International Journal of Humanities Social Science and Management (IJHSSM)
Volume 4, Issue 6, Nov.-Dec., 2024, pp:480-486 ISSN: 3048-6874
www.ijhssm.org

"Effect of irrigation scheduling and foliar application of thiourea on production and productivity of wheat (Triticum aestivum L.)"

Manoj Kumar Ram[1*], Shubhranshu Singh[2], Mr. Ram Niwas[3], Rahul Yadav[4],Jayesh Pratap Singh[5], Chandan Kumar Singh[6],

[1,4,5,6] *Department of Agronomy Rama University Mandhana Kanpur, Uttar Pradesh, India*
[3]*Assitant Professor, Department of Agronomy Rama University Mandhana Kanpur, Uttar Pradesh, India*
[2]*Department of Agronomy (ANDUA&T),Kumarganj, Ayodhya,Uttar Pradesh, India*
Correspondence mail:- mkraj645@gmail.com

Date of Submission: 12-11-2024 Date of Acceptance: 24-11-2024

Abstract:
This experiment was carried out during *Rabi* season of 2021-22 at Agricultural Research Farm of faculty of Agricultural Sciences and Allied Industries, Rama University, Mandhana, Kanpur Nagar (U.P). The present experiment was laid out in split plot design, the experiment consists of4treatments in main plot in which method of sowing *viz;* 1. I_1- irrigation at CRI, irrigation at I_2- CRI+ BT, irrigation at I_3- CRI + BT + MK, irrigation at I_4- CRI + MT + BT + MK and 4treatments where spray of thiourea *viz;* T_1 -Control, T_2 - Spray of thiourea at maximum tillering, T_3 - Spray of thiourea at booting stage, T_4 - Spray of thiourea at maximum tillering + booting stage in sub plot with three replications in mustard crop. Among growth parameter viz; plant height, number of tillers, leaf area index, dry matter production and yield attributing character viz; length of ear, number of spikelet's /ears, number of grains per ear and test weight and grain and straw yield of wheat crop was recorded maximum from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest when three irrigation scheduling at CRI + BT + MK stage. Among spray of thiourea, growth parameter, yield attributing character and yield of grain and straw was recorded maximum from the application two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and Spray of thiourea at maximum tillering stage of wheat crop. The maximum gross return, net return and B:C ratio was recorded from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest when three irrigation scheduling at CRI + BT + MK stage and two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and Spray of thiourea at maximum tillering stage of wheat crop..

Keywords:- Thiourea, Irrigation, Growth, Yield and Quality

I. Introduction

Wheat (*Triticum aestivum* L.) is one of the prime cereals among all food grain crops produced globally **(Anon 1971)**. India grains the second leading position as a wheat producing country in the world after China throughout the world. Wheat is the second largely consumed food grain crop after rice in our country. Production and productivity of wheat crop is improved up to optimum level after comes of the green revolution in country. It is considered ideal source of carbohydrates, protein, minerals, B-group vitamins and dietary fiber *i.e* .excellent health-building cereal crop. It contains carbohydrate 78.10%, protein14.70%, fat 2.10%, minerals 2.10% and considerable proportions of vitamins (thiamine and vitamin-B) and minerals (zinc, iron), dietary fibers.

Wheat *(Triticum aestivum L.)* is an annual plant of Gramineae family. It is the world most widely cultivated food crop. Wheat is an important staple food crop throughout the globe. India is the second largest producer of wheat after China, beginning an agrarian state leading in area and production of wheat in India. Wheat is the world's second most important annual crop after rice. Surface water gets depleted by runoff water from agricultural field containing pesticides fertilizer and waste chemicals from industries and sewage from cities and rural area the fall in ground water level owing to excessive removal for agriculture and other uses with high costs of fuel and electrical energy used in drawing groundwater. However a holistic strategy to evolve integrated solutions for multiple problems has been elusive the vertical effort practices viz. irrigation management application of mulches increase the duration of moisture availability with an increase in the amount of

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 4, Issue 6, Nov.-Dec., 2024, pp:480-486 ISSN: 3048-6874
www.ijhssm.org

available moisture in the soil. Water is the most important factor that are necessary for proper growth balanced development and higher yield of all crop .water deficiency effect plant growth and grain yield Irrigation management is one of the important managerial activities and effect the effective utilization of water by crop Maximum grain yield (2.27t/ha) was obtained with application of 200 mm irrigation treatment Under scarcity of water,

The irrigation is the main factor to determining the grain yield of wheat. The advent of high-yielding varieties of cereal in agricultural development irrigation is very essential for wheat production. Total requirement of grain production can be obtained by three way Ist application of balance fertilizer, IInd use high yielding varieties and IIIrd timely irrigated the wheat crop.

