Original Research Article

Yield attributes and yield of wheat affected by irrigation schedules and varieties under HAT zone conditions of Andhra Pradesh

ABSTRACT

Aims: A field experiment was conducted to evaluate the effect of different irrigation schedules and varieties on yield attributes and yield of wheat under high altitude and tribal area (HAT) zone conditions of Andhra Pradesh.

Study design: Split-plot design was used to conduct the research experiment.

Place and Duration of Study: Regional Agricultural Research Station, Chintapalle, Visakhapatnam, ANGRAU, Andhra Pradesh. The study was conducted during *Rabi* season 2021-22.

Methodology: Split-plot design was used to conduct the experiment in which three irrigation schedules i.e., irrigation at CRI, maximum tillering, jointing, flowering and milking stages (M1), irrigation at CRI, flowering and milking stages (M2) and irrigation at CRI and milking stages (M3) as main plots and four varieties *i.e.,* DBW-252(V1), HI-1544 (V2), HI-8759 (V3) and HI-8713 (V4) as subplots. The parameters such as Spike length, spike weight, no. of productive tillers m^{-2}, no. of grains $spike^{-1}$, no. of filled grains $spike^{-1}$, 1000 grain weight, grain yield, straw yield, biological yield and harvest index were determined found superior with five irrigations scheduled at CRI, maximum tillering, jointing, flowering and milking stages and among the varieties HI-8759 recorded the maximum values which were on a par with HI-8713.

Results: Spike length, spike weight, no. of productive tillers m^{-2}, no. of grains $spike^{-1}$, no. of filled grains $spike^{-1}$, 1000 grain weight found superior with five irrigations schedules. Among the varieties HI-8759 recorded the maximum values which were on a par with HI-8713.Higher grain and straw yields were recorded under five irrigations schedule. Despite of lower grain yield observed with two irrigations but straw yield was remained statistically on a par with three irrigations. The harvest index (%) was significantly highest with five irrigations and lowest with two irrigations. However, among the varieties HI-8759 recorded significantly higher grain and straw yield. Straw yield was remained at par with HI-8713. Harvest index of HI-8759 was significantly superior over all the varieties. Lowest grain and straw yields were recorded with HI-1544.

Conclusion: Five irrigation schedules at different phenological stages significantly improved the yield of wheat. Among the varieties, the variety HI-8759 registered the highest yield which was on a par with HI- 8713 in terms of straw and biological yields.

***Keywords**: Irrigation schedules, Wheat, CRI, maximum tillering, jointing, flowering, milking, varieties, grain yield and straw yield.*

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1. INTRODUCTION

Wheat is the most preponderant food crop in the world. It occupies an area of 220.4 M ha in the world with a production of 765.77 MT [1] Whereas in India, it is cultivated to an extent of 31.35 M ha with a production of 107.86 MTand productivity of 3.42 t ha^{-1}[2] and it occupies 2nd position in terms of area & production next to rice among the cereals in our country.

Among the states of India, Uttar Pradesh rank first concerning area (9.5 M ha) and production (32.59 MT) but the productivity is much lower (3432 kg ha^{-1}) than Punjab (5008 kg ha^{-1}) and Haryana (4687 kg ha^{-1}). In Andhra Pradesh, there is no prominent area under wheat cultivation [3]. Being the “King of cereals”, it contains 70% of carbohydrates and it supplements a healthy nutritional profile with an average of 12.2% protein, 1.7% fat, 2.7% minerals, 1.8% lipids, 1.8% ash, 2.0% fiber content, and also provides 314 Kcal per 100g of food [4].

To attain optimal yields, quality and grain-protein content, wheat crop needs enough available water. Wheat is extremely sensitive to water stress during crown root initiation (CRI) and flowering, but excessive watering can result in excessive vegetative growth, a shorter reproductive time and a poorer final yield. As a result, aligning the duration of irrigation intervals with the stages of crop growth may result in fewer irrigations and a more profitable crop yield. Selection of right cultivar at right place is having prime importance for different agro-climatic regions to attain maximum yields.

Newer high-yielding varieties being relatively, thermosensitive, perform better even under variable climatic conditions. The wheat crop requires cool weather during the vegetative phase and warm weather during the reproductive phase. Farmers of high altitude and ~~tribal (~~HAT~~)area~~zone of Andhra Pradesh area usually cultivate rice as a major cereal crop during *kharif* and the majority of land left fallow during *rabi*, though the climatic conditions of the HAT zone of A.P. are ideal for wheat cultivation. The main aim of the research was to conduct the studies on wheat cultivation with different irrigation schedules and varieties at Regional Agricultural Research Station, Chintapalle for introducing wheat as a non-traditional crop.

