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Yogesh Kumar Sahu

Research Scholar, Mahatma
Gandhi Chitrakoot Gramodaya
Vishwa Vidyalaya, Chitrakoot,
District Satna, Madhya Pradesh,
India

Pawan Sirothiya

Associate Professor, Mahatma
Gandhi Chitrakoot Gramodaya
Vishwa Vidyalaya, Chitrakoot,
District Satna, Madhya Pradesh,
India

Corresponding Author:**Yogesh Kumar Sahu**

Research Scholar, Mahatma
Gandhi Chitrakoot Gramodaya
Vishwa Vidyalaya, Chitrakoot,
District Satna, Madhya Pradesh,
India

Evaluation of Plant height of wheat crop as influenced by different irrigation methods and frequency of irrigation

Yogesh Kumar Sahu and Pawan Sirothiya

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Abstract

The experiment was carried out to find out the Evaluation of Plant height of wheat crop as influenced by different irrigation methods and frequency of irrigation. The treatments comprised of two irrigation methods, four irrigation frequencies were evaluated in RBD (factorial) design with three replications. The four times irrigations given to wheat crop at CRI, tillering, jointing and milking stages resulted in almost significantly higher plant height at every stage of observations i.e. from 30 DAS up to the harvest stage. The second and third best irrigation scheduling was three and then the times Irrigation scheduling was three and then two times irrigation.

Keywords: Irrigation, crop, frequency and stage

Introduction

Wheat (*Triticum aestivum* L.) is one of the most cultivated cool-season crop originated from the Middle East. It has somewhat longer growing period and minimum heat requirement than the other small grain crops; and billions of people in the world use it as food in various forms such as steamed breads, cookies, cakes, pasta, noodles and couscous (Cauvain, 2003; Kingfisher, 2004) [2, 7]. It is the cheapest source and supplies 72 percent of the calories and protein in the average diet (Heyne 1987; Ken, 2004; Rehm and Schmitt, 2010) [4, 5, 9]. According to Deshmukh and padole (1993) [3], in a field trial on clay loam soil, wheat was irrigated at cumulative pan evaporation (CPE) of 50, 75, 100 or 125 mm. Grain yield increased from 2.07 t ha⁻¹ to with irrigation at 125 mm CPE to 3.23 t ha⁻¹ with irrigation at 50 mm CPE. Parsad (1993) [8] in the field conducted on silty loam found that combination of manual weed control + irrigation at 150 mm CPE +150 kg N achieved the greatest wheat grain yields. Abd El-Gawad *et al.* (1994) [1] found that increasing number of irrigation from two to four increased wheat growth and seed index; while Ibrahim *et al.* and Khaatun *et al.* (2007)

Materials and Methods

A field experiment on different methods of irrigation and stages of irrigation on growth wheat (*Triticum aestivum* L.) was carried out during the year 2016-2017 and 2017-2018 at the Instructional Farm, MGCGVV, Chitrakoot, Satna (M.P.). The research work was conducted in the Randomized Block Design with three replications. Each replication was comprised of 08 treatment combinations. In different treatments combination of T₀ Control, T₁ 1 Irrigation surface (CRI stage), T₂ 2 Irrigation surface (CRI +Jointing stage), T₃ 3 Irrigation surface (CRI +Jointing+Milking stage), T₄ 4 Irrigation surface (CRI+Tillering+Jointing+Milking stage), T₅ 1 Irrigation sprinkler (CRI stage), T₆ 2 Irrigation sprinkler (CRI +Jointing stage), T₇ 3 Irrigation sprinkler (CRI+Jointing+Milking stage), T₈ 4 Irrigation sprinkler (CRI+Tillering+Jointing+Milking stage). The Chitrakoot is situated in semi-arid and sub tropical zone of Kymore Plateau & Satpuda Hills of Madhya Pradesh, North of 24° 31' latitude and East of 81° 15' longitude with an altitude of 306 m from mean sea level. The soil of the investigation field was clay loam with good drainage and uniform texture with medium NPK status. Observations were recorded according to standard procedure on Plant height (cm).

Results

Plant height (cm)

The observations recorded periodically regarding plant height recorded after 30, 60, 90 and at harvest stages are shown in Table 1 to 5. The rise in plant height, in common, was recorded as the plant growth progressed till harvest stage. It

was, in common progressed very fast between 30 to 60 days period in all the applications. There after the rise was slow. At 30 days stage, the plant height in different applications ranged from lowest 15.64 cm to highest 17.77 cm at 60 DAS, 54.11 to 66.41 cm where as at harvest stage, it varied from 65.54 cm to 84.68 cm based on two years mean values.

