components of grain sorghum (*Sorghum bicolor* L.) cultivars under Isfahan conditions

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ABSTRACT

Razmi, N. and M. Chasemi. 2007. Effect of different irrigation regimes on growth, grain yield and its components of grain sorghum (*Sorghum bicolor* L.) cultivars under Isfahan conditions. Iranian Journal of Crop Sciences. 9 (2):169-183.

Effect of four irrigation regimes (irrigation after 100,130,160 and 190 mm evaporation from class A pan) on yield and its components of four grain sorghum cultivars namely Local Ardestan , Payam, Sepedeh and Kimya was studied, using split plot design with four replications, in Research Field Station of Faculty Agriculture, Isfahan Technology University. Analysis of variance and mean comparison between treatments showed that yield and its components had negative response to water stress condition, and with increasing irrigation intervals from I₁ to I₄ these values decreased significantly. Therefore, grain yield reduced 9% in I₂, 27% in I₃ and 51% in I₄ in comparison to I₁. There was considerable variation among the cultivars in grain yield and its components. Results also showed maximum plant height and biological and grain yield in local Ardestan, maximum grain per panicle in Sepideh and latest maturity to Kimya cultivars. Irrigation×cultivar had significant effect on grain yield and its components of sorghum cultivars. Local Ardestan cultivar had the least yield reduction under this conditions.

Key words: Irrigation regimes, Grain yield , Yield components, Sorghum, Water use efficiency.

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