2. MATERIAL AND METHODS

2.1 Study Site

Theresearch study was conducted during *rabi* season of 2021-22 at the at Regional Agricultural Research Station, Chintapalle. It is situated between 17° 52' N latitude and 82° 20' E longitude with an altitude of 839.0 meters above the mean sea level in the high altitude and tribal area zone of Andhra Pradesh, India.

2.2 Weather Parameters

The weekly maximum temperature during experimentation ranged from 25.0°C to 33.9°C and the minimum temperature ranged from 7.8°C to 19.1°C. The maximum temperature recorded was 33.9°C during the 11th standard week in the month of March 2022 whereas the minimum temperature recorded was 7.8 ºC during the 51st standard week in December 2021. Total rainfall of 90.0 mm was received in 7 rainy days during the crop growth period. The maximum rainfall (70.0 mm) was obtained during the 47th standard week. The weekly mean relative humidity ranged between75.6 to 91.3% during the experimentation. Maximum relative humidity was observed during the month of November 2022 on the 46th standard week.

2.3 Experimental Setup

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The experiment was laid out in split- plot design with three irrigation schedules *i.e.,* irrigation at CRI, maximum tillering, jointing, flowering and milking stages (M1), irrigation at CRI, flowering and milking stages (M2) and irrigation at CRI and milking stages (M3) are consisted as main plots and four varieties *i.e.,* DBW-252(V1), HI-1544 (V2), HI-8759 (V3) and HI-8713 (V4) as subplots. Wheat crop was sown on thoroughly prepared experimental plot. The crop was supplied with recommended fertilizer dose of 120 kg N, 60 kg P_2O_5 and 40 kg K_2O ha^{-1}. 60 kg of N and entire dose of P_2O_5 and K_2O were applied as basal, remaining 60 kg of N was applied in two equal splits at 25 DAS and 45 DAS. Application of irrigation was done to the respective treatments as specified. Field operations such as weeding and plant protection measures were taken as per recommendations of ANGRAU. Data were collected on spike length(cm), spike weight(g), no. of productive tillers m^{-2}, no. of grains $spike^{-1}$, no. of filled grains $spike^{-1}$, 1000 grain weight(g), grain yield(kg ha^{-1}), straw yield(kg ha^{-1}) and harvest index(%). The length and weight of the spike was measured from randomly selected spikes in each plot with the help of meter scale and weighing balance respectively at harvest stage. The mean length and weight of spikes for each plot was determined from the measured values by using statistical analysis. With the help of a quadrate of 1.0 square meter, the sampling area was randomly selected and the number of productive tillers at harvest were counted and mean values were recorded. The randomly selected five spikes were taken out from labelled plants then threshed and grains were counted. Average number of grains and filled grains from all spikes were computed to get the number of grains $spike^{-1}$ and number of filled grains $spike^{-1}$. One thousand grains were counted from the representative sample of each treatment drawn from winnowed and clean grain and their weight in grams was recorded by electronic balance.

The grain yield obtained in kg from each net plot separately was recorded after threshing, cleaning and drying to optimum moisture content, afterwards yield was converted into kg ha^{-1}. The straw yield of each plot was calculated after threshing by subtracting net plot grain yield from net plot bundle weight and expressed in kg ha^{-1}. The both grain yield and straw yields of net plot were combined to attain biological yield of net plot in kg $plot^{-1}$ and finally expressed in terms of kg ha^{-1}. The harvest index of the crop was recorded by dividing the economic yield (grain yield) by the biological yield (grain and straw yield) and represented in percentage.

$$Harvest\ index(\%) = \frac{Economic\ \ Yield}{Bilological\ \ yield\ (grain + Straw\ )} \times 100 \quad - \quad - \quad - \quad (1)$$

3. RESULTS AND DISCUSSION

3.1 Yield attributes:

3.1.1 Spike Length (cm): Data in Table 1 indicates that the spike length of wheat increased progressively with increasing irrigations from two(M3) to five(M1). The higher length of spike (8.9 cm) was recorded under five irrigations schedules. This might be attributed to the availability of sufficient moisture for nutrient uptake and translocation of photosynthates when five irrigations were scheduled at CRI, maximum tillering, jointing, flowering and milking stages. Such explanations were also stated by Kumar et al.[5] and Islam *et al.*[6]. The shortest spike (7.9 cm) was observed with two irrigations schedules and remained at par with three irrigations schedules. In case of varieties, the maximum length of spike (10.6 cm) was recorded with DBW-252 which was significantly superior over rest of the varieties. This might be due to its inherent capacity over other varieties. Tyagi *et al.*[7] and Ali *et al.*[8] also found similar results. Interaction effect (M x V) between irrigation schedules and varieties on spike length was found to be non-significant.

