



Effect of Different Concentrations of Potassium Nitrate (KNO_3) As Foliar Spray on Growth of Wheat (*Triticum aestivum* L.)

(*Kshetrimayum Manishwari Devi)

Ph.D Scholar, Department of Agronomy, College of Agriculture, Central Agricultural University, Imphal-795004

*Corresponding Author's email: ahenbisanakshetri@gmail.com

Abstract

A field experiment entitled “Effect of different concentrations of potassium nitrate (KNO_3) as foliar spray on growth of wheat (*Triticum aestivum* L.)” was conducted during *rabi* season, 2012-2013 at the Research Farm, College of Agriculture, Central Agricultural University, Imphal. The treatments comprised of different concentrations of potassium nitrate (0.5%, 1%, 1.5%, 2%, 2.5% and 3%). The experiment was laid out in randomized block design with three replications and seven treatment combinations. Observations on plant height, number of leaves per plant, number of tillers per hill, fresh weight per plant, dry weight per plant, number of effective tillers per hill were recorded. Among the treatments potassium nitrate @ 3% produced significantly tallest plants. Application of potassium nitrate @ 3% significantly recorded the maximum number of leaves per plant, number of tillers per hill, fresh weight per plant, dry weight per plant and number of effective tillers per hill.

Keywords: Potassium nitrate, foliar spray and wheat

Introduction

Wheat (*Triticum aestivum* L.) belongs to family Poaceae (Gramineae) and is an annual self-pollinated and photo periodically long day cool season cereal. It is the oldest and most extensively grown food crop in the world. In India, wheat is the second most important food crop of the country after contributing nearly one-third of the total food grain production. This contribution has increased over years while it was less than 10% in the fifties. Wheat grain is a staple food used to make flour for biscuits, bread, cakes, breakfast cereals pasta, noodles and for fermentation to make beer other alcoholic beverage or biofuel. Wheat straw is used for feeding the cattle. Foliar application as spraying fertilizer solutions of suitable concentrations are prepared by dissolving fertilizer salts in water and they are sprayed over crop foliage. The solution absorbed by leaves which comes directly into plant system and help in rapid concentration of nutrient deficiency and boosting plant growth. Potassium nitrate is a chemical compound with the chemical formula KNO_3 . Potassium nitrate is fully water soluble and can be utilized completely by the plants without leaving unwanted residues. Because of its high solubility, it also can be used in foliar sprays.

Methodology

A field experiment was conducted to study the “Effect of different concentrations of potassium nitrate (KNO_3) as foliar spray on growth of wheat (*Triticum aestivum* L.)” at the Research Farm of College of Agriculture, Central Agricultural University, Imphal during *rabi* season, 2012-13. The material used and the methodology adopted for the research are detailed below.

Experimental treatments

The field experimental consisted of seven treatments. Details of the experimental treatments along with symbols used for this experiment are given here as follows:

Treatment notation	Treatment details
T ₁	Control (spray of water)
T ₂	KNO ₃ @ 0.5%
T ₃	KNO ₃ @ 1%
T ₄	KNO ₃ @ 1.5%
T ₅	KNO ₃ @ 2%
T ₆	KNO ₃ @ 2.5%
T ₇	KNO ₃ @ 3%

Layout and design

The detail of the layout plan and design are given as follows:

Experimental design	: Randomized Block Design (RBD)
Number of replication	: 3 (three)
Number of treatment	: 7 (seven)
Gross experimental area	: 369.75 m ²
Net experimental area	: 252 m ²
Plot size	: 3 X 4 m ²
Total number of plots	: 21
Variety	: VL-804

Spraying of potassium nitrate (KNO₃): Maximum tillering stage and late jointing stages

Results and discussions

Current knowledge suggests that the foliar application of potassium nitrate (KNO₃) as foliar spray with different concentrations is an important strategy to stabilize and sustain the productivity of cereals. In this context, an effort has been made to find out the “Effect of different concentrations of potassium nitrate (KNO₃) as foliar spray on growth of wheat (*Triticum aestivum* L.)” and the experiment was conducted during *rabi* season, 2012-2013. The main findings are discussed below.



Fig: Field view

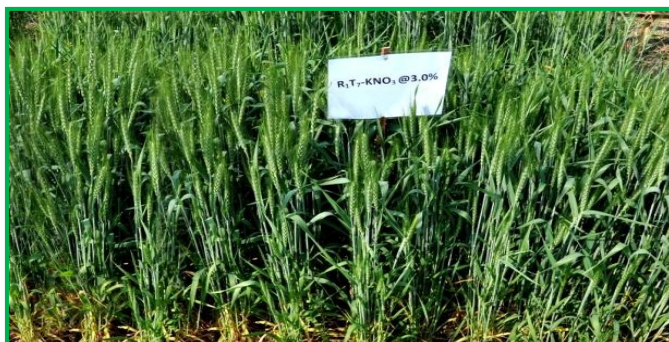


Fig: KNO₃ @ 3 % treated plot

Effect of different concentrations of potassium nitrate (KNO₃) on growth of wheat: Data on plant height at various stages revealed that during the early stage of crop growth (30 DAS), the foliar application of potassium nitrate (KNO₃) did not produce significant effect in respect to plant height. However, at later stages of crop growth foliar application of potassium nitrate (KNO₃) showed significant effect on the plant height. The maximum plant height was obtained at foliar application of KNO₃@ 3% (82.93cm) than the control (62.10 cm). It may be due to the encouragement of cell elongation, cell division and consequently increase meristemic growth.