Table 1: Plant height (cm) of wheat as influenced by different methods and frequency of irrigation

Treatments	30 DAS			60 DAS			90 DAS			At harvest		
	2016-17	2017-18	Mean	2016-17	2017-18	Mean	2016-17	2017-18	Mean	2016-17	2017-18	Mean
Methods of irrigation												
Surface	15.94	16.88	16.41	57.99	61.77	59.88	64.53	68.45	66.49	72.68	75.21	73.94
Sprinkle	16.67	17.83	17.25	59.99	62.36	61.17	67.90	72.90	70.40	77.78	80.08	78.93
SEm ±	0.43	0.65	0.54	0.80	0.80	0.80	1.51	0.66	1.09	1.75	2.31	2.03
CD (P=0.05)	N S	N S	N S	N S	N S	N S	N S	1.86	N S	N S	N S	N S
Frequency of irrigation												
CRI stage	15.28	16.01	15.64	54.34	53.89	54.11	56.45	60.47	58.46	64.19	66.90	65.54
CRI + jointing stage	16.21	16.68	16.44	59.45	59.85	59.65	65.84	68.83	67.33	74.62	75.88	75.25
CRI+ jointing + Milking stage	16.66	18.24	17.45	61.54	65.33	63.43	67.73	74.99	71.36	79.44	81.11	80.27
CRI + tillering + jointing + milk. stage	17.06	18.49	17.77	63.63	69.20	66.41	74.85	78.42	76.63	82.67	86.70	84.68
S.E m ±	0.30	0.46	0.38	0.57	0.57	0.57	1.07	0.47	0.77	1.24	1.63	1.44
CD (P=0.05)	0.86	1.30	1.08	1.61	1.60	1.61	3.02	1.31	2.17	3.50	4.62	4.06
Interaction	N S	N S	N S	N S	N S	N S	N S	N S	N S	N S	N S	N S

The plant height was observed to be fluctuated remarkably only due to frequency of irrigation at every stage of observations. The methods of irrigation (surface or sprinkler) as well as treatment interactions did not exert significant impact in both years. The scrutiny of treatments effect indicate that the four irrigations given to wheat on CRI, tillering, Jointing, milking stages brought about almost significantly higher plant height at every stage of observations in both the years. The maximum plant height at 30, 60, 90 DAS and harvest stages was 17.77, 66.41, 76.63 and 84.68 cm, respectively. However the second best treatment was three irrigations given at CRI, jointing and milking stages. On

the other hand almost significantly minimum plant height was notated when only one irrigation was provided at the CRI Stage, the height being 15.64, 54.11, 58.46, and 65.54 cm at the two years mean data.

The perusal data in Tables 2 to 5 evidently indicate that the treatment interaction between procedures and frequency of irrigation were observed to be extraneous at every stage of observations. However the best treatment interaction was four irrigations applied through sprinkler system. On the other hand the lowest plant height was recorded when only one irrigation at CRI stage was given through surface method.

Table 2: Plant height (cm) at 30 DAS of wheat as influenced by different methods and frequency of irrigation

Frequency of irrigation			Methods of irrigation		Mean
			2016-17		
			Surface	Sprinkler	
Surface irrigation CRI stage			15.25	15.31	15.28
CRI +Jointing stages			15.61	16.81	16.21
CRI +Jointing +milking stages			16.21	17.10	16.66
CRI + tillering+ Jointing +milking stages			16.67	17.45	17.06
Mean			15.94	16.67	16.30
Frequency of irrigation 2017-18					
Sprinkler irrigation CRI stage			15.65	16.37	16.01
CRI +Jointing stages			16.58	16.77	16.68
CRI+ Jointing milking stages			17.42	19.05	18.24
CRI +tillering+ Jointing + milking stages			17.86	19.11	18.49
Mean			16.88	17.83	17.35
Year		Methods of irrigation	Stage of irrigation		Interaction
2016-17	S. Em ±	0.43	0.30		0.61
	CD 5%	N S	0.86		N S
2017-18	S.E m ±	0.65	0.46		0.92
	CD 5%	N S	1.30		N S

Table 3: Plant height (cm) at 60 of wheat as influenced by different methods and frequency of irrigation

