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Influence of Water Management Practices on Yield and Moisture Use Efficiency of Different Millet Crops under Rice Fallows

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ABSTRACT

A field experiment was conducted on clay loam soils of Agricultural College Farm, Bapatla during *rabi*, 2017-18 to study the effect of deficit water management practices on growth and yield of rice fallow millet crops. Results of the experiment revealed that growth parameters, yield attributes and yield were influenced by scheduling of irrigation at different stages of crop growth in maize, sorghum and bajra. Higher plant height in maize (260.5 cm), sorghum (203.6 cm) and bajra (150.4 cm) were recorded under irrigation scheduled at vegetative, flowering and grain filling stages compared to V_2, V_3 and V_4 treatment. In drymatter accumulation, irrigation scheduled at vegetative, flowering and grain filling stages (V_1) recorded higher drymatter accumulation in maize (13498 kg ha^{-1}), sorghum (16170 kg ha^{-1}) and bajra (12834 kg ha^{-1}), followed by irrigations given at flowering and grain filling stages (V_3). Higher equivalent yield in maize (6320 kg ha^{-1}), sorghum (6992 kg ha^{-1}) and bajra (2768 kg ha^{-1}) were recorded under irrigation scheduled at vegetative, flowering and grain filling stages compared to V_2, V_3 and V_4 treatments. However, higher moisture use efficiency was registered with Irrigation given at flowering stage only (V_4) in all the three crops compared to other treatments.

Key words: *Scheduling of irrigation, millet crops,water management practices.*

Rrice-fallow pulses was a dominant cropping sequence of Krishna zone, the area under these crops has declined due to late planting of rice, owing to late onset of monsoon and delayed release of canal water besides severe attack of viral diseases and parasitic weed *Cuscuta*. In this changed scenario, farmers are now growing millets in rice-fallows as an alternate crop to pulses. Millets are small-seeded grasses that are hardy and grow well in dry zones as rainfed crops, under marginal conditions of soil fertility and moisture. Millets are important crops in the semiarid tropics of Asia and Africa with 97 per cent of millet production in developing countries and need very little water for their production compared to irrigated crops. Millets can withstand more heat and reduced water availability and grow in less rain. Proper irrigation scheduling is simply applying the appropriate amount of water at the right time. Scheduling considers such physical factors as the water holding capacity of the soil, crop water use rate, and plant characteristics (e.g., root depth and sensitivity to water stress). Deficit (or regulated deficit) irrigation is one way of maximizing water use efficiency (WUE) for higher yields per unit of irrigation water applied.

MATERIAL AND METHODS

A field trial to study the effect of deficit water management practices on growth and yield of millets was conducted on clay loam soils at Agricultural College Farm, Bapatla during *rabi* season, 2017-18. The experiment was laid out in strip-plot design with the treatments comprising of three millet crops *viz.,* H_1: Maize, H_2: Sorghum and H_3: Bajra allotted to horizontal strips and four scheduling of irrigation (V_1- Irrigation at vegetative + flowering + grain filling, V_2- Irrigation at vegetative + flowering, V_3 - Irrigation at flowering + grain filling and V_4 - Irrigation at flowering stage) allotted to vertical strips under rice fallow conditions. All the crops were sown on 11th, December 2017. Five plants were tagged in each net plot area for recording observations that did not involve destructive sampling. All the observations were recorded on these plants at 30, 60, 90 DAS and at harvest. Five plants in the second row from the border row in each plot were cut at each time for recording drymatter accumulation. Grain yield of sorghum and bajra were counted to maize equivalent by calculate grain yield of sorghum and bajra crops with their prevailing prices of respective crops.

Maize equivalent yield of sorghum =

$$\frac{\text{Yield of sorghum} \times \text{Price of sorghum}}{\text{Price of maize}}$$

Maize equivalent yield of bajra =

$$\frac{\text{Yield of bajra} \times \text{Price of bajra}}{\text{Price of maize}}$$

Table 1. Plant height (cm) of different millet crops at harvest as influenced by water management practices under rice fallows

Horizontal strips-Crops	Vertical strips-Irrigations				
	V_1(V+F+G)	V_2(V+F)	V_3(F+G)	V_4(F)	Mean
H_1-Maize	260.5	254.1	252.7	245.3	253.2
H_2-Sorghum	203.6	202.5	179.0	174.2	189.8
H_3-Bajra	150.4	143.9	139.9	140.5	143.5
Mean	204.9	200.2	190.5	186.7	
	SEm ±		CD (0.05)	CV (%)	
Crops	3.6		14.2	5.9	
Irrigations	3		10.3	4.2	
H x V			NS		
V x H			NS		

Table 2. Drymatter accumulation (kg ha^{-1}) of different millet crops at harvest as influenced by water management practices under rice fallows

Horizontal strips-Crops	Vertical strips-Irrigations				
	V_1(V+F+G)	V_2(V+F)	V_3(F+G)	V_4(F)	Mean
H_1-Maize	13498	12092	13802	12606	13000
H_2-Sorghum	16170	14174	14685	13962	14748
H_3-Bajra	12834	11766	12271	11294	12041
Mean	14168	12677	13586	12621	
	SEm ±		CD (0.05)	CV (%)	
Crops	267		1048	6.9	
Irrigations	150.3		520	3.4	
H x V			NS		
V x H			NS		

