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, K2CaMg(SO4)2·2H2O (George, 1931; Luca, 2005