Thiourea is a nitrogen and sulfur containing compound with better water solubility and absorption potential is known to impart tolerance against prevailing abiotic stresses. Structurally, its molecule has two main functional groups; 'thiol' is reported vital for oxidative stress response and 'imino' strikingly capable to fulfil the increased N requirement under abiotic stress conditions. Thiols are well-known to maintain the disturbed redox state (–SH/-S-S- ratio) of the cell and its proper functioning under stress conditions. Its involvement and applicability has also been demonstrated for increasing grain filling under drought. At physiological level, this is directly associated with enhanced photosynthesis, increased metabolite translocation and co-ordinated regulation of plant's source to sink relationships plant's source to sink relationships (Pandey *et al.*, 2013)

II. Materials and Method

Geographically, Kanpur is situated in sub tropical region at an altitude of 125.9 meter from the mean sea level and latitude ranging of 25^0 56' to 28° 58' North and longitude 79° 31' to 80° 34' East. The climate of locality is semi arid with moderate rainfall and cold winters. The mean annual rainfall is 850 mm extending generally from the mid June to mid October. The temperature rises maximum during May - June (45 - 48°C) and come down to 4 - 5 ^0C during December - January. Occasional showers are also received during winter and summer**.**

The experiment was laid out in Split Plot Design. Two factors were there i.e. irrigation scheduling and foliar spray of thiourea. The factors were I_1- irrigation at CRI, irrigation at I_2- CRI+ BT, irrigation at I_3- CRI + BT + MK, irrigation at I_4- CRI + MT + BT + MK and 4treatments where spray of thiourea *viz;* T_1 -Control, T_2 - Spray of thiourea at maximum tillering, T_3 - Spray of thiourea at booting stage, T_4 - Spray of thiourea at maximum tillering + booting stage.

Experimental Findings

Initial plant population per running meter row length of wheat crop does not show significant results due to irrigation scheduling at different stage and foliar application on Thio-urea of wheat crop. Correspondingly, the interaction effect of irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop does not show significant results on initial plant population.

Plant height at 30 DAS of wheat crop does not show significant results due to irrigation scheduling at different stage and foliar application of thio-urea on wheat crop.

The maximum plant height at 60, 90 DAS and harvest stage was documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest when three irrigation scheduling at CRI + BT + MK stage. However, the minimum plant height at 60, 90 DAS and harvest stage was recorded from one irrigation scheduling at CRI stage. the maximum plant height at 60, 90 DAS and harvest stage was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and Spray of thiourea at maximum tillering stage of wheat crop. However, the minimum plant height at 60, 90 DAS and harvest stage was recorded from control plot. The interaction effect of irrigation scheduling at different stage and foliar application of thio-urea on wheat crop does not show significant results on plant height at any stage.

Number of tillers at 30 DAS of wheat crop does not show significant results due to irrigation scheduling at different stage and foliar application of thio-urea on wheat crop. The maximum number of tillers at 60, 90 DAS and harvest stage was documented 30 from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest when three irrigation scheduling at CRI + BT + MK stage. However, the minimum number of tillers at 60, 90 DAS and harvest stage was recorded from one irrigation scheduling at CRI stage. The maximum number of tillers at 60, 90 DAS and harvest stage was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and Spray of thiourea at maximum tillering stage of wheat crop. However, the minimum number of tillers at 60, 90 DAS and

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 4, Issue 6, Nov.-Dec., 2024, pp:480-486 ISSN: 3048-6874
www.ijhssm.org

harvest stage was recorded from control plot. The interaction effect of irrigation scheduling at different stage and foliar application of thio-urea on wheat crop does not show significant results on number of tillers at any stage.

The maximum number of effective ear were documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest when three irrigation scheduling at CRI + BT + MK stage. However, the minimum number of effective ear were recorded from one irrigation scheduling at CRI stage. The maximum number of effective ear was documented from two spray of thiourea at maximum tillering + booting stage which were 31 statistically highest with spray of thiourea at booting stage and Spray of thiourea at maximum tillering stage of wheat crop. However, the minimum number of effective ear were recorded from control plot.