Table: 1 Effect of different concentrations of potassium nitrate (KNO₃) as foliar spray on plant height (cm) at different stages of the crop

Treatment	Plant height (cm)			
	Days after sowing			
	30	60	90	120
T ₁	16.03	28.01	58.45	62.10
T ₂	16.20	30.15	63.40	69.95
T ₃	16.46	31.01	68.53	76.91
T ₄	16.10	32.56	72.75	80.41
T ₅	15.64	32.80	76.96	81.20
T ₆	16.41	32.93	77.94	81.27
T ₇	15.99	33.15	77.99	82.93
SEM (±)	0.63	0.89	2.04	1.73
CD (P =0.05)	NS	2.75	6.29	5.34

Number of leaves per plant were recorded at different growth stages of the crop. It was observed that foliar application of potassium nitrate (KNO₃) did not showed significant effect at the early stage (30 DAS) and at the later stages (60 and 90 DAS) foliar application of potassium nitrate (KNO₃) showed significant effect in respect to the number of leaves per plant. It may be due to the role of potassium on plant nutrition.

Table: 2 Effect of different concentrations of potassium nitrate (KNO₃) as foliar spray on number of leaves per plant at different stages of the crop

Treatment	Number of leaves per plant			
	Days after sowing			
	30	60	90	120
T ₁	3.03	3.17	4.30	3.27
T ₂	2.93	3.63	5.03	3.40
T ₃	3.00	3.67	5.03	3.40
T ₄	2.93	3.83	5.10	3.43
T ₅	3.07	3.83	5.23	3.34
T ₆	2.83	3.90	5.33	3.34
T ₇	3.00	3.97	5.33	3.47
SEM (±)	0.08	0.15	0.18	0.11
CD (P =0.05)	NS	0.47	0.56	NS

Data on number of tillers per hill did not show significant response at the early stage of growth (30 DAS). However, at later stages of crop growth foliar application of potassium nitrate (KNO₃) showed significant effect on the number of tillers per hill. The maximum number of tillers was obtained at foliar application of KNO₃@ 3% (8.35) than the control (4.57). This may be due to the fact that crop get more nutrients through foliar application which in turn produced more number of tillers per hill and also due that crop response was more to favourable environment in term of increased vegetative growth like tillers production.

Table: 3 Effect of different concentrations of potassium nitrate (KNO₃) as foliar spray on number of tillers/hill at different stages of the crop

Treatment	Number of tillers/hill			
	Days after sowing			
	30	60	90	120
T ₁	0.62	2.17	5.00	4.57
T ₂	0.61	3.53	7.53	6.13
T ₃	0.74	4.63	8.63	7.43
T ₄	0.62	5.10	8.77	7.83
T ₅	0.55	5.30	9.30	8.20
T ₆	0.63	5.48	9.43	8.33
T ₇	0.63	5.50	9.44	8.35
SEM (±)	0.06	0.27	0.53	0.39
CD (P =0.05)	NS	0.82	1.63	1.22

Fresh weight per plant did not show significant response at the early stage of growth (30 DAS). However, at later stages of crop growth foliar application of potassium nitrate (KNO₃) showed significant effect on fresh weight per plant. The maximum fresh weight per plant was obtained at foliar application of KNO₃ @ 3% (11.86 cm) than the control (6.70 cm). This may be due to the increased rates of photosynthesis, photorespiration and RuBP carboxylase activity.

Table: 4 Effect of different concentrations of potassium nitrate (KNO₃) as foliar spray on fresh weight (g/plant) at different stages of the crop

Treatment	Fresh weight (g/plant)			
	Days after sowing			
	30	60	90	120
T ₁	0.23	0.94	4.05	6.70
T ₂	0.20	1.74	6.93	9.75
T ₃	0.23	1.82	7.32	10.40
T ₄	0.20	1.97	7.82	11.43
T ₅	0.18	2.13	8.29	11.43
T ₆	0.22	2.16	8.34	11.46
T ₇	0.22	2.17	8.42	11.86
SEM (±)	0.02	0.18	0.50	0.51
CD (P =0.05)	NS	0.54	1.53	1.58

Dry weight per plant did not show significant response at the early stage of growth (30 DAS). However, at later stages of crop growth foliar application of potassium nitrate (KNO₃) showed significant effect on dry weight per plant. The maximum dry weight per plant was obtained at foliar application of KNO₃ @ 3% (8.86 cm) than the control (4.70 cm). This may be due to the increased rates of photosynthesis, photorespiration and RuBP carboxylase activity.

Table: 5 Effect of different concentrations of potassium nitrate (KNO₃) as foliar spray on dry weight (g/plant) at different stages of the crop

Treatment	Dry weight (g/plant)			
	Days after sowing			
	30	60	90	120
T ₁	0.054	0.24	1.60	4.70
T ₂	0.056	0.35	2.00	6.75
T ₃	0.067	0.38	2.16	7.57
T ₄	0.056	0.39	2.23	8.77
T ₅	0.050	0.40	2.33	8.83
T ₆	0.059	0.42	2.34	8.79
T ₇	0.058	0.45	2.53	8.86
SEM (±)	0.01	0.03	0.16	0.27
CD (P =0.05)	NS	0.09	0.50	0.83

Number of effective tillers per hill was affected significantly by different concentrations of potassium nitrate (KNO₃). The maximum number of effective tillers was obtained in foliar application of KNO₃ @ 3% (5.17) than the control (3.73).

Conclusion

Potassium nitrate (KNO₃) as a foliar application helps in improving the growth parameters of wheat. Foliar application of potassium nitrate (KNO₃) @ 3% at maximum tillering stage and late jointing stage helps in better growth and development, induces higher dry matter accumulation per plant.