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Effect of seed priming treatments on growth, yield, and seed quality of wheat (*Triticum aestivum* L.) variety K-607 (Mamta)

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Abstract
The present study was conducted during the Rabi seasons of 2017-18 and 2018-19 at the New Dairy Farm, Kalyanpur, Kanpur, to evaluate the effect of different seed priming treatments on growth, yield, and seed quality of wheat variety K-607 (Mamta). Treatments included hydropriming (4 and 8 hours), chemical priming with Thiram and Trichoderma viride, nutrient priming using potassium nitrate (0.5% and 1%), and hormonal priming with GA_3, NAA, and IAA at 50 and 100 ppm concentrations. Significant improvements were observed in all growth and yield parameters, including plant height, tiller count, spike length, number of grains per spike, and seed yield. The treatment GA_3 at 50 ppm (T_9) recorded the highest seed yield (6006.67 kg/ha), followed by 8 hrs hydration + Thiram 3 g/kg seed (T_4) and hydration for 8 hrs (T_2). These treatments also significantly improved seed quality. Thus, seed priming, particularly with GA_3 50 ppm, offers a simple and effective method for enhancing wheat productivity and seed performance.

Keywords: Seed priming, wheat, GA_3, potassium nitrate, yield, seed quality, hydropriming, Thiram

1. Introduction
Wheat (*Triticum aestivum* L.) is a staple food crop in India and globally, serving as a key source of energy, protein, and micronutrients. Improving seed quality and plant establishment is crucial for optimizing yield potential. Seed priming is a low-cost, pre-sowing technique that enhances seed performance by initiating pre-germinative metabolic processes (Afzal *et al*., 2008; Bradford, 1986) [2, 4]. This study investigates the effects of various seed priming treatments on the growth, yield, and seed quality parameters of wheat variety K-607 (Mamta).

2. Materials and Methods
2.1 Experimental Site and Materials
The study was conducted at New Dairy Farm, Kalyanpur, Kanpur, during Rabi 2017-18 and 2018-19 using wheat variety K-607 (Mamta). Fifteen treatments, including control, hydropriming, nutrient priming (KNO_3), chemical priming (Thiram, Trichoderma viride), and hormonal priming (GA_3, NAA, IAA) were evaluated.

2.2 Experimental Design
- Design: Randomized Block Design (RBD)
- Replications: 3
- Plot size: 20 m²
- No. of treatments: 15

2.3 Treatment Details

Code	Treatment Description
T_0	Control
T_1	Hydration 4 hrs
T_2	Hydration 8 hrs
T_3	4 hrs hydration + Thiram 3 g/kg
T_4	8 hrs hydration + Thiram 3 g/kg
T_5	Thiram 3 g/kg
T_6	Trichoderma viride 4 g/kg
T_7	KNO_3 0.5%
T_8	KNO_3 1%
T_9	GA_3 50 ppm
T_{10}	GA_3 100 ppm
T_{11}	NAA 50 ppm
T_{12}	NAA 100 ppm
T_{13}	IAA 50 ppm
T_{14}	IAA 100 ppm

2.4 Observations Recorded

Following field observations were recorded for the following parameters:

- Days to 50% heading
- Plant height (cm)
- Number of tillers per running meter
- Spike length (cm)
- Number of spikes lets per spike
- Number of grains per spike
- Seed yield per square meter (g)
- Seed yield per hectare (kg)

3. Results and Discussion

3.1 Days to 50% Heading

Significant variation was recorded across treatments. T_5 and T_8 showed the longest duration to heading (83 days), whereas T_4 exhibited the earliest (80 days), suggesting early maturity can be induced through hydropriming and Thiram.

Table 1: Analysis of Variance for Field Observations.

Source of variation	D.F.	TSS	MSS	F-Calculated values	F-Table value	
					5 percent	1 percent
Replication(R)	2				3.34	5.45
Treatments(T)	14				2.04	2.75
Error	28					
Total	44					

3.2 Plant Height

T_9 (GA_3 50 ppm) produced the tallest plants (101.80 cm), significantly higher than control (95.75 cm). This is attributed to enhanced cell elongation due to gibberellic acid (Ansari and Sharif-Zadeh, 2012) [3].

3.3 Number of Tillers per Meter

T_8 (KNO_3 1%) recorded the highest tiller count (113), followed by T_2 and T_9. KNO_3 likely enhanced nutrient uptake, supporting vigorous tillering (Lara *et al.*, 2014) [7].

3.4 Spike Length

Maximum spike length was recorded in T_{10} (12.45 cm), followed by T_4 and T_{13}. Hormonal priming with GA_3 and IAA played a key role in spike elongation (Khan *et al.*, 2011) [6].

3.5 Number of Spikelets per Spike

T_8 recorded the maximum (21.67), confirming the positive role of nutrient priming in reproductive development.

