Int.J.Curr.Microbiol.App.Sci (2020) *9*(10): 3627-3634

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 9 Number 10 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.910.420

Evaluation of Number of Leaves/Plant of Wheat Crop as Influenced by Different Irrigation Methods and Frequency of Irrigation

Yogesh Kumar Sahu* and Pawan Sirothiya

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

**Corresponding author*

Keywords

Irrigation, Harvest, Stage and Wheat

Article Info

Accepted:
26 September 2020
Available Online:
10 October 2020

A B S T R A C T

The experiment was carried out to find out the Evaluation of Number of leaves/plant 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 number of leaves/plant 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.

Introduction

Wheat (*Triticum aestivum* L.) is one of the leading cereals in the world. It belongs to the family Gramineae and it is the world's most widely cultivated cereal crop which ranks first followed by rice. It ranks first both in acreage and production among the grain crops of the world (FAO, 2008). BARI (2006) also reported that wheat grain is rich in food value containing 12% protein, 1.72% fat, 69.60% carbohydrate and 27.20% minerals.

It is essential that the water use efficiency (WUE) of winter wheat be improved, while maintaining, or potentially increasing, grain yields.

For example, the North China Plain occupies 39% of the country's cultivated area; but only has 8% of the nation's water resources, and this water shortage has seriously restricted the development of winter wheat production. Determining a suitable irrigation frequency is an important step in being able to optimize

winter wheat yield and WUE. Irrigation frequency can affect plant growth in various ways. Decreased irrigation frequency is an important technique used to improve WUE of paprika Shin JH *et al.,* (2012) and citrus García-Tejero I *et al.,* (2011). In winter wheat, increased irrigation frequency results in low evapotranspiration Li QQ, Lang K *et al.,* 2013. Han *et al.*, (2014) revealed that by irrigating twice in the winter wheat growing season, grain yield could be increased; however, irrigation timing at the end of the growing season could decrease grain yield.

Similarly, Li *et al.,* 2010 revealed that frequent irrigation late in the winter wheat growing season decreased WUE, and this was mainly due to changes in the vertical distribution of root density. Previous studies also suggested that, for winter wheat, a one-time irrigation of 120mm could produce a reasonable grain yield and WUE, and irrigation (60 mm) at both the jointing and heading stages significantly improved WUE Li QQ, Bian CY *et al.,* 2015, Li QQ *et al.,* 2011, Naresh RK *et al.,* 2012.

Planting pattern also plays an important role in improving grain yield and WUE. Research in North India revealed that planting pattern could significantly increase both winter wheat and summer maize (*Zea mays* L.) grain yield and WUE Naresh RK *et al.,* 2012. In a North China study, furrow planting significantly increased winter wheat grain yield and WUE under water deficit conditions Li QQ *et al.,* 2010.

In addition, partial root zone irrigation was found to affect the growth and WUE of crops. Parsad (1993) in the field conducted on silty lome found that combination of manual weed control + irrigation at 150 mm CPE +150 kg N achieved the greatest wheat grain yields. Abd El- Gawad *el al*. (1994) 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 aestivam 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 T_0 Control, T_1 1 Irrigation surface (CRI stage), T_2 2 Irrigation surface (CRI +Jointing stage), T_3 3 Irrigation surface (CRI +Jointing + Milking stage), T_4 4 Irrigation surface (CRI +Tillering +Jointing +Milking stage), T_5 1 Irrigation sprinkler (CRI stage), T_6 2 Irrigation sprinkler (CRI +Jointing stage), T_7 3 Irrigation sprinkler (CRI +Jointing +Milking stage), $T_8$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 24^0 31' latitude and East of 81^0 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 Number of leaves/plants.

Results and Discussion

Number of leaves/plant

This parameter was observed periodically throughout the plant growth from 40,40 and 90 DAS and the data so obtained have been summarized in Table 1 to 4.

Table.1 Number of leaves / plant of wheat as influenced by different methods and frequency of irrigation

Treatments	40 DAS			60 DAS			90 DAS		
	2016-17	2017-18	Mean	2016-17	2017-18	Mean	2016-17	2017-18	Mean
Methods of irrigation									
Surface	12.88	15.93	14.40	40.36	41.10	40.73	47.25	49.84	48.54
Sprinkle	13.61	16.38	14.99	42.03	41.94	41.98	49.84	52.74	51.29
S. Em±	0.49	0.54	0.52	1.69	0.58	1.14	1.79	0.42	1.11
CD (P=0.05)	N S	N S	N S	N S	N S	N S	N S	1.18	N S
Frequency of irrigation									
CRI stage	11.36	14.66	13.01	31.65	33.85	32.75	38.57	40.66	39.61
CRI+ jointing stages	13.29	15.11	14.20	38.30	37.30	37.80	46.40	48.35	47.37
CRI +Jointing +Milking stages	13.93	17.22	15.57	44.84	41.11	42.97	51.98	55.69	53.83
CRI+ tillering +jointing + milk. stages	14.41	17.65	16.03	49.98	53.83	51.90	57.24	60.48	58.86
S.E m ±	0.35	0.38	0.37	1.19	0.41	0.80	1.20	0.30	0.75
CD (P=0.05)	0.99	1.08	1.04	3.37	1.17	2.27	3.40	0.84	2.12
Interaction	**N S**	**N S**	**N S**	**N S**	**Sig.**	**N S**	**N S**	**Sig**	**N S**