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3.1.2 Spike Weight (g): Data pertaining to spike weight (Table 1) revealed that irrigation schedules and varieties significantly influenced the weight of spike but not their interaction. The highest spike weight (3.3 g) was recorded with five irrigations schedules. This was due to availability of water at critical stages of crop growth. The lowest spike weight (2.4 g) was recorded with two irrigations schedules and remained at par with three irrigations schedules (2.8 g). This explanation was in accordance with Abhineet *et al.* [9]. Maximum spike weight was observed with the variety DBW-252 (3.0 g) and similar weight was observed with HI-8759 (3.0 g). This might be due to the inherent capacity of the variety DBW-252 with longest spike and the variety HI-8759 genetically having bold seeds, individual grains contributed to increase the spike weight. The variety HI-1544 recorded significantly lowest spike weight (2.5 g) among all the varieties. Similar results were reported by Ali *et al.*[8].

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3.1.3 Number of Productive Tillers m^{-2}: The highest number of productive tillers (219.8 m^{-2}) were recorded with five irrigations schedules and found significantly superior over three and two irrigations at different phenological stages. This might be attributed due to better nutrient uptake consequently less or no tiller mortality with optimum moisture supply when five irrigations were applied. The lowest number of productive tillers (192.1 m^{-2}) were recorded with two irrigations schedules. Similar results were also reported by Ali and Amin [10], Kabir *et al.* [11], Yadav *et al.*[12] and Moghaddam *et al*.[13].Among the varietiesSignificantly maximum number of productive tillers (223.6 m^{-2}) were recorded with the variety HI-8759 and followed by the varieties HI-8713 (210.9 m^{-2}) and HI-1544 (202.6 m^{-2}). Lowest number of productive tillers (186.3 m^{-2}) were produced by the variety DBW-252. The productive tillers m^{-2} were significantly influenced by the genetic potential and environmental conditions. Such annotations were also stated by Tomar *et al.*[14], Sapkota *et al*.[15], Mubeen et al.[16] and Moghaddam *et al.*[13].Interaction effect (M x V) between irrigation schedules and varieties on number of productive tillers m^{-2} was found to be non-significant.

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3.1.4 Number of Grains Spike^{-1}: The analysis of the data (Table 2) clearly revealed that the highest number of grains spike^{-1} (52.7) were observed with five irrigations schedules which was significantly superior over three irrigations (48.1) scheduled at CRI, flowering and milking stages and two irrigations (46.9) scheduled at CRI and milking stages and it was evident that no significant effect on number of grains spike^{-1} when irrigation was skipped at flowering stage. It might be due to inadequate irrigation supply at the time of jointing and maximum tillering stages and also due to high temperature at grain filling stage, caused forced maturity of the crop and led to less number of grains spike^{-1} which were ~~shrivelled~~shriveled, small and light weighted as apparent from its low test weight. Such explanations were also reported by Ali and Amin [10], Kabir et al.[11], Yadav et al.[12], Ali et al.[17] and Kumar et al.[18].Among the varieties DBW-252 attained the highest number of grains spike^{-1} (52.3) and was at par with HI-8759 (50.8) and significantly superior over remaining varieties, HI-8713 (47.1) and HI-1544 (46.7). This might be due to highest spike length of the variety DBW-252 and the variety HI-8759 having good genetic potential like more productive tillers and test weight in comparison to other varieties. Mishra et al.[19] and Singh and Singh [20] reported similar results.Interaction effect (M × V) between irrigation schedules and varieties on number of grains spike^{-1} was found to be non-significant.

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3.1.5 Number of Filled Grains Spike^{-1}: The number of filled grains spike^{-1} as affected significantly due to different irrigation schedules were presented in Table 2 The highest number of filled grains (48.9 spike^{-1}) were recorded with five irrigations scheduled at CRI, maximum tillering, jointing, flowering and milking stages and found significantly superior over three irrigations scheduled at CRI, flowering and milking stages (44.9 spike^{-1}) and two irrigations scheduled at CRI and milking stages (42.3 spike^{-1}) and the data further revealed that number of filled grains spike^{-1} at three and two irrigations were on par to each other.