Table 3. Maize Equivalent yield (kg ha^{-1}) of different millet crops as influenced by water management practices under rice fallows

Horizontal strips-Crops	Vertical strips-Irrigations				
	V_1(V+F+G)	V_2(V+F)	V_3(F+G)	V_4(F)	Mean
H_1-Maize	6320	6100	6280	5900	6150
H_2-Sorghum	6992	6738	6921	6300	6738
H_3-Bajra	2768	2557	2714	2267	2577
Mean	5360	5132	5305	4822	
	SEm ±		CD (0.05)	CV %	
Crops	58.7		230.3	4	
Irrigations	117.4		406.3	6.8	
H x V			NS		
V x H			NS		

RESULTS AND DISCUSSION

Effect of scheduling of irrigation on growth parameters of rice fallow millets

Higher plant height in maize (260.5 cm), sorghum (203.6 cm) and bajra (150.4 cm) were recorded under irrigation scheduled at vegetative, flowering and grain filling stages compared to irrigation scheduled at flowering, grain filling and vegetative, flowering and irrigation only at flowering stage. Drymatter accumulation by the crops at maturity

Table 4. Moisture use efficiency (kg ha.mm^{-1}) of different millet crops as influenced by water management practices under rice fallows

Horizontal strips-crops	Vertical strips-Irrigations				
	V_1(V+F+G)	V_2(V+F)	V_3(F+G)	V_4(F)	Mean
H_1-Maize	15.5	17.3	17.5	18.2	17.1
H_2-Sorghum	18.8	19.9	20.3	20.8	19.9
H_3-Bajra	12.8	14.2	14.8	15.7	14.4
Mean	15.7	17.1	17.5	18.2	
	SEm ±		CD (0.05)	CV %	
Crops	0.43		1.7	8.7	
Irrigations	0.6		2.1	10.4	
H x V			NS		
V x H			NS		

also was influenced by all the irrigation practices, and the data from Table 2 revealed that higher drymatter was produced with three irrigations provided at different critical stages of crop growth (V_1) (13498 kg ha^{-1} in maize, 16170 kg ha^{-1} in sorghum and 12834 kg ha^{-1} in bajra), followed by two irrigations given at flowering and grain filling stages (V_3), two irrigations given at vegetative and flowering stages (V_3). The lowest was noticed under V_4 plot in all the crops.

Effect of water management practices on yield and MUE of maize

Higher equivalent yield in maize (6320 kg ha^{-1}), sorghum (6992 kg ha^{-1}) and bajra (2768 kg ha^{-1}) were recorded under irrigation scheduled at vegetative, flowering and grain filling stages compared to irrigation scheduled at flowering, grain filling and vegetative, flowering and irrigation only at flowering stage. Higher moisture use efficiency was recorded undert one irrigation provided only at flowering stage of crop growth (V_4) (18.2 kg ha.mm^{-1} in maize, 20.8 kg ha.mm^{-1} in sorghum and 15.7 kg ha.mm^{-1} in bajra), followed by two irrigations given at flowering and grain filling stages (V_3), two irrigations given at vegetative and flowering stages (V_3). The lowest was noticed under V_1 plot in all the crops.

CONCLUSION

From the present study, it was concluded that irrigation scheduled at vegetative, flowering and grain filling stages recorded higher plant height, drymatter accumulation, grain yield compared to irrigation scheduled at flowering, grain filling and at vegetative, flowering and irrigation given only at flowering stage. Higher moisture use efficiency was recorded undert one irrigation provided at only at flowering stage followed by two irrigations given at flowering and grain filling stages and two irrigations given at vegetative and flowering stage. The lowest was noticed under irrigation given at all three stages.

LITERATURE CITED

Afria B S and Shrikant 2004 Performance of pearlmillet (*Pennisetum glaucum*) cultivars under terminal water stress in relation to physiological and yield parameters. *Indian Journal of Agricultural Sciences.* 74(11):610-612.

Ahuja K N and Singh S P 1990 Irrigation requirement of sorghum based intercropping systems in spring season in north-western India. *Indian Journal of Agronomy.* 35(4):400-407.

Alfalahi A A, Abodi A, H M K, Jabbar B K A, Muhdi A M and Sulman K A 2015 Scheduling Irrigation as a Water Saving Practice for Corn (*Zea mays* L.) production in Iraq. *International Journal of Applied Agricultural Sciences*. 1(3): 55-59.

Ashraf U, Salim M N, Sher A, Sabir S, Khan Pan S, Tang X 2016 Maize growth, yield formation and water-nitrogen usage in response to varied irrigation and nitrogen supply under semi-arid climate. *Turkish Journal of Field Crops*. 21(1): 87-95.

Bhuva H M and Sharma S 2015 Influence of nutrient uptake by irrigation, nitrogen and phosphorus and their effect on quality parameters of *rabi* pearlmillet. *Journal of Agricultural& Environmental Sciences.* 15 (3): 324-327.

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