Length of ear in wheat crop was significantly influenced due to irrigation scheduling at different stage and foliar application of thio-urea on wheat crop. The maximum length of ear was documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically at par with three irrigation scheduling at CRI + BT + MK stage. However, the minimum length of ear was recorded from one irrigation scheduling at CRI stage. The maximum length of ear was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and spray of thiourea at maximum tillering stage of wheat crop. However, the minimum length of ear was recorded from control plot. The interaction effect of irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop does not show significant results on length of ear.

Number of spikelet's /ears in wheat crop was significantly influenced due to irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop. The maximum number of spikelet's /ears were documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically at par with three irrigation scheduling at CRI + BT + MK stage. However, the minimum number of spikelet's /ears was recorded from one irrigation scheduling at CRI stage. The maximum number of spikelet's /ears was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and spray of thiourea at maximum tillering stage of wheat crop. However, the minimum number of spikelet's /ears were recorded from control plot. The interaction effect of irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop does not show significant results on number of spikelet's /ears.

Number of grains per ear in wheat crop was significantly influenced due to irrigation scheduling at different stage and foliar application of thio-urea on wheat crop. The maximum number of grains per ear was documented from four irrigation scheduling at CRI + MT + BT + MK which 34 were statistically at par with application of three irrigation scheduling at CRI + BT + MK stage and two irrigations at CRI+ BT stage. However, the minimum number of grains per ear was recorded from one irrigation scheduling at CRI stage. The maximum number of grains per ear was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and spray of thiourea at maximum tillering stage of wheat crop. However, the minimum number of grains per ear were recorded from control plot. The interaction effect of irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop does not show significant results on number of grains per ear.

Test weight of wheat seed crop was significantly influenced due to irrigation scheduling at different stage and foliar application of Thiourea on wheat crop. The maximum test weight of wheat grain was documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest when three irrigation scheduling at CRI + BT + MK stage. However, the minimum test weight of wheat grain was recorded from one irrigation scheduling at CRI stage. Although, the maximum test weight of wheat grain was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and spray of thiourea at maximum tillering stage of wheat crop. However, the minimum test weight of wheat grain was recorded from control plot. The interaction effect of irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop does not show significant results on test weight of wheat grain.

Grain yield of wheat crop was significantly influenced due to irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop. The maximum grain yield of wheat crop was documented from 36 four irrigation scheduling at CRI + MT + BT + MK which were statistically. Although, the maximum grain yield of wheat crop was documented from two spray of thiourea at

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 4, Issue 6, Nov.-Dec., 2024, pp:480-486 ISSN: 3048-6874
www.ijhssm.org

maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and spray of thiourea at maximum tillering stage of wheat crop. However, the minimum grain yield of wheat crop was recorded from control plot. The interaction effect of irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop does not show significant results on grain yield of wheat crop.

Straw yield of wheat crop was significantly influenced due to irrigation scheduling at different stage and foliar application of thio-urea on wheat crop. The maximum straw yield of wheat crop was documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest with three irrigation scheduling at CRI + BT + MK stage. However, the minimum straw yield of wheat crop was recorded from one irrigation scheduling at CRI stage. The maximum straw yield of wheat crop was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and spray of thiourea at maximum tillering stage of wheat crop. However, the minimum straw yield of wheat crop were recorded from control plot. The interaction effect of irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop does not show significant results on straw yield of wheat crop.

biological yield of wheat crop was significantly influenced due to irrigation scheduling at different stage and foliar application of Thiourea on wheat crop. The maximum biological yield of wheat crop was documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest with three irrigation scheduling at CRI + BT + MK stage. However, the minimum biological yield of wheat crop was recorded from one irrigation scheduling at CRI stage. Although, the maximum biological yield of wheat crop was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage of wheat crop. However, the minimum biological yield of wheat crop was recorded from control plot. The interaction effect of irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop does not show significant results on biological yield of wheat crop.

harvesting index of wheat crop was significantly influenced due to irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop. The maximum harvesting index of wheat crop was documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest with three irrigation scheduling at CRI + BT + MK stage. However, the minimum harvesting index of wheat crop was recorded from one irrigation scheduling at CRI stage. Although, the maximum harvesting index of wheat crop was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage of wheat crop. However, the minimum harvesting index of wheat crop was recorded from control plot. The interaction effect of irrigation scheduling at different stage and foliar application of Thio-urea on wheat crop does not show significant results on harvesting index of wheat crop.