This might be as a result of adequate moisture in the root zone throughout the crop growth period that maintained the chlorophyll content in leaves of plant and crop remained green for longer period of time. This helped in increasing the photosynthetic activity and contributed to higher number of filled grains due to increase in translocation of photosynthates from source to sink. Similar results were observed by Kabir *et al.*[11] and Maqsood et al. [21].Perusal of data presented in Table 2 clearly reveals that the various varieties significantly affected the number of filled grains spike^{-1}. The maximum number of filled grains (48.5 spike^{-1}) were recorded with the variety DBW-252 and was significantly superior over rest of the varieties. Lowest number of filled grains (43.0 spike^{-1}) were produced by the variety HI-1544. These results are in accordance with Abhineet *et al.* [9].Interaction effect between irrigation schedules and varieties on number of filled grains spike^{-1} was found to be non-significant.

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3.1.6 1000 grain weight (g): A perusal of data presented in Table 2 showed that different irrigation schedules had significant effect on the test weight. However, maximum test weight (41.4 g) was noted under five irrigations scheduled at CRI, maximum tillering, jointing, flowering and milking stages and found significantly superior over three irrigations scheduled at CRI, flowering and milking stages (39.0 g) and two irrigations scheduled at CRI and milking stages (36.6 g) and the data further revealed that 1000 grain weight at three and two irrigations were on par to each other. This might be due to adequate supply of water for translocation of photosynthates to the grain when five irrigations scheduled at CRI, maximum tillering, flowering, jointing and milking stages. These findings were similar to those of Kumar *et al.*[5], Wang et al.[22] and Ali et al.[17].1000 grain weight is also an important yield contributing attribute of wheat crop which was significantly influenced by the prevailing growing condition and genetic potential of a variety. It is clear from data (Table 2) that test weight was significantly affected by various wheat varieties. The highest test weight (41.3 g) was recorded under HI-8759 which was superior over the remaining varieties *i.e.,* HI-8713 (39.1 g), HI-1544 (37.9 g) and DBW-252 (37.6 g). The superiority of HI-8759 seems to be on account of proper grain formation due to translocation of metabolites towards grain development under optimum environmental condition. These findings were in close line to that of Dhiman [23] who also reported significant variations in test weight of varieties.Interaction effect between irrigation schedules and varieties on 1000 grain weight was found to be non-significant

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3.2 Yield

3.2.1 Grain yield (kg ha^{-1}): Five irrigation schedules at CRI, maximum tillering, jointing, flowering and milking stages recorded the maximum grain yield of (4255.9 kg ha^{-1}) which was significantly superior over three irrigation schedules at CRI, flowering and milking stages (3361.3 kg ha^{-1}) and two irrigation schedules at CRI and milking stages (2826.9 kg ha^{-1}). When compared to the five irrigations, three and two irrigation schedules recorded 21.02 and 33.57 per cent reduction in yield, respectively. This might be attributed to cumulative effect of vegetative growth and yield attributes viz., number of productive tillers m^{-2}, number of filled grains spike^{-1} and test weight. The results are in line with Kabir *et al.*[11]; Sarwaret al.[24]; Mubeen et al.[16]. The grain yield is the sum of all different yield contributing factors which are controlled by genetically and environmentally, since, wheat yield production is a complex process and it governed by complimentary interaction between source (photosynthesis and availability of assimilates) and sink component (storage organs). In this study, it was found that the yield was significantly influenced by different varieties. Among the varieties HI-8759 resulted in highest grain yield (4050 kg ha^{-1}) attributed to their higher biomass accumulation due to higher number of tillers and its appropriate partitioning as evident from corresponding higher harvest index and better yield attributes i.e., effective tillers m^{-2} , grains spike^{-1}, spike length and 1000 grain weight and it was significantly superior over the rest of the varieties and it gave 7.82 %, 24.06 % and 24.26 % higher grain yield over varieties HI-8713 (3733.1

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kg ha^{-1}), DBW-252 (3075.2 kg ha^{-1}) and HI- 1544 (3067.2 kg ha^{-1}) respectively. These conclusions were similar to that of Moghaddam et al.[13]; Tomar et al.[14]; Ram and Gupta [25]; Haq et al.[26]; Alam et al.[27]. Interaction between irrigation schedules and varieties on grain yield of wheat was found non-significant.