3.6 Number of Grains per Spike

T_4 (8 hrs hydration + Thiram) had the highest grain count (55), with T_9 and T_{10} close behind, indicating enhanced pollination and grain set (Afzal *et al.*, 2005) [1].

3.7 Seed Yield per Square Meter and per Hectare

T_9 (GA_3 50 ppm) showed the highest yield (600.67 g/m² and 6006.67 kg/ha), followed by T_2 (hydration 8 hrs) and T_4 (hydration + Thiram). These results reflect the comprehensive benefits of hormonal priming on biomass allocation and grain filling (Kalpana *et al.*, 2013) [5].

Table 2: Effect of Seed Priming on Plant growth and development parameters. (Pooled data)

Treatments	Days to 50% heading	Plant Height (cm)	No. of Plants per Running Meter	Spike Length (cm)
Control: T_0	81.67	95.75	99.83	10.76
Hydration for 4 hrs: T_1	80.50	95.98	109.83	11.26
Hydration for 8 hrs: T_2	82.00	99.38	112.83	10.97
4 hrs hydration followed by Thiram treatment @ 3gm/kg: T_3	81.67	99.55	112.50	10.92
8 hrs hydration followed by Thiram treatment @ 3 gm/kg: T_4	80.50	98.78	112.17	11.50
Thiram treatment @ 3 gm/kg: T_5	83.33	98.62	107.67	11.30
Trichoderma treatment @ 4 gm/kg: T_6	82.83	98.82	109.00	11.08
Priming with KNO_3 @ 0.50 percent: T_7	83.17	99.70	105.67	11.26
Priming with KNO_3 @ 1.00 percent: T_8	83.17	100.28	113.17	11.41
Priming with GA_3 @ 50 ppm: T_9	81.83	101.80	112.50	11.08
Priming with GA_3 @ 100 ppm: T_{10}	81.83	98.75	110.83	12.45
Priming with NAA @ 50 ppm: T_{11}	82.67	100.08	104.17	11.10
Priming with NAA @ 100 ppm: T_{12}	82.83	100.66	111.33	11.31
Priming with IAA @ 50 ppm: T_{13}	82.17	100.50	109.00	11.47
Priming with IAA @ 100 ppm: T_{14}	82.33	99.58	107.50	11.30
SE (d)	0.73	0.68	0.76	0.27
C.D. (5%)	1.46	1.35	1.51	0.53

Table 3: Effect of Seed Priming Treatments on seed yield parameters. (Pooled data)

Treatments	No. of Spikelets per Spike	No. of Grains per Spike	Yield gm sqm^{-1}	Seed Yield kg^{-ha}
Control: T_0	17.75	50.50	527.50	5276.50
Hydration for 4 hrs: T_1	18.33	53.83	558.00	5580.00
Hydration for 8 hrs: T_2	18.00	55.00	599.00	5990.00
4 hrs hydration followed by Thiram treatment @ 3gm/kg: T_3	18.00	51.83	576.00	5760.00
8 hrs hydration followed by Thiram treatment @ 3 gm/kg: T_4	19.17	55.00	597.83	5978.00
Thiram treatment @ 3 gm/kg: T_5	19.50	54.17	544.67	5445.00
Trichoderma treatment @ 4 gm/kg: T_6	18.67	53.17	553.00	5530.00
Priming with KNO_3 @ 0.50 percent: T_7	18.83	53.33	556.83	5568.33
Priming with KNO_3 @ 1.00 percent: T_8	21.67	54.83	587.83	5878.33
Priming with GA_3 @ 50 ppm: T_9	18.50	54.67	600.67	6006.67
Priming with GA_3 @ 100 ppm: T_{10}	18.67	54.67	566.50	5665.00
Priming with NAA @ 50 ppm: T_{11}	18.33	52.00	536.00	5360.00
Priming with NAA @ 100 ppm: T_{12}	18.83	53.33	564.00	5640.00
Priming with IAA @ 50 ppm: T_{13}	19.00	54.50	558.00	5580.00
Priming with IAA @ 100 ppm: T_{14}	19.00	54.17	544.00	5440.00
SE (d)	0.59	0.75	0.62	26.01
C.D. (5%)	1.18	1.50	1.23	52.09