The maximum B:C ratio of wheat crop was documented from four irrigation scheduling at CRI + MT + BT + MK (1.223) which were statistically highest with three irrigation scheduling at CRI + BT + MK stage (1.223). However, the minimum B:C ratio (1.190) of wheat crop was recorded from one irrigation scheduling at CRI stage. Although, the B:C ratio of wheat crop was documented from two spray of thiourea at maximum tillering + booting stage (1.168) which were statistically at par with spray of thiourea at booting stage B:C ratio (1.145) of wheat crop. However, the minimum B:C ratio of wheat crop was recorded from control plot cost of cultivation (Rs. /ha. 56,895)

III. Discussion

Growth and development studies on wheat crop: The results of this experiment were clearly justified that the maximum plant height at 60, 90 DAS and harvest stage was documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest when three irrigation scheduling at CRI + BT + MK stage. It is clearly justified that as a number of irrigations increase the growth and development of wheat crop. The number of irrigations at different stage with proper scheduling have been increase the dry matter production. Similar finding has been reported by Deshmukh *et.al.,* (1992) and Singh *et.al.,* (1997).

Although, the maximum plant height at 60, 90 DAS and harvest stage was documented from two spray of thiourea at maximum tillering + booting stage. 43 Among application of Thio-urea at booting and tillering stage of wheat crop have been increase the growth and development that's result increase the plant height of plant under water stress condition. The maximum number of tillers at 60, 90 DAS and harvest stage was documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest when three irrigation scheduling at CRI + BT + MK stage. As

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 4, Issue 6, Nov.-Dec., 2024, pp:480-486 ISSN: 3048-6874
www.ijhssm.org

number of irrigation increase, the tiller production increase and tiller mortality must decrease. Similar finding has been reported by Sarkar and Paul (2000) and Shivani et al., (2003). The maximum number of tillers at 60, 90 DAS and harvest stage was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and Spray of thiourea at maximum tillering stage of wheat crop. This is due to spray of Thio-urea a of wheat growth stage decrease the transpiration and therefore decrease the tiller mortality of wheat crop at critical water stress condition where possibility of water deficit become increase the mortality of tiller due to mutual competition among them. Similar result has been found by Sahu and Singh (1995).

Yield attributes and yield studies on wheat crop

The data related to the yield attributing character viz; length of ear, number of spikelet's /ears, number of grains per ear and test weight in wheat crop at different stage as furnished by irrigation scheduling at different stage and foliar application of Thio-urea have been indicate that yield attribute exhibitedpositive results with increase number of irrigation and application of Thio-urea at different stage. This is due to application of thio-urea at different growth stage of wheat crop limit the micro water stress at plant and soil level. Thio- urea could be reduced temporary water shortage and terminal heat that caused injurious effect on plant at reproductive stage of wheat plant. Which ultimately reduced the occasional yield losses in wheat crop. Similar result has been found by Zain et. al., (2017).

The maximum grain yield of wheat crop was documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest with three irrigation scheduling at CRI + BT + MK stage. Although, the maximum grain yield of wheat crop was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage and spray of thiourea at maximum tillering stage of wheat crop. The data clearly show that limited number of irrigations with application of Thio-urea at different stage can successfully reduce number of irrigations without too much decreasing the yield of wheat. Similar finding has been reported by Kabir et al.,(2009) and Mishra and Kushwaha. (2016).

Economics: The maximum gross and net return of wheat crop was documented from four irrigation scheduling at CRI + MT + BT + MK which were statistically highest with three irrigation scheduling at CRI + BT + MK stage. Although, the gross and net return of wheat crop was documented from two spray of thiourea at maximum tillering + booting stage which were statistically at par with spray of thiourea at booting stage net return of wheat crop. Application of irrigation at critical stage of crop growth increase the yield of wheat crop which ultimately increase the net and gross return. Similarly, the Thio-urea can increase the growth and yield of wheat crop and finally increase the benefit : cost ratio of wheat crop.

IV. Conclusion

On the basis of our finding it is concluded that the four irrigation scheduling at CRI + MT + BT + MK and two spray of thiourea at maximum tillering + booting stage were found best in the terms of Growth, Yield attributes, Yield parameters and B:C ratio.

Table 1 Effect of different irrigation scheduling and Thiourea spray on Plant population, Plant height, Number of tillers.