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3.2.2 Straw yield (kg ha^{-1}):

Straw yield (kg ha^{-1}). Data pertaining to straw yield are furnished in Table 3. The data revealed that straw yield of wheat was significantly influenced by various schedules of irrigation. Maximum straw yield (5315.9 kg ha^{-1}) was recorded under five irrigations scheduled at CRI, maximum tillering, jointing, flowering and milking stages and was significantly superior over three irrigations scheduled at CRI, flowering and milking stages (4526.7 kg ha^{-1}) and two irrigations scheduled at CRI and milking stages (4036.8 kg ha^{-1}). The straw yield was found on par for two and three irrigation schedules. The straw yield decreased with decrease in number of irrigations this might be due to lack of sufficient moisture to produce its maximum vegetative growth. These results were in close conformity to those of Moghaddam et al.[13]; Islam et al.[6]. However, in varieties maximum straw yield (4886.9 kg ha^{-1}) was found with HI-8759 and was significantly superior over the varieties HI-8713 (4839.1 kg ha^{-1}), DBW-252 (4430.3 kg ha^{-1}) and HI-1544 (4349.1 kg ha^{-1}). This might be due to efficient in utilizing biomass towards grain formation as well as straw as evident from its highest harvest index. These findings are in line with those of Nagarjuna *et al.*[28]; Verma et al.[29]. Interaction between irrigation schedules and varieties on straw yield of wheat was found non-significant.

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3.2.3 Harvest index (%):

The data on harvest index (%) as influenced by irrigation schedules and varieties have been summarized in Table 3. The study of data clearly indicated that the irrigation schedules had significant effects on the harvest index. Maximum harvest index (%) was found with five irrigations scheduled at CRI, maximum tillering, jointing, flowering and milking stages (44.4 %) which was on par with three irrigations scheduled at CRI, flowering and milking stages (42.6 %) and the lowest harvest index was found with two irrigations scheduled at CRI and milking stages (40.9 %). This might be due to the marked variation in grain and straw yields due to variation in irrigation schedules ~~was~~ asalso observed by Ahmad and Kumar[30]; Atikullah et al.[31]. In case of varieties highest harvest index was recorded with variety HI-8759 (45.2 %) it was on par to HI-8713 (43.4 %) and significantly superior over the varieties HI-1544 (41.1 %) and DBW-252 (40.7 %). Sapkota et al.[15] ~~was~~also found similar results. Interaction effect between irrigation schedules and varieties on harvest index was found to be non- significant.

3.2.4 Biological Yield (kg ha^{-1}):

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The highest biological yield was recorded with five irrigations scheduled at CRI, maximum tillering, jointing, flowering and milking stages (9571 kg ha^{-1}) which was significantly superior over three irrigations scheduled at CRI, flowering and milking stages (7888 kg ha^{-1}) and two irrigations scheduled at CRI and milking stages (6863 kg ha^{-1}). This might be due to cumulative effect of vegetative growth attributes, yield attributes, grain yield and straw yield. The magnitude of increase in biological yield over three and two irrigations were 17.59 % and 28.29 %, respectively. Alam et al. [32], Nagarjuna et al.[28] and Ramunaidu et al.[33] have recorded similar findings.Among the varieties HI-8759 produced the highest biological yield (8936 kg ha^{-1}) and significantly superior over rest of the varieties. This might be due to maximum grain and straw yield were produced by this variety and its higher biomass accumulation. The magnitude of increase in biological yield with variety HI-8759 over varieties HI-8713 (8572 kg ha^{-1}), DBW-252 (7505 kg ha^{-1}) and HI-1544 (7416 kg ha^{-1}) was 4.08 %, 16.01 % and 17.01 % respectively. These results were in line with Ram and Gupta [25], Haq *et al.*[26] and Abhineet *et al.*[9]. Interaction between irrigation schedules and varieties on biological yield of wheat was found non-significant.

Table 1. Spike length (cm) and Spike weight (g) of wheat as influenced by different irrigation schedules and varieties.

