Effect of Polyhalite application

on the yield, quality and shelf life of green pepper in Hainan province, China

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Introduction

Green pepper is one of the most important cash crops in Hainan province, representing the prominence that China has gained in the tropical crop industry (Zu et al., 2014). The soil pH in approximately 50% of pepper fields in Hainan province is below 5.5, falling below the suitable green pepper soil pH range of 5.5-7 (Yang et al., 2009). Growing green peppers on low pH soil often results in poor growth, nutrient deficiencies (potassium - K, calcium - Ca and magnesium - Mg), low yield and poor quality.

Polyhalite, $K_2Ca_2Mg(SO_4)_4 \cdot 2H_2O$ (George, 1931; Luca, 2005), marketed as Polysulphate by ICL Fertilizers, is a naturally occurring mineral which is certified as an organic fertilizer, containing 48% SO_3, 14% K_2O, 6% MgO and 17% CaO, all of which are fully soluble. This new four-in-one fertilizer is abundant in Ca and Mg which makes it the ideal fertilizer for the tropical agricultural regions of China.

Objective

The objective of this study was to quantify the effects of Polyhalite on green pepper production in Hainan province including: yield, quality and shelf life.

Materials and methods

Properties of soil

The soil is a sandy loam with a pH value of 5. The properties of the soil were: organic matter 14.12 g kg^{-1}, alkali-hydrolyzed nitrogen 96.45 mg N kg^{-1}, available phosphorus 13.21 mg P_2O_5 kg^{-1}, available potassium 65.12 mg K_2O kg^{-1}, exchangeable calcium 763.25 mg Ca kg^{-1}, exchangeable magnesium 115.36 mg Mg kg^{-1}.

Experimental design

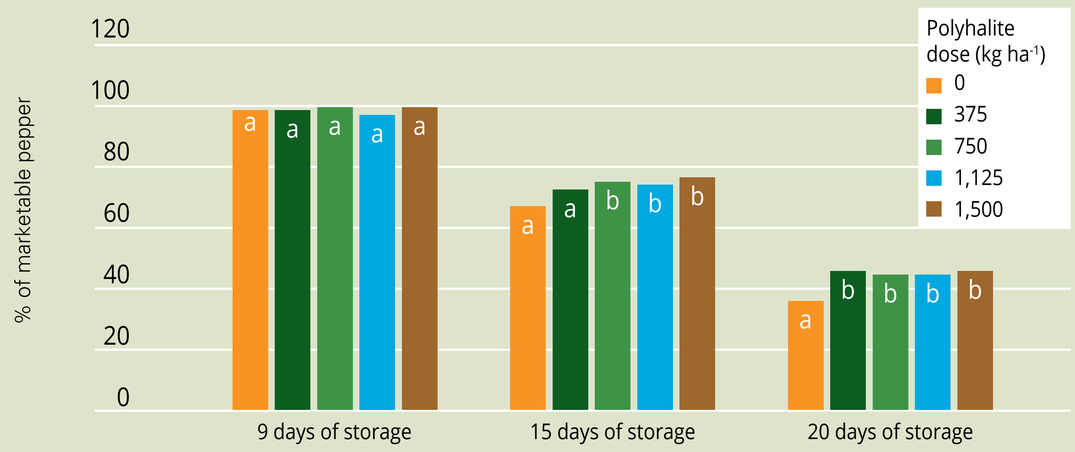
The field experiment was conducted at a farm in Wenchang city, Dongyang county, Hainan province. The experiment was laid out in a complete randomized block design with three replications.

- **Control:** Farmers' traditional practice: 1,125 kg ha^{-1} of compound fertilizer (15-15-15) applied as base-fertilizer; topdressing of 375 kg ha^{-1} of compound fertilizer at fruit stage;
- **Treatment 1:** Farmer practice + 375 kg ha^{-1} Polyhalite
- **Treatment 2:** Farmer practice + 750 kg ha^{-1} Polyhalite
- **Treatment 3:** Farmer practice + 1,125 kg ha^{-1} Polyhalite
- **Treatment 4:** Farmer practice + 1,500 kg ha^{-1} Polyhalite

The area of each plot was 20 m^2 (1.43 m X 14 m); plant and row spacing 25 cm × 40 cm. Control of weeds, insects, and diseases were done according to local standard prevention recommendations.