TREATMENT	Plant Population	Plant Height				Number of Tillers			
A. Irrigation Schedule		**45DAS**	**60DAS**	**90DAS**	**Harvest**	**30DAS**	**60DAS**	**90DAS**	**Harvest**
CRI	28.368	29.645	45.037	67.013	72.66	41.092	68.49	75.21	65.407
CRI+BT	28.708	29.720	47.420	79.698	79.633	41.678	81.65	78.54	74.145
CRI+BT +MK	28.245	29.520	47.453	80.603	80.505	42.650	88.05	81.82	79.828
CRI+MT+BT +MK	28.640	29.550	51.418	92.580	92.465	42.560	94.11	87.05	86.245
C.D.	NA	N/A0.289	1.632	2.65	2.34	N/A	1.632	2.65	4.200
SE(m)	0.278	0.409	0.463	0.67	0.65	0.289	0.463	0.67	1.684
SE(d)	0.393	N/A0.289	0.654	0.87	0.58	0.409	0.654	0.87	1.191
B. Thiourea Spray									
Control	28.578	29.605	47.213	80.813	79.56	42.00	80.9	76.19	72.622

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 4, Issue 6, Nov.-Dec., 2024, pp:480-486 ISSN: 3048-6874
www.ijhssm.org

Spray of Thiourea at maximum tillering	28.455	29.568	47.710	81.315	80.685	42.273	84.16	77.37	75.768
Spray of Thiourea at booting stage	28.332	29.585	47.673	81.683	81.258	42.333	85.21	78.28	77.193
Spray of Thiourea at max. tillering + booting stage	28.595	29.678	48.733	82.083	81.598	42.37	85.99	81.79	80.043
C.D.	NA	N/A	1.35	1.76	2.54	N/A	1.35	1.76	4.000
SE(m)	0.559	0.411	0.944	0.30	0.48	0.411	0.944	0.30	1.362
SE(d)	0.395	0.581	0.667	0.25	0.68	0.581	0.667	0.25	1.926
Interaction (AxB)									
SE(d)±	NA	1.162	N/A	N/A	N/A	1.162	N/A	N/A	N/A
C.D at 5%	1.118	N/A	1.887	4.995	5.027	N/A	1.887	4.995	3.853

Table 2 Effect of different irrigation scheduling and Thiourea spray on Effective Tillers, Length of ear (cm), Number of spikelet/ear, Number of grain/ear, Test weight, Grain yield, Straw yield, Biological yield, Harvest Index.

TREATMENT	**Effective Tillers**	**Length of ear (cm)**	**Number of spikelet/ear**	**Number of grain/ear**	**Test weight**	**Grain yield**	**Straw yield**	**Biological yield**	**Harvest Index**	**B:C Ratio**
A. Irrigation Schedule										
CRI	64.725	9.271	36.466	1.390	36.693	37.608	83.928	123.160	30.518	0.993
CRI+BT	69.770	10.188	39.240	1.420	39.523	44.038	85.838	129.973	33.870	1.113
CRI+BT +MK	78.480	11.295	40.733	1.518	40.948	49.863	85.553	133.790	37.308	1.190
CRI+MT+BT +MK	85.723	12.143	41.890	1.693	42.423	56.835	85.935	142.673	39.830	1.223
C.D.	3.87	1.85	1.721	0.299	1.498	1.654	1.221	4.551	1.241	NA
SE(m)	1.23	0.132	0.248	0.380	0.579	0.469	0.891	1.290	0.352	NA
SE(d)	1.45	0.187	0.350	0.579	0.680	0.663	0.261	1.824	0.497	NA
B. Thiourea Spray										
Control	67.618	10.259	38.491	1.378	38.330	45.338	85.123	130.480	34.578	1.088
Spray of Thiourea at maximum tillering	74.475	10.815	39.678	1.493	39.983	46.658	85.142	131.900	35.178	1.118
Spray of Thiourea at booting stage	76.293	10.880	40.288	1.505	40.298	47.405	85.243	133.150	35.428	1.145
Spray of Thiourea at max. tillering + booting stage	81.313	10.943	40.873	1.545	40.975	48.943	85.745	134.065	36.343	1.168
C.D.	2.32	0.197	1.10	0.090	1.12	1.958	0.30	1.230	1.276	NA
SE(m)	0.54	0.071	0.452	0.520	0.520	0.938	1.151	1.900	0.495	NA
SE(d)	0.62	0.041	0.320	0.077	0.677	1.074	0.028	0.687	0.700	NA
Interaction (AxB)										
SE(d)±	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C.D at 5%	1.118	0.318	0.683	1.419	1.619	1.763	2.719	2.819	1.594	NA

References

[1]. Anonymous (2015). Economic survey of India. Economics Division, Ministry of Finance, Govt. of India.