Treatments	Spike length (cm)	Spike weight (g)
Irrigation schedules (M)		
M_1: CRI, Maximum tillering, Jointing, Flowering and Milking	8.9	3.3
M_2: CRI, Flowering and Milking	8.1	2.8
M_3: CRI and Milking	7.9	2.4
SEm ±	0.16	0.10
CD (P=0.05)	0.6	0.4
CV (%)	6.5	12.1
Varieties (V)		
V_1: DBW – 252	10.6	3.0
V_2: HI – 1544	7.3	2.5
V_3: HI – 8759	7.8	3.0
V_4: HI – 8713	7.5	2.9
SEm ±	0.15	0.11
CD (P=0.05)	0.4	0.3
CV (%)	5.4	11.6
Interaction		
(M×V)	NS	NS
(V×M)	NS	NS

Table 2: Yield attributes of wheat as influenced by different irrigation schedules and varieties. varieties.

Treatments	Yield attributes			
	No. of productive tillers m^{-2}	No. of grains $spike^{-1}$	No. of filled grains $spike^{-1}$	1000 grain weight (g)
Irrigation schedules (M)				
M_1: CRI, Maximum tillering, Jointing, Flowering and Milking	219.8	52.7	48.9	41.4
M_2: CRI, Flowering and Milking	205.7	48.1	44.9	39.0
M_3: CRI and Milking	192.1	46.9	42.3	36.6
SEm +	3.35	1.12	0.98	0.58
CD (P=0.05)	13.2	4.4	3.9	2.3
CV (%)	5.6	7.9	7.5	5.2
Varieties (V)				
V_1: DBW – 252	186.3	52.3	48.5	37.6
V_2: HI – 1544	202.6	46.7	43.0	37.9
V_3: HI – 8759	223.6	50.8	45.6	41.3
V_4: HI – 8713	210.9	47.1	44.3	39.1
SEm +	3.73	0.99	0.90	0.53
CD (P=0.05)	11.1	2.9	2.7	1.6
CV (%)	5.4	6.0	6.0	4.1
Interaction				
(M×V)	NS	NS	NS	NS
(V×M)	NS	NS	NS	NS

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Table 3: Yield (kg ha^{-1}) and harvest index (%) of wheat as influenced by different irrigation schedules and varieties.

Treatments	Yield (kg ha^{-1}) and Harvest index (%)			
	Grain yield (kg ha^{-1})	**Straw yield (kg ha^{-1})**	**Biological yield (kg ha^{-1})**	**Harvest index (%)**
Irrigation schedules (M)				
M_1: CRI, Maximum tillering, Jointing, Flowering and Milking	4255.9	5315.9	9571.8	44.4
M_2: CRI, Flowering and Milking	3361.3	4526.7	7888.0	42.6
M_3: CRI and Milking	2826.9	4036.8	6863.7	40.9
SEm ±	73.71	197.58	253.34	0.71
CD (P=0.05)	289.8	776.8	996.0	2.8
CV (%)	7.3	14.8	10.8	5.8
Varieties (V)				
V_1: DBW - 252	3075.2	4430.3	7505.6	40.7
V_2: HI - 1544	3067.2	4349.4	7416.7	41.1
V_3: HI - 8759	4050.0	4886.9	8936.9	45.2
V_4: HI - 8713	3733.1	4839.1	8572.2	43.4
SEm ±	75.54	90.44	139.82	0.65
CD (P=0.05)	224.3	268.6	415.2	1.9
CV (%)	6.5	5.9	5.2	4.5
Interaction				
(M×V)	NS	NS	NS	NS
(V×M)	NS	NS	NS	NS

4. CONCLUSION

From the results of the above experiment conducted on wheat in *rabi* season the following broad conclusions can be drawn that the five irrigation schedules at different phenological stages significantly improved spike length, weight as well as productive tillers, filled grains,

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1000 grain weight and yield of wheat. While, significantly lower values were observed in two irrigation ~~schedules(~~schedules (M3). Among the varieties DBW-252 recorded significantly longest spike and shortest spike was observed under HI-1544 and highest spike weight was observed under DBW-252 and it was statistically on par to HI-8759 and HI-8713. Significantly highest number of productive tillers and test weight were recorded by HI-8759 and lowest values were recorded by DBW-252. Although DBW-252 recorded significantly highest number of grains and filled grains spike^{-1} and remained on a par with HI-8759 in terms of grains spike^{-1}. Five irrigation schedules at different phenological stages significantly improved the yield of wheat. While, significantly lower yield was observed in two irrigation schedules. Among the varieties, the variety HI-8759 registered the highest yield which was on a par with HI- 8713 in terms of straw and biological yields.

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