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Original Research Article

Assess the Suitable Time of Wheat (*Triticum aestivum* L.) Sowing under Timely Sown Condition to Avoid Terminal Heat Stress in South Bihar

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Keywords

Terminal heat stress, Wheat, Time of sowing

ABSTRACT

A field experiment was conducted at KrishiVigyan Kendra, Aurangabad and in farmers' field during rabi seasons of 2013-14 and 2014-15, to evaluate the suitable time of Wheat (*Triticum aestivum* L.) sowing under timely sown condition to avoid terminal heat in South Bihar. Experiment was laid out in a completely randomized block design with 4date of sowing i.e 5th November, 15th November 25th November , 5th December in a total of five replications during rabi 2013-14 and 2014-15. Sowing of wheat at 5th November produce significantly maximum grain yield (44.64 q/ha) being at par with1 5th November both were significantly more over 25th November and 5th December. Sowing of wheat at 5th November and 15th November produces 6.13%, 3.70% more grain yield over 25th November and 33.65% and30.59% more grain yield over 5th December, respectively. Straw yield (52.90q/ha) recorded maximum with5th November being at par with 15th November both were significantly more over 25th November and 5th December. Sowing of wheat at 5th November and 15th November produces 8.49%, 7.51% more straw yield over 25th November and 15.96% and14.91% more straw yield over 5th December. The B-C ratio also recorded significantly higher with 5th November and statically at par with 15th November over 25th November and 5th December. The higher returns by 6.13 and 3.71% & by 33.65% & 30.60%, respectively were recorded when wheat sown at 5th November and 15th November than 25th November and 5th December respectively.

Introduction

Wheat is one of the most staple foods of the humanity (Meena et al., 2013). Its area and productivity is increasing rapidly adopting across the globe, due to its wider adaptability sustainability under divers agro climatic conditions (Kumar et al., 2014). However, considerable portion of the wheat grown in South Asia is considered to be affected by heat stress, of which the majority is present in India (Joshi et al., 2007a). In India terminal heat stress is a major reason of yield decline in wheat due to delayed planting (Joshi et al., 2007a). Selection of suitable crop varieties according to the agroclimatic conditions may play crucial role in realizing the optimum production of any crop commodity (Singh et al., 2008). The most heat-stressed locations of South Asia are the Eastern Gangetic Plains (EGP), central and peninsular India, whereas heat stress is considered moderate in north western parts of the Indio-Gangetic Plains (IGP) (Joshi et al., 2007b). Late planted wheat suffers drastic yield losses which may exceed to 40-50%. Global climate models predict an increase in mean ambient temperature between 1.8 and 5.8^{o}C by end of this century (IPCC, 2007). Grain yield was negatively related to the thermal time accumulated above the base temperature of 310C (Mian et al., 2007). High temperature above 32 ^{0}C has been reported reducing grain yield and grain weight (Wardlaw et al., 2002). Shrivelled small grains are produced and different yield associated traits such as tillering, grain weight and grains numbers/spike are reduced. Using this factor (3–4 % loss per 10C above 15–20 ^{0}C), it can be calculated that most commercially sown wheat cultivars in India would lose approximately 50 % of their yield potential when exposed to 32–38^{0}C temperature at the crucial grain formation stage. The experiment was conducted at the at Krishi vigyan Kendra , Aurangabad and farmers of Aurangabad district during the years *rabi* 2013-14 and 2014-15. By the late sowing the varieties was given high temperature stress during grain filling stage in comparison to timely sown condition.

Materials and Methods

The field experiment was conducted at KrishiVigyan Kendra and farmers' field in Aurangabad district of Bihar during the two consecutive rabi seasons of 2013-14 and 2014-15. The experimental site is situated in South Bihar at 24^{0}.50$^{'}$ N, 84^{0}.70' E, and at 332'above mean sea level. The maximum temperature remained above 35.60°C and 35.97°C during 2013-14 and 2014-15, respectively. The total rainfall received during crop period was 10.77 and 13.25 mm during 2013-14 and 2014-15, respectively (Fig. 1). The soil was clay-loam having normal soil reaction (pH 7.5), low in organic carbon (0.51%) and available nitrogen (205.7 kg/ha), and medium in available phosphorus (19.3 kg/ha) and available potassium (198.5 kg/ha). The experiment was laid out in completely randomized block design with 5 replications comprising of 4 date of sowing i.e. 5th November, 15th November 25th November 5th December. In experimental plots, wheat was established by with zero-till drill (ZTD). The wheat variety HD-2733 was tested in different dates of sowingh. The fields were leveled with leveler to allow drill to place seeds at a uniform distance and proper depth in all the replications. The experimental plots meant for zero-till drill (ZTD) sowing were subjected to two ploughing followed by harrowing and planking before sowing with zero-till drill (ZTD) by planking on four date of sowing. Experimental field was fertilized at the rate of 120:60:40 kg NPK/ha. Nitrogen was applied in three splits (1/2 dose of N at basal rest1/2dose each equal at Ist irrigation and 2nd irrigation), while the entire P_2O_5 and K_2O were applied as basal application. Pendimethalin was sprayed within 1 days after sowing, by knap-sack sprayer using 800 litres/ha water in all treatment plots in all replications. Post-emergence herbicides, metsalfuron @ 33g/ha, was applied with knap-sack sprayer fitted with flat-fan nozzle using 500 litres/ha of water at 30 days after sowing (DAS) in all treatment plots in each replications. The data on plant height, number of tillers, crop biomass and number of grains/spike were recorded. The crop was harvested manually in the second week of April. On the basis of existing price of the inputs and outputs, variable cost of cultivation and gross returns were calculated.

Results and Discussion

Number of effective tillers/m^2, spike length, grains/spike and test-weight were significantly influenced by different date of sowing. Number of effective tillers/m^2 at harvest stage recorded maximum with wheat sown at 5th November being at par with 15th November both were significantly higher over 25th November and 5th December. Spike length was recorded significantly higher with wheat sown at 5th November over other treatment. Number of grain significantly influenced by date of sowing maximum number of grain/spike was recorded with when wheat was sown at 5th November over 15th November, 25th November and 5th December. 1000 grain weight was also significantly influenced by date of sowing. Maximum 1000grain weight recorded with wheat sown at 5th November being at par with 15th November they were significantly higher over 25th November and 5th December (Table 1).

Sowing of wheat at 5th November produce significantly maximum grain yield (44.64 q/ha) being at par with1 5th November both were significantly more over 25th November and 5th December. Sowing of wheat at 5th November and 15th November produces 6.13%, 3.70% more grain yield over 25th November and 33.65% and30.59% more grain yield over 5th December, respectively. Straw yield (52.90q/ha) recorded maximum with5th November being at par with 15th November both were significantly more over 25th November and 5th December. Sowing of wheat at 5th November and 15th November produces 8.49%, 7.51% more straw yield over 25th November and 15.96% and14.91% more straw yield over 5th December, respectively (Table 1). Similar findings were also reported by Dwivedi et. al.(2015).

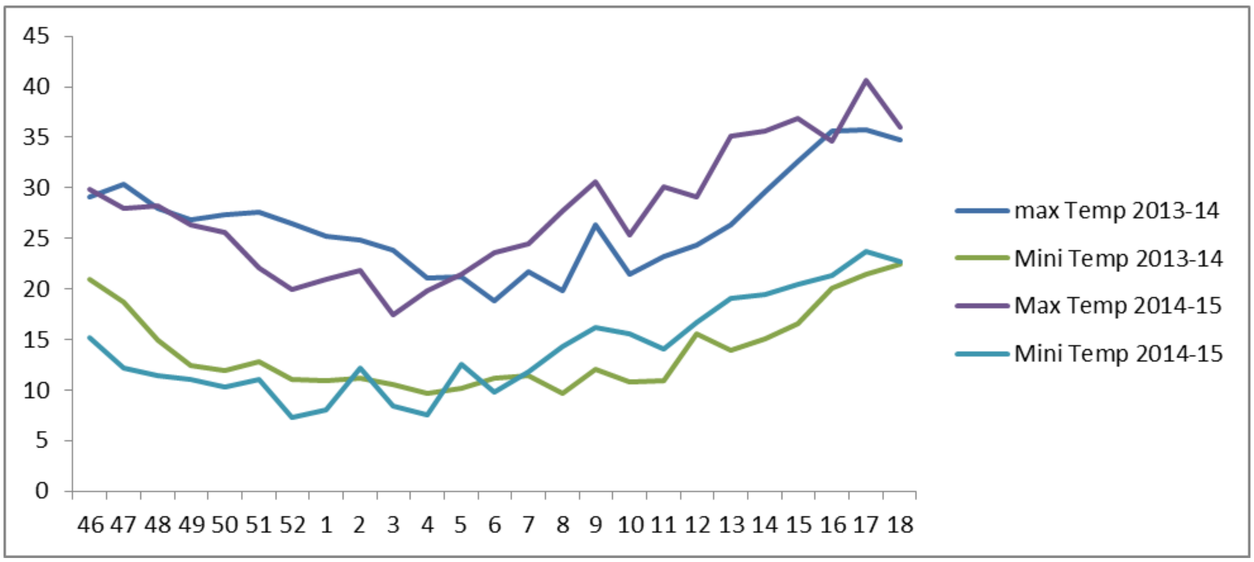
Table.1 Effect of date of sowing on yield and yield attributes and yield on wheat (Pooled data of two years)

Treatment	No. of effective tillers/m^2	Length of Spike(cm)	No of grain/ spike	1000 grain Weight (g)	Grain yield (q/ha)	Straw yield (q/ha)
T_1- 5 November	334.20	9.54	48.40	44.56	44.64	52.90
T_2 –15 November	318.20	9.13	44.80	45.06	43.62	52.42
T_3 –25 November	276.40	8.79	43.80	43.80	42.06	48.76
T_4–5 December	235.00	8.25	40.20	41.50	33.40	45.62
LSD (P=0.05)	22.97	0.37	2.98	0.91	2.32	2.85

Table.2 Effect of various fertilizer doses and vermicompost on growth of Banana cv-Grand Nain

Treatment	Cost of cultivation(Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C Ratio
T_1- 5 November	25500	64,728	39,228	2.54
T_2 –15 November	25500	63,249	37,749	2.48
T_3 –25 November	25500	60,987	35,487	2.39
T_4–5 December	25500	48,430	22,930	1.90
LSD (P=0.05)	-	3,367	3,367	0.13

Fig.1 Maximum and Minimum Temperature during crop period 2013-14 and 2014-15



The benefit accrued was more in wheat sowing at 5th November and statically at par with 15th November over 25th November and 5th December. Net return (Rs 39228/ha) recorded significantly higher with 5th November and statically at par with 15th November over 25th November and 5th December. The B-C ratio also recorded significantly higher with 5th November and statically at par with 15th November over 25th November and 5th December. The higher returns by 6.13 and 3.71% and by 33.65% and 30.60%, respectively were recorded when wheat sown at 5th November and 15th November than 25th November and 5th December (Table 2).

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