Table.2 Number of leaves/plant at 40 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	10.80	11.93	11.36
CRI+ jointing stage	13.07	13.51	13.29
CRI+ jointing + milking stages	13.67	14.18	13.93
CRI+ tillering +jointing +milking stages	13.99	14.82	14.41
Mean	12.88	13.61	13.24
Frequency of irrigation2017-18			
Sprinkler irrigation CRI stage	14.62	14.69	14.66
CRI+ jointing stages	14.72	15.50	15.11
CRI+ jointing + milking stages	17.18	17.25	17.22
CRI+ tillering + jointing +milking stages	17.20	18.10	17.65
Mean	15.93	16.38	16.15

Year		Methods of irrigation	Stage of irrigation	Interaction
2016-17	S. Em ±	0.49	0.35	0.70
	CD 5%	N S	0.99	N S
2017-18	S.E m ±	0.54	0.38	0.76
	CD 5%	N S	1.08	N S

Table.3 Number of leaves/plant at 60 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	29.89	33.41	31.65
CRI & jointing stages	28.23	38.37	38.30
CRI+ jointing + milking stages	43.51	46.17	44.84
CRI+ tillering+ Jointing + milking stages	49.79	50.16	49.98
Mean	40.36	42.03	41.19
Frequency of irrigation	**2017-18**		
Sprinkler irrigation CRI stage	30.16	37.53	33.85
CRI & jointing stages	37.32	37.29	37.30
CRI+ Jointing + milking stages	45.19	37.03	41.11
CRI+ tillering+ Jointing + milking stages	51.75	55.90	53.83
Mean	41.10	41.94	41.52

Year		Methods of irrigation	Stage of irrigation	Interaction
2016-17	S. Em ±	1.69	1.19	2.38
	CD 5%	N S	3.37	N S
2017-18	S.E m ±	0.58	0.41	0.82
	CD 5%	N S	1.17	2.39

Table.4 Number of leaves / plant 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	36.11	41.04	38.57
CRI+ jointing stages	45.86	46.93	46.40
CRI+ Jointing + milking stages	50.56	53.39	51.98
CRI+ tillering+ jointing + milking stages	56.48	58.01	57.24
Mean	47.25	49.84	48.54
Frequency of irrigation	**2017-18**		
Sprinkler irrigation CRI stage	38.19	43.13	40.66
CRI +jointing stages	47.42	49.28	48.35
CRI+ jointing + milking stages	54.11	57.26	55.69
CRI+ tillering+ jointing + milking stages	59.64	61.31	60.48
Mean	49.84	52.74	51.29

Year		Methods of irrigation	Stage of irrigation	Interaction
2016-17	S.Em ±	1.79	1.20	2.40
	CD 5%	N S	3.40	N S
2017-8	S.E m ±	0.42	0.30	0.59
	CD 5%	1.18	0.84	1.80

The enhancement in leaves/plant, in general, was taken place with the advance inclement of plant growth till 90 DAS stage of observations. The leaves formation was very fast between 40 and 60 DAS stage of plant growth. There after the rise was allow up to 90 DAS stage. At 40 DAS stage, the leaves count in various treatments ranged from 13.01 to 16.03/plant, at 60 DAS 33.85 to 53.83/plant whereas at 90 DAS, it ranged from 39.61 to 58.86/plant based on two years mean values.

As regards with the effect of methods and frequency of irrigation, the four irrigations gave at CRI, tillering, jointing and milking stages ensued in remarkably higher leaves/plant at every stage of observations in both the years. The maximum number of leaves formation at 40, 60 and 90 DAS stage was 16.03, 51.90 and 58.86/plant, respectively. However the second best treatment was three irrigations given at CRI, jointing and milking stages of plant growth and development. On the other hand, almost significantly by minimum leaves formation /plant was recorded when only one irrigation was given at CRI stage the leaves count being 13.01, 32.75 and 39.61/plant at the respective stages. These values are based on two years experimentation. The scouting of data in Table 1 to 4 evidently reveal that the treatment interactions between procedures and frequency of irrigation was observed to be extraneous at every stage of observations.

