RESPONSE OF WHEAT TO POLYHALITE IN JIANGSU, CHINA

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Abstract

Two field experiments were conducted in evaluating response of wheat to different application rate of polyhalite ($K_2SO_4.MgSO_4.2CaSO_4.2H_2O$; POLY4) as a source of potassium in Buzhi and Wanguanj, Jiangsu, China. POLY4 was assessed at 0, 45, 90 and 130 kg K_2O ha^{-1}. Response of wheat yield to rate of POLY4 varied with the site of field trial.

The highest yield of wheat was at the rate of 130 kg K_2O ha^{-1} in Wanguanj and at the rate of 45 kg K_2O ha^{-1} in Buzhi. The study demonstrated that applying POLY4 can enhance uptake of nutrients in plants, soil available K content and improve wheat yield. Results conclude that POLY4 could be used as a source of potassium for wheat in Jiangsu, China.

Introduction

- Jiangsu province in China is one of the major provinces for wheat production with the planting area of 2.1 million ha.
- The adequate rate of K_2O applied is efficient to maintain wheat yield with economic use of K source.
- POLY4 is solubilized slowly and contains four macro nutrients that are essential to plant growth: potassium (14% K_2O), sulphur (19% S), magnesium (6% MgO) and calcium (17% as CaO).
- A limited number of studies evaluating polyhalite as a K source in wheat production of China motivated undertaking of the current work to assess the agronomic performance of rate of POLY4 on wheat in Jiangsu.

Objectives

- Assess the effect of rate of POLY4 as K_2O source on wheat yield and uptake of nutrients in plants.
- Assess the effect of rate of POLY4 as K_2O source on availability of soil nutrients.

Methods

- Field experiments were carried out in silty loam soils of Buzhi and Wanguanj, Jiangsu with an initial soil analysis of K 56 mg kg^{-1} and Mg 81 mg kg^{-1} in Wanguanj and K 57 mg kg^{-1} and Mg 110 mg kg^{-1} in Buzhi.
- N and P_2O_5 were applied at local recommended rates.

Summary of potassium fertilizer applications

Treatment number	Treatment	Nutrients applied (kg ha^{-1})			
		K_2O	CaO	MgO	S
1	Control	0	0	0	0
2	POLY4	45	54	19	61
3	POLY4	90	107	39	123
4	POLY4	130	155	56	177

Wheat growth in the field

Design of experiment

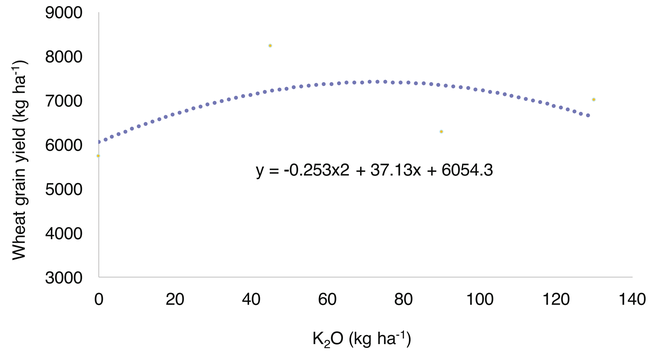
- The design of the experiment at the site was a randomised block design with four replications.
- Plot dimensions were 6 x 5 m^2.

Statistical analysis

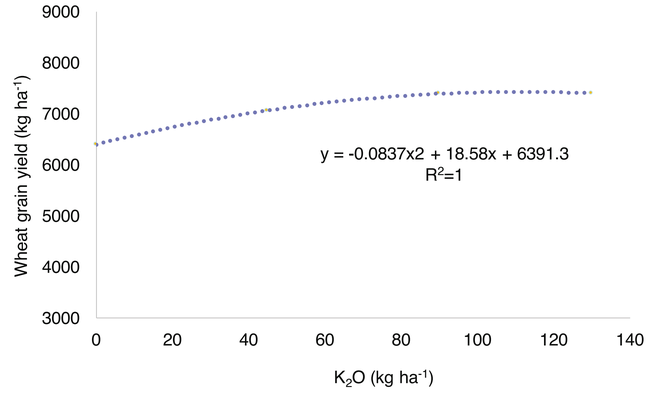
- Statistical analysis was carried out using GenStat software version 17 (VSN International, 2011).

Results

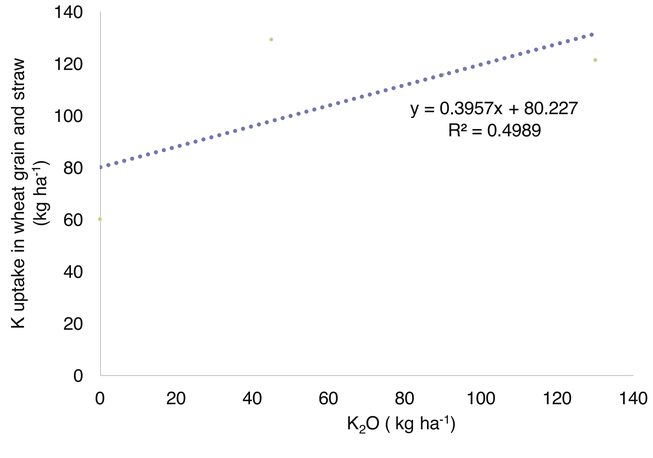
Response of wheat yield to different application rate of POLY4 in Buzhi



Response of wheat yield to different application rate of POLY4 in Wanguanj

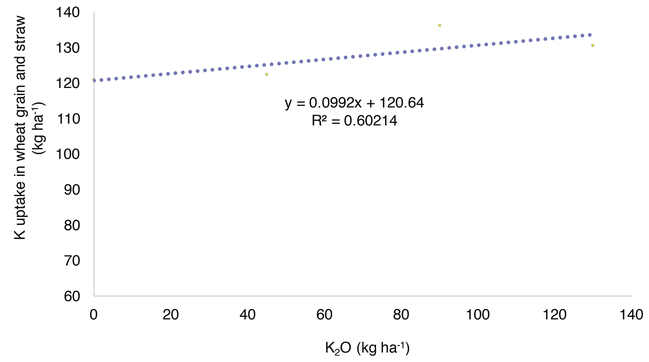


K uptake of wheat grain and straw under different application rate of POLY4 in Buzhi



POLY4 granulated fertilizer

K uptake of wheat grain and straw under different application rate of POLY4 in Wanguanj



Correlation between post-harvest soil availability K content (Y) and different application rate of POLY4 (X)

Site name	Liner correlation equation	r	P value
Buzhi	Y = 0.2694X + 49.578	0.654	< 0.05
Wanguanj	Y = 0.1376X + 120.01	0.307	ns

Conclusions

- Applying POLY4 significantly increased wheat yield compared to the control.
- Response of wheat yield to rate of POLY4 varied with the site of field trial. The highest yield of wheat was at the rate of 130 kg K_2O ha^{-1} in Wanguanj and at the rate of 45 kg K_2O ha^{-1} in Buzhi.
- There was a positive correlation between K uptake of wheat grain and straw and rate of POLY4.
- Applying POLY4 significantly enhanced total uptake of K in plant (grain and straw) in Buzhi.
- There was a positive correlation between soil available K content in post-harvested soil and rate of POLY4 (r = 0.307 in Wanguanji; r =0.654, P < 0.05 in Buzhi). Applying POLY4 enhanced uptake of soil available K content.