[2]. Anonymous (2019). India state Economic Survey and Agriculture Department of Punjab.

[3]. Ahmad, A. (2002). Effect of irrigation scheduling on the performance of wheat

genotypes in vertosols, M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad,

[4]. Ali, BT, Hwary, E, Yagoub, OS, 2012. Effect of different irrigation intervals on wheat (Triticum aestivum L.,) in semiarid regions of Sudan. Journal of Science and Technology, 12(3), 75-83.

[5]. Deshmukh, V.S.; Mulay, A.J.; Bharad, G.M.; Kale, H.B. and Atale, S.B. (1992). Effect of deletion of irrigation at critical growth stage on grain yield of late sown wheat (Triticum aestinum L.) in Vidarbha. Indian Journal of Agronomy 37 (1:47-48).

[6]. Jana, PK, Bandyopadhyay, P, Ray, D and Bhowmick, MK, (2001). Response of wheat to irrigation regimes in new alluvial zone of West Bengal, Annals of Agricultural Research, 22, 498-502,

[7]. Kabir, NAME, Khan, AR, Islam, MA and Haque, MR, (2009). Effect of seed rate and irrigation level on the performance of wheat cv. Gourab; J. Bangladesh Agril. Univ., 7(1): 47–52,

[8]. Khan, RU, Rashid, A, Khan, MS and Farooq, MA, (2011). Determination of optimum time of first irrigation for higher yield and monetary return of wheat crop; Sarhad J. Agric. 27:349-352,

[9]. Khan, J, Mohammad, S, Tahir, S, Aneela and Malik, A. (2007). Effect of different irrigation schedules on water use and yield of wheat. Sarhad J. Agric. 23, 4-8.

[10]. Khokhar, B, Hussain, I and Khokhar, Z. (2010).Effect of different irrigation frequencies on growth and yield of different wheat genotypes in sindh. Pakistan; J. Agriculture Res., 23 108-113.

[11]. Kumar, P. and Pannu, R.K. (2012). Effect of different sources of nutrition and irrigation levels on yield, nutrient uptake and nutrient use efficiency of wheat. International Journal of Life Science, Botany and Pharma Research, 1(4):187-192.

[12]. Mishra, G. and Kushwaha, H.S. (2016). Winter wheat yield and soil physical properties responses to different tillage and irrigation. European Journal of Biological Research, 56:530-537.

[13]. Mubeen, M, Ahmad, A, Wajid, A, Khaliq, T, Sultana, RS, Hussain, S, Ali, A, Ali, H, and Nasim, W. (2013).Effect of growth stage-based irrigation schedules on biomass accumulation and resource use efficiency of wheat cultivars. American Journal of Plant Sciences.4: 1435-1442.

[14]. Oweis, T. (1994). Supplemental irrigation: An option for improved water use efficiency. P, 115-131. In Proceedings of Regional Seminar on the Optimization of Irrigation in Agriculture. Amman, Jordan. 21-24 Nov. 1994.

[15]. Rahim, R, Rahamtullah, MA and Waraich, AE, (2010) Effect of phosphorus application and irrigation scheduling on wheat yield and phosphorus use efficiency. Soil & Environ. 29(1), 15 – 22.

[16]. Ram, H; Dandhwal, V., Kumar, K.; Vashist and Kaur, H. (2013). Grain yield and water use efficiency of wheat in relation to irrigation levels and rice straw mulching in North West India. Agricultural water Management. 128 : 92-101.

[17]. Sahu, M. P. and Singh, D. (1995) Role of thiourea in improving productivity of wheat (Triticum aestivum L.). J. Plant Growth Regulation. 14 (4):169-178.

[18]. Saren, BK and Jana, PK,(2001) Growth and productivity of wheat (Triticum aestivum L.) as influenced by depths of irrigation, nitrogen and its time of application, Journal of Interacademicia, 5,(1), 39-44.

[19]. Saren, BK, Dey, S and Mandal, D, (2004) Effect of irrigation and sulphur on yield attributes, productivity, consumptive use, consumptive use efficiency of wheat (Triticum aestivum). Indian Journal of Agricultural Sciences, 74, (5), 257-261