Discussion

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 leaves per plant at all the stage of observations i.e. from 30, 60, 90 DAS and harvest stage. The second and third best irrigation scheduling was three and then two times irrigation. Whereas only one irrigation given at CRI stage brought about the significantly decreased plant height and leaves formation per plant. Similarly at 90 DAS, maximum leaves/plant were 58.86 as against only 39.61 leaves plant under one irrigation, The higher irrigation frequency might have provided desirable condition for water movement in soil and for uptake by roots (Segal *et al.*, 2000). The sufficient water availability at all the four critical(water-demanding)stages provided most favourable conditions to absorbed required nutrients for the proper root shoot growth and development of plant all any with sufficient production of photosynthates. The present results agree with those of many researchers (Kahlown *et al.*, 2007, Mantazav *et al.*, 2008, Dukes *et al.*, 2010, Davk *et al.*, 2016 and Sarkar *et al.*, 2017).

The four times irrigations given to wheat crop at CRI, tillering, jointing and milking stages resulted in almost significantly higher leaves per plant 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 leaves formation per plant. Accordingly at harvest stage, Similarly at 90 DAS, maximum leaves were 58.86/plant as against only 39.61 leaves plant under one irrigation.

References

Abd El-Gawad, A.A., S. El-Habbal, A.S.A. Edris and A.D. El-Ham. 1994. Effect of water stress during grain filling and nitrogen fertilizer on chemical composition and technological properties of wheat plants. Egyptian J. Appl. Sci. 9: 216-232.

BARI (Bangladesh Agricultural Research Institute). 2006. Annual report for 2005.

Bangladesh April. Res. Inst. Joydebpur, Gazipur, Bangladesh. pp. 22−23.

FAO (Food and Agriculture Organization). 2008. Production Year Book. Food and Agriculture Organization. Rome. 68: 115.

García-Tejero I, Durán-Zuazo VH, Muriel-Fernández JL, Martínez-García G, Jiménez-Bocanegra JA. Benefits of low-frequency irrigation in citrus orchards. Agron Sustain. Dev. 2011; 31(4): 779–791.

Han HF, Li QQ, Dong BD. Effects of irrigation frequency and stages on grain yield and quality characteristics of winter wheat. Acta Ecol. Sin. 2010; 30(6): 1548–1555.

Hu TT, Kang SZ, Li FS, Zhang JH. Effects of partial root-zone irrigation on the nitrogen absorption and utilization of maize. Agr. Water Manage.2009; 96: 208–214.

Khatun, M.R., A.M.S. Alam and M.R. Amin. 2007. Effect of irrigation on yield and its components in five varieties of wheat (*Triticum aestivum* L.). Int. J. Sustain. Agric. Technol, 3: 1-6.

Li QQ, Lang K, Liu QR, Bian CY, Liu XH, Chen GQ. Dry matter, grain yield, and evapotranspiration of winter wheat under deficit irrigation in North China Plain. J. Food Agr. Environ. 2013; 11: 2593–3596.

Li QQ, Dong BD, Qiao YZ, Liu MY, Zhang JW. Root growth, available soil water, and water-use efficiency of winter wheat under different irrigation regimes applied at different growth stages in North China. Agr. Water Manage. 2010; 97(10): 1676–1682.

Li QQ, Bian CY, Liu XH, Ma CJ, Liu QR. Winter wheat grain yield and water use efficiency in wide-precision planting pattern under deficit irrigation in North China Plain. Agr. Water Manage. 2015; 153: 71–76.

Li QQ, Shen JY, Zhao DD. Effect of irrigation frequency on yield and leaf water use efficiency of winter wheat. Tran. CSAE 2011; 27(3): 33–36.

Naresh RK, Singh SP, Chauhan P. Influence of conservation agriculture, permanent raised bed planting and residue management on soil quality and productivity in maize–wheat system in western Uttar Pradesh. Int. J. Life Sci. Biote. 2012; 1(4): 27–34.

Parsad, K. 1993. Effect of irrigation and nitrogen on the efficiency of weed management in wheat. Integrated weed management for sustainable agriculture Proc. of Indian Soc. of Weed Sci. Int'l. Symposium, India. Vol. III, 71-74.

Shin JH, Noh EH, Son JE. Transpiration, growth, and water use efficiency of paprika plants (*Capsicum annuum L.*) as affected by irrigation frequency. Hortic. Environ. Biote. 2012; 53(2): 129–134.

Yactayo W, Ramírez DA, Gutiérrez R, Mares V, Posadas A, Quiroz R. Effect of partial root-zone drying irrigation timing on potato tuber yield and water use efficiency. Agr. Water Manage.2013; 123: 65–70.

How to cite this article:

Yogesh Kumar Sahu and Pawan Sirothiya. 2020. Evaluation of Number of Leaves/Plant of Wheat Crop as Influenced by Different Irrigation Methods and Frequency of Irrigation. *Int.J.Curr.Microbiol.App.Sci.* 9(10): 3627-3634. doi: https://doi.org/10.20546/ijcmas.2020.910.420