Frequency of irrigation	Methods of irrigation		Mean
	2016-17		
	Surface	Sprinkler	
Surface irrigation CRI stage	50.37	52.31	54.34
CRI+ jointing stages	58.46	60.44	59.45
CRI+ jointing +milking stages	61.16	61.91	61.54

CRI +tillering jointing +milking stages	61.97	65.29	63.63
Mean	57.99	59.99	58.99
Frequency of irrigation 2017-18			
Sprinkler irrigation CRI stage	52.51	55.27	53.89
CRI +Jointing stages	62.45	57.25	59.85
CRI +Jointing+ milking stages	64.56	66.09	65.33
CRI +tillering+ Jointing +milking stages	67.55	70.84	69.20
Mean	61.77	62.36	62.07

Year		Methods of irrigation	Stage of irrigation	Interaction
2016-17	S. Em \pm	0.80	0.57	1.14
	CD 5%	N S	1.61	N S
2017-18	S.E m \pm	0.80	0.57	1.13
	CD 5%	N S	1.60	N S

Table 4: Plant height (cm) at 90 DAS of wheat as influenced by different methods and frequency of irrigation

Frequency of irrigation		Methods of irrigation		Mean
		2016-17		
		Surface	Sprinkler	
Surface irrigation CRI stage		55.07	57.83	56.45
CRI + jointing stages		64.19	67.48	65.84
CRI +jointing + milking stages		66.38	69.07	67.73
CRI +tillering+ jointing +milking stages		72.49	77.21	74.85
Mean		64.53	67.90	66.21
Frequency of irrigation 2017-18				
Sprinkler irrigation CRI stage		57.52	63.42	60.47
CRI+ jointing stages		67.43	70.23	68.83
CRI+ jointing +milking stages		72.58	77.39	74.99
CRI + tillering+ jointing +milking stages		76.28	80.57	78.42
Mean		68.45	72.90	70.67

Year		Methods of irrigation	Stage of irrigation	Interaction
2016-17	S.Em ±	1.51	1.07	2.14
	CD 5%	N S	3.02	N S
2017-18	S.E m ±	0.66	0.47	0.93
	CD 5%	1.86	1.31	N S

Table 5: Plant height (cm) at harvest stage of wheat as influenced by different methods and frequency of irrigation

Frequency of irrigation		Methods of irrigation		Mean
		2016-17		
		Surface	Sprinkler	
Surface irrigation CRI stage		61.33	67.06	64.19
CRI+ jointing stages		72.67	76.56	74.62
CRI+ jointing + milking stages		76.49	82.39	79.44
CRI +tillering+ Jointing +milking stages		80.21	85.13	82.67
Mean		72.68	77.78	75.23
Frequency of irrigation 2017-18				
Sprinkler irrigation CRI stage		63.29	70.51	66.90
CRI +jointing stages		74.32	77.43	75.88
CRI+ jointing +milking stages		79.59	82.63	81.11
CRI +tillering+ jointing +milking stages		83.66	89.74	86.70
Mean		75.21	80.08	77.64

Year		Methods of irrigation	Stage of irrigation	Interaction
2016-17	S.Em ±	1.75	1.24	2.47
	CD 5%	N S	3.50	N S
2017-18	S.E m ±	2.31	1.63	3.27
	CD 5%	N S	4.62	N S

Discussion

The growth parameter of wheat did not change up to significant extent due to irrigation applied either through surface method or by sprinkler system at any of the stages of observations. This might be owing to the fact that in both the systems of irrigation, sufficient quantity of soil moisture was available for the actively growing plant throughout the growing period, therefore the crop growth was found almost equal. The frequency or number of irrigations was given at

the critical growth stages of crop plants play significant role on the ultimate productivity of any crop. The results of present experiment that the four times irrigation given to wheat crop at CRI, tillering, jointing and milking stages resulted in almost significantly higher plant height from 30, 60, 90 DAS. The second and third best irrigation scheduling was three and then two times irrigation. Where as only one irrigation given at CRI stage brought about the significantly decreased plant height.

Conclusion

The growth parameter of wheat did not change up to significant extent due to irrigation applied either through surface method or by sprinkler system at any of the stages of observations. The four times irrigations given to wheat crop at CRI, tillering, jointing and milking stages resulted in almost significantly higher plant height at every stage of observations i.e. from 30 DAS up to the harvest stage. The second and third best irrigation scheduling was three and then the times Irrigation scheduling was three and then two times irrigation. Whereas only the one irrigation given at CRI stage brought about the significantly decreased plant height.

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