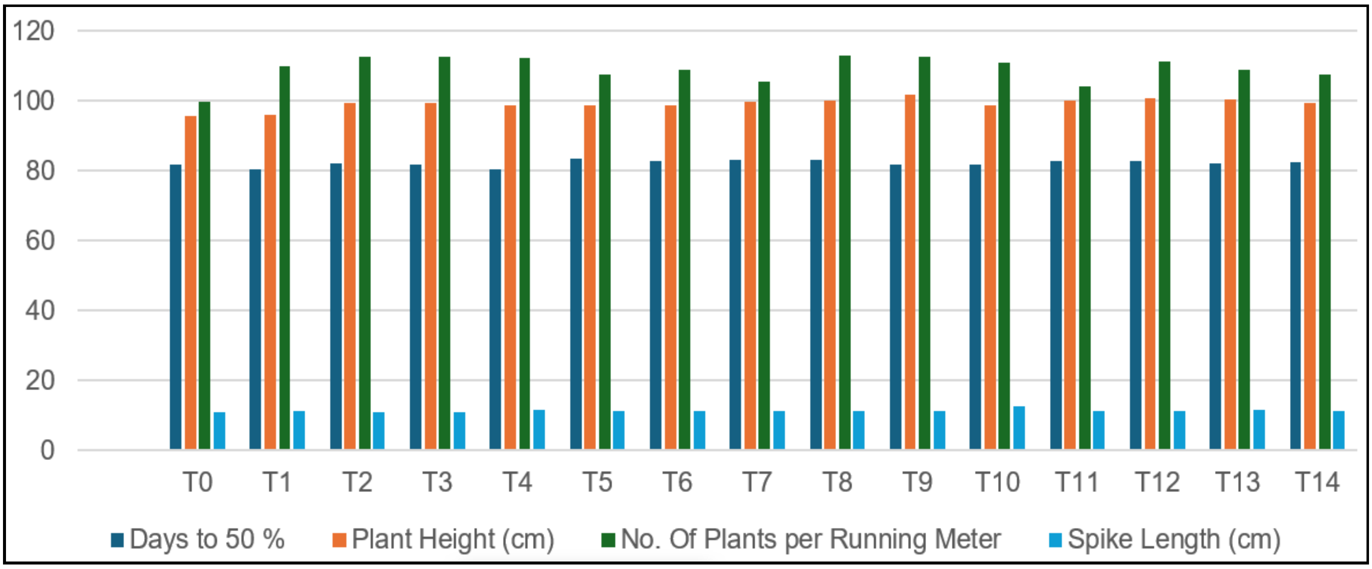

Fig 1: Effect of Seed Priming on Plant growth and development parameters

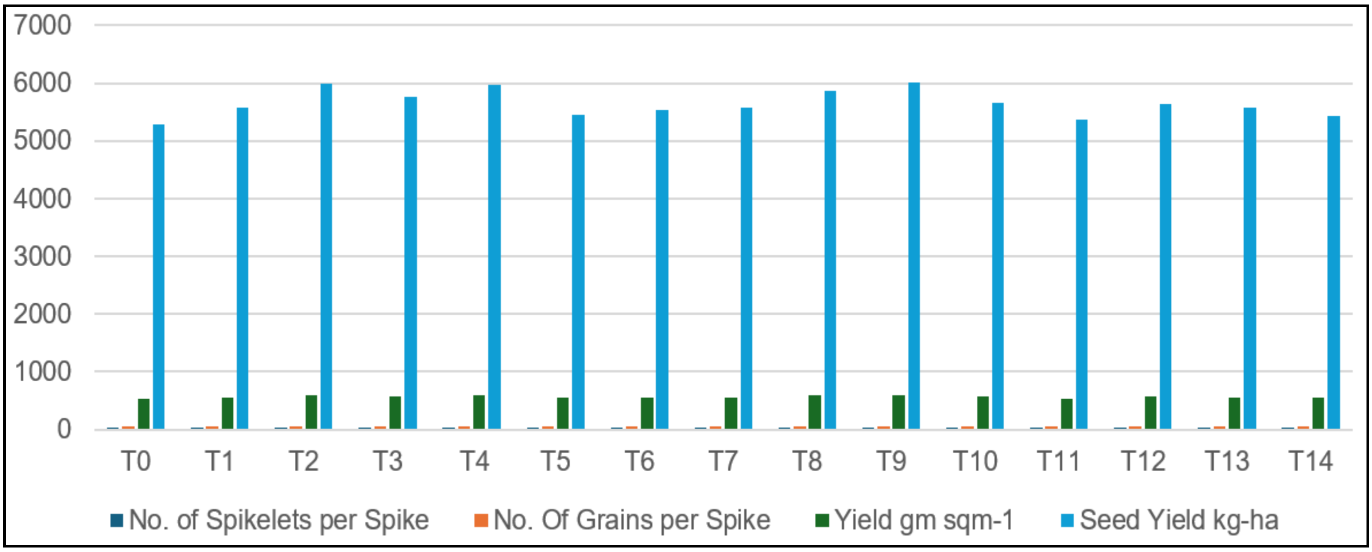

Fig 2: Effect of Seed Priming Treatments on seed yield parameters.

4. Conclusion

Seed priming significantly improved all measured parameters in wheat. GA_3 50 ppm (T_9) was the most effective treatment, followed by T_2 and T_4. These treatments are recommended for practical use to improve wheat yield and seed quality.

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