Results and discussion

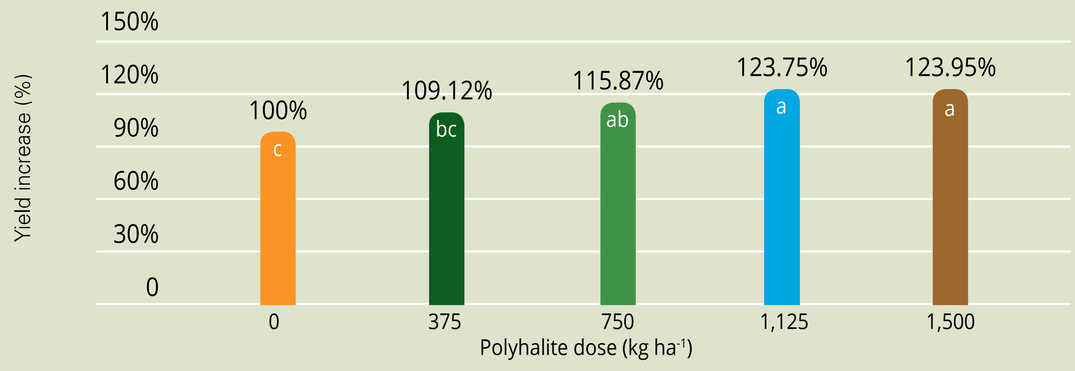
Fig. 1 Effect of Polyhalite application on percentage of marketable pepper after harvest



Different letters within columns indicate statistically significant differences

There was no significant difference in the percentage of marketable pepper among all treatments after 9 days of storage. As the storage time was increased from nine days to 15 and then 20 days, a significantly higher percentage of marketable pepper was achieved in treatments that contained Polyhalite, due to improved shelf life.

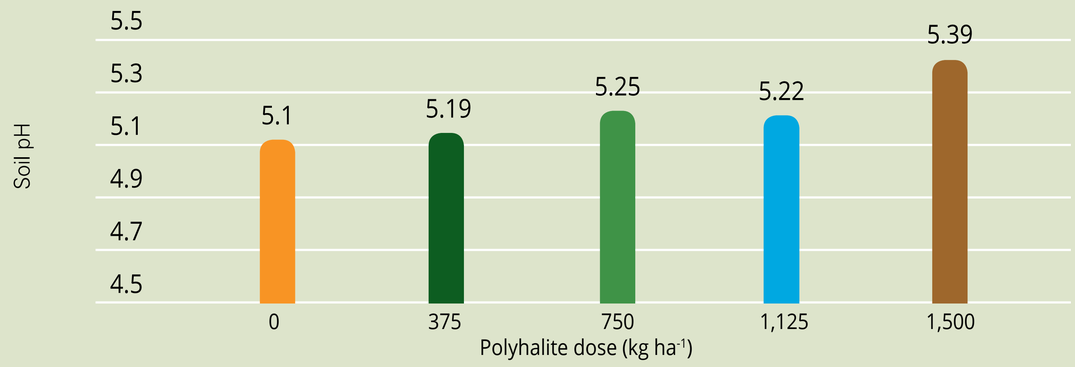
Fig. 2 Effect of Polyhalite application on pepper yield



Different letters within columns indicate statistically significant differences

Comparing Polyhalite treatments with the control, the yields of green pepper increased significantly by up to 24% at the highest dose (1,500 kg Polyhalite ha^{-1})

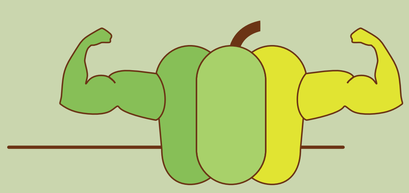
Fig. 3 Effect of Polyhalite application on soil pH after pepper harvest



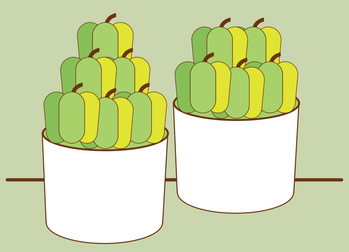
Comparing Polyhalite treatments with the control, the application of Polyhalite increased soil pH from 5.1 to 5.39.

Conclusions

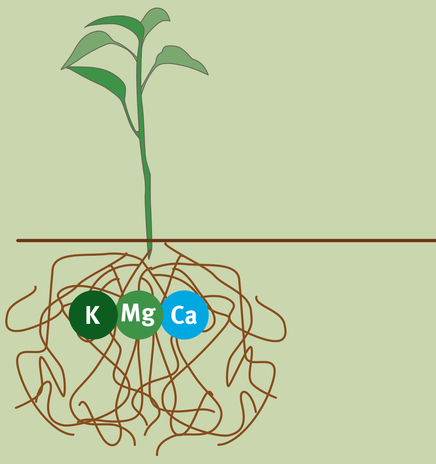
① Application of Polyhalite improved the yield and quality of green pepper.



② Application of Polyhalite increased significantly the shelf life of green pepper.



③ Application of Polyhalite increased the pH and thus the availability of nutrients in the soil, especially for K, Ca and Mg, that in turn improves the fertility of acidic soil.



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Where needs take us

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