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Original Research Article

Growth and Growth Parameters of Late Sown Wheat (*Triticum aestivum* L.) as affected by Growth regulators

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A B S T R A C T

Late Sowing is a main problem in wheat cultivation in India. Which brings the crop to survive and yield under unfavourable environmental condition. It causes restrictions of wheat plants growth. In the present approach, a pot experiment with twelve treatments and four replications of each treatments was conducted with Completely Randomised Design (CRD) in the department of Crop Physiology, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, (U.P) to explored new approach for growth enhancement under late sown condition. Wheat seedligs were sprayed with different growth regulators with different concentrations. Result showed that foliar application of GA340 ppm appreciate plant height (cm), tiller number, leaf area (cm2), total dry matter (g). However, Kinetin 15 ppm accelerated the root length (cm), total dry matter (g) and chlorophyll intensity (%)of wheat crop. RGR and NAR value was mainly improved by the application of Thiourea 400 ppm.

Keywords

Foliar application, Wheat, Growth regulators

Introduction

Wheat (*Triticum aestivum* L.) which is physiologically categorized as a C_3 plant, being second most important staple food crop. Globally, it is the most important human food grain and ranks second in total production as a cereal crop behind maize; the third being rice. Much of the carbohydrate fraction of wheat is starch**.**

Wheat is widely cultivated as a cash crop because it produces a good yield per unit area, grows well in a temperate climate even with a moderately short growing season crop. But during recent year wheat production are quite lower than ancient. The reasons of low production and productivity of Wheat at that time was; the tall growing plant habit resulting in lodging, when grown under fertile soils; the poor tillering and low sink capacity of the varieties used; higher susceptibility to diseases; the higher sensitivity to thermo & photo variations, etc., resulting in poor adaptability, and longer crop duration resulting in a long exposure of plants to the climatic variations and insect pest/disease attacks.

Among several constraints which affect its productivity, delayed sowing ranks at the top as it exposes the crop at high temperature stress at anthesis and grain filling stage. Regmi *et al*., (2002) reported a yield decline in wheat when it was sown after the third

week of November. A major reason for late sowing is the late harvest of the preceding crops.

The inputs applied to the wheat crop were not efficiently utilized and resulted in reduced yield under late sowing (Hobbs and Gupta, 2002). In late sown wheat, all the growth stages, such as tillering, flowering, and grain filling are adversely affected by the shortened growing period. The reduction in the optimum growth period caused by a rise in temperature leads to leaf senescence resulting in a photosynthetic rate that is too low to meet plant carbon economy (Sharma-Natu *et al*., 2006).This reduction in growth can be compensated by cultivating short-duration varieties that are generally low yielding. The other effective approach is the exogenous application of plant growth regulators (PGRs) involved in promoting plant growth and development under normal and stressful conditions.

Materials and Methods

The research work was carried out in pots using Completely Randomized Design (CRD).The soil of the experimental pots was sandy loam with average fertility. All the growth regulators with their three concentrations were applied at two different growing stages(At after germination and before anthesis stage). Each treatment replicated four times. The silent features of plant growth regulators used in the experiment are furnished below:

T1- Control
T2- Foliar application of Gibberellic acid (20 ppm)
T3- Foliar application of Gibberellic acid (40 ppm)
T4- Foliar application of Kinetin (5 ppm)
T5- Foliar application of Kinetin (10 ppm)
T6- Foliar application of Kinetin (15 ppm)
T7- Foliar application of NAA (20 ppm)
T8- Foliar application of NAA (40 ppm)
T9- Foliar application of NAA (60 ppm)
T10- Foliar application of Thiourea (400 ppm)
T11- Foliar application of Thiourea (800 ppm)
T12- Foliar application of Thiourea (1200 ppm)

Results and Discussion

It has been concluded that GA_3, 20 and 40 ppm and Kinetin, 5, 10 and 15 ppm promoted the plant height. While NAA, 20, 40 and 60 ppm and Thiourea, 400, 800 and 1200 ppm also enhanced the plant height but have lower rate in comparison to GA_3 and Kinetin. This increment in plant height is mainly due to stimulation of cell division and increase in plasticity of cells. Our finding is also supported by the finding of Roitsch and Ehness (2000) and Gogoi *et al*., (2009).

Number of tillers per plant increased with the advancement of the crop days in case of all growth regulators against control. More number of tillers per plant was mainly extended by the foliar spray of GA_3, 40 ppm followed by its lower concentration *i.e.* GA_3, 20 ppm. Kinetin, 15 ppm also had an uplifting effect on tiller number. Other hormones also supporting this character but in minor rate. This finding confirmed the view reported earlier by Rai *et al.*, (2012).

A morphological and major yield supporting character *i.e.* green leaf area per plant of wheat crop was accelerated significantly against control after treatment of growth regulators. Extended green leaf area was found by the treatment of GA_3 40 ppm followed by Kinetin 15 ppm and its lower concentrations. Higher concentration of Thiourea also expand green leaf area of wheat plant. The most probable reason behind this character is cell division and its elongation. Our results are in favour of finding of Atta (2005).

Table.1 Influence of Growth regulators on Plant Height (cm), Number of Tillers/Plant, Leaf Area (cm^2)/Plant and Root Length (cm) of wheat crop under late sown condition

S. No.	Treatments	At harvest stage			
		Plant Height (cm)	Number of Tillers	Leaf Area (cm2)	Root Length (cm)
1	Control	63.9	4.0	648.00	7.8
2	GA_3 20 ppm	72.2	6.5	985.50	10.0
3	GA_3 40 ppm	76.2	6.8	1053.00	10.5
4	KN 5 ppm	72.4	5.4	756.00	9.6
5	KN 10 ppm	74.1	5.8	891.00	10.1
6	KN 15 ppm	75.3	6.0	945.00	10.6
7	NAA 20 ppm	64.6	4.5	661.50	8.1
8	NAA 40 ppm	65.0	5.2	715.50	8.3
9	NAA 60 ppm	69.8	5.8	864.00	9.9
10	TU 400 ppm	64.0	4.8	715.50	8.8
11	TU 800 ppm	64.3	5.1	769.50	9.2
12	TU 1200 ppm	64.8	5.3	810.00	9.8
	S.E(diff.)	**0.32**	**0.29**	**3.36**	**0.27**
	C.D at 5% P	**0.65**	**0.46**	**6.82**	**0.56**

Table.2 Influence of Growth regulators on Total Dry Matter (g), RGR (mg $g^{-1}day^{-1}$), NAR (mg cm^{-2} day^{-1}) and Chlorophyll Intensity (%) of wheat under late sown condition.

S. No.	Treatments	At harvest	In between 70-100 DAS	In between 70-100 DAS	90-100 DAS
		TDM (g)	RGR (mg $g^{-1}day^{-1}$)	NAR (mg cm^{-2} day^{-1})	Chlorophyll Intensity (%)
1	Control	23.34	2.35	0.0128	35.0
2	GA_3 20 ppm	25.74	2.40	0.0140	39.6
3	GA_3 40 ppm	26.59	2.36	0.0153	41.6
4	KN 5 ppm	26.23	2.55	0.0186	38.6
5	KN 10 ppm	26.56	2.43	0.0158	41.5
6	KN 15 ppm	27.29	2.37	0.0152	42.3
7	NAA 20 ppm	25.07	2.83	0.0179	35.9
8	NAA 40 ppm	25.63	2.76	0.0175	36.2
9	NAA 60 ppm	25.98	2.51	0.0149	37.8
10	TU 400 ppm	25.23	3.53	0.0236	34.2
11	TU 800 ppm	26.09	3.47	0.0223	36.9
12	TU 1200 ppm	26.72	3.15	0.0207	37.1
	S.E(diff.)	**0.33**	**0.03**	**0.0002**	**1.49**
	C.D at 5% P	**0.68**	**0.07**	**0.0004**	**3.01**

According to above result of the experiment, it may be concluded that the foliar application ofthat foliar application of GA_3 40 ppm appreciate plant height (cm), tiller number, leaf area (cm^2), total dry matter (g). However, Kinetin 15 ppm axcelerated the root length (cm), total dry matter (g) and chlorophyll intensity (%) of wheat crop. RGR and NAR value was mainly improved by the application of Thiourea 400 ppm.

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