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Importance of under variable moisture regimes on wheat (*Triticum aestivum* L.) cultivars

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Abstract
A field experiment was carried out at Agrometeorology Research Farm, Narendra Deva University of Agriculture & Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) during Rabi season 2017 to study the "Importance of under variable moisture regimes on wheat (*Triticum aestivum* L.) cultivars.". The experiment consisted of 9 treatment combinations and tested in Randomized block design with three replications. Experiment consisted of three moisture regimes viz. 0.8 IW/CPE ratio, 1.0 IW/CPE ratio and 1.2 IW/CPE ratio and three wheat cultivars Viz. HUW-234, PBW-343 and NW-1012. Result reveal that moisture regimes of 0.8 IW/CPE ratio was found suitable for higher growth of wheat crop.

Keywords: wheat, moisture regimes, dry matter, LAI

Introduction
Wheat (*Triticum aestivum* L.) is a staple food of the world and belongs to family Poaceae. It is most important staple food of about two billion people (36% of the World population). About 55% of the world population depends on wheat for intake of about 20% of food calories. Wheat is self-pollinated crop and it has been described as the 'King of cereals'. In India, it is grown in an area of 30.47 million hectare, production 95.85 million tone's with a productivity of 3.15 tonnes per hectare. Uttar Pradesh having first rank in respect of both area (9.95 million hectare) and production (30.24 million tone's) with a productivity of 3.10 tone's per hectare in 2015 (Anonymous 2015) [1]. Irrigation in wheat can be scheduled mainly by three approaches *viz.*, soil moisture depletion approach, climatic approach (IW/CPE ratio) and physiological growth stage. Among them the climatological approach is very scientific and useful which has been widely recognized among the scientists and research workers throughout the world. It is well known that evapo-transpiration by a full crop cover is closely associated with evaporation from an open pan (Dastane, 1967) [2]. (Parihar *et al.* 1974) [3] Suggested a relatively more practical meteorological approach of IW/CPE. The ratio between fixed amount of irrigation water (IW) and CPE are a basis for irrigation scheduling of crops. Temperature below or above normal alter plant functions and productivity. In late sown wheat, low temperature prevailing during germination substantially affects the germination and seedling emergence. Germination is a critical process, as temperature below 12 °C result in poor and uneven emergence (Timmermans *et al.*, 2007) [6]. Therefore, the rate of emergence and final emergence percentage are important factors in determining the crop potential in various temperature of wheat production. In late sowing season, temperature of soil can be expected to be below 10 °C, which affects the seed germination and stand establishment. However mid-season sowing of winter wheat for any locality is usually most favourable, whereas late sown wheat suffers more winter injury, which produces fewer tillers and may ripen in lower grain weight and number of grains per plant (Razzaq *et al.*, 1986) [4]. The genotypic response of wheat to planting dates varies for yield contributing characters due to different genetic potential. The decline becomes prominent in the cultivars requiring more days for heading under normal planting. Increase in temperature cause shortens of heading period (Tashiro & Wardlaw, 1999) [5]. Similarly, cultivars matured earlier when planted late, indicating the forced maturity due to high temperature.

Materials and Methods
An experiment was conducted during Rabi 2017 at the Agrometeorology Research Farm of N.D. University of Agriculture& Technology, Kumarganj, Faizabad (U.P.) on the topic entitled "Importance of under variable moisture regimes on wheat (*Triticum aestivum* L.) cultivars." The experimental site is located in the main campus of NDUA&T, Kumarganj, (Faizabad) situated at a distance of about 42 km. away from Faizabad district headquarter on

Faizabad Raibarelly road. The details of materials and methods employed & techniques adopted during the course of experimentation has been described in this experiment. The experiment was conducted in Randomized Block Design (RBD) and replicated the three times. The different growth parameters studied were wheat as different phenophases, Plant height, Total dry matter, Number of effective tillers (m^{-2}), Leaf area index.

Results

Different phenophases of wheat as affected by moisture regimes and wheat cultivars at different phenological stages have been presented in (Table-1). The maximum days taken from emergence to maturity were recorded (128.3days) with moisture regime 1.2 IW/CPE ratio while minimum days taken from emergence to maturity (126.7 days) was observed under moisture regimes of 0.8 IW/CPE ratio and (1.0 IW/CPE ratio). Different wheat cultivars had marked influence on the days taken to different phenophases of wheat crop Days taken to different phenophases ranged from 125.1 to 130 days irrespective of different wheat cultivars. Maximum days taken (130.0 days) from emergence to maturity was obtained in PBW-343 fillowed by NW-1012 (129.6 days) while minimum days taken (125.1days) was obtained in wheat cultivars HUW-234 from emergence to maturity of wheat crop.

Plant height of wheat recorded at various growth stages as affected by Moisture regime and wheat cultivars have been presented in (Table-2). Plant height increased successively with age of crop. It is evident from the data that different moisture regime and variety influenced plant height significantly at all the stages except 30 DAS. Taller plants were obtained at 0.8 IW/ CPE ratio which was significant over rest both of moisture regime. Shorter plants were recorded under 1.2 IW/CPE ratio. Wheat cultivars had significant variation on plant height at all the stages. It is quite evident from the data that higher plant height was obtained in PBW-343 which was at par with HUW-234 at all the stages while significantly superior over NW-1012 variety. Data also showed that NW-1012 variety recorded smaller height of plant at all the stages.

Number of tillers on wheat cultivars recorded at various growth stages as affected by moisture regime and wheat cultivars have been presented in (Table-3). The number of tillers increased successively with age of crop. It is evident from the data that different moisture regime and wheat cultivars influenced number of tillers significantly at all the stages except 30 DAS. The maximum number of tillers was obtained at 0.8 IW/CPE ratio which was significant over rest both of moisture regimes. The minimum number of tillers was recorded under 1.2 IW/CPE ratio conditions. Varieties had significant variation on number of tillers at all the stages except 30DAS. It is quite evident from the data that maximum number of tillers was obtained in PBW-343 which was at par with NW-1012 at all the stages while significantly superior over HUW-234 wheat cultivar. Data also showed that HUW-234 variety recorded minimum number of tillers at all the stages.

Dry matter accumulation as influenced by moisture regimes and wheat cultivars have been presented in (Table-4). It is quite obvious from the data that dry matter accumulation varied significantly due to moisture regimes at all the stages of wheat. except 30 DAS and 60 DAS It was recorded higher under the treatment when wheat was irrigated with 0.8 IW/CPE ratio which was significantly superior over rest both of the moisture regimes.0.8 ratio recorded lowest dry matter at all the stages. Dry matter accumulation was affected significantly at all the stages except 30DAS and 60 DAS due to wheat cultivars. Higher dry matter accumulation was recorded in PBW-343 wheat cultivars which was at par with NW-1012 while significant over HUW-234 variety which had lowest dry matter accumulation at all the growth stages.

Leaf area index of wheat crop as affected by different moisture regimes and wheat cultivars recorded at successive growth stages have been presented in (Table-5). LAI increased successive till 60 DAS and there after declined. It is quite obvious from the data that the LAI was significantly affected due to different moisture regimes at all the stages. Significantly higher leaf area index was obtained with 0.8 IW/CPE ratio which except 30 DAS as compared to 0.8 IW/CPE ratio which proved lowest LAI at all the stages of crop. Leaf area index was affected significantly at all the stages due to wheat cultivars. Higher leaf area index was recorded in PBW-343 variety. HUW-234 recorded lowest leaf area index at all the growth stages.

Table 1: Days taken to different phenophases as influenced by Moisture regime and Wheat Cultivars.

Treatments	Days taken to different phenophases							
	Emergence	CRI	Tillering	Jointing	Flowering	Milking	Dough	Maturity
Moisture regimes								
0.8 IW/CPE ratio	8.0	21.4	42.7	62.6	82.6	102.3	117.6	128.3
1.0 IW/CPE ratio	7.6	21.2	42.6	62.6	82.1	102.2	117.6	128.1
1.2 IW/CPE ratio	7.3	21.1	42.3	62.4	82.1	102.1	177.5	126.7
Cultivars								
HUW-234	7.3	21.1	42.6	62.4	82.2	102.5	117.5	125.1
PBW-343	8.0	20.6	42.5	62.5	82.3	101.7	117.6	130
NW-1012	7.6	21.9	42.6	62.7	82.3	102.3	117.6	129.6

Table 2: Plant height (cm) as influenced by Moisture regime and Wheat Cultivars.

Treatments	Plant height (cm)			
	30 DAS	60 DAS	90 DAS	At harvest
Moisture regimes				
0.8 IW/CPE ratio	23.73	67.77	90.36	92.20
1.0 IW/CPE ratio	23.70	67.40	89.87	91.70
1.2 IW/CPE ratio	23.43	65.85	87.58	89.37
SEm±	0.46	1.40	1.64	1.70
CD at 5%	NS	4.19	4.94	5.11
Cultivars				

HUW-234	23.93	67.8	90.4	92.23
PBW-343	24.27	60.85	91.8	93.67
NW-1012	22.67	64.21	85.62	87.37
SEm±	0.46	1.40	1.64	1.70
CD at 5%	1.39	4.19	4.94	5.11

Table 3: Number of tillers (m^{-2}) as influenced by Moisture regime and Wheat Cultivars.

Treatments	Number of tillers (m^{-2})			
	30 DAS	60 DAS	90 DAS	At harvest
Moisture regimes				
0.8 IW/CPE ratio	185.33	420.33	454.00	450.00
1.0 IW/CPE ratio	183.00	411.00	444.33	441.01
1.2 IW/CPE ratio	182.67	387.00	417.67	415.33
SEm±	4.61	8.31	7.60	7.92
CD at 5%	NS	24.94	22.80	23.75
Cultivars				
HUW-234	184.67	353.17	381.67	379.33
PBW-343	177.00	443.17	478.33	474.00
NW-1012	189.33	422.00	456.00	449.00
SEm±	4.61	8.31	7.60	7.92
CD at 5%	NS	24.94	22.80	23.75

Table 4: Dry matter accumulation (gm^{-2}) as influenced by Moisture regime and Wheat Cultivars

Treatments	Dry matter accumulation (gm^{-2})			
	30 DAS	60 DAS	90 DAS	At harvest
Moisture regimes				
0.8 IW/CPE ratio	65.08	396.36	777.18	914.33
1.0 IW/CPE ratio	65.0	387.65	760.10	894.23
1.2 IW/CPE ratio	64.27	365.05	715.78	842.10
SEm±	1.37	8.27	12.68	18.64
CD at 5%	NS	NS	38.011	55.89
Cultivars				
HUW-234	64.62	333.16	653.25	768.53
PBW-343	61.20	417.81	819.23	963.80
NW-1012	65.52	398.10	780.58	918.33
SEm±	1.38	8.27	12.68	18.64
CD at 5%	NS	NS	38.011	55.89

Table 5: Leaf Area index as affected by Moisture regime and Wheat Cultivars.

Treatments	Leaf Area Index		
	30 DAS	60 DAS	90 DAS
Moisture regimes			
0.8 IW/CPE ratio	1.48	4.78	4.88
1.0 IW/CPE ratio	1.48	4.67	4.77
1.2 IW/CPE ratio	1.46	4.03	4.12
SEm±	0.04	0.088	0.108
CD at 5%	NS	0.26	0.32
Cultivars			
HUW-234	1.50	4.02	4.11
PBW-343	1.42	4.8	4.9
NW-1012	1.52	4.67	4.77
SEm±	0.04	0.09	0.10
CD at 5%	NS	0.264	0.324

Conclusion

It is concluded that study in moisture regimes of 0.8 IW/CPE ratio was found suitable for higher growth of wheat crop. Wheat cultivar PBW-343 was found suitable for optimum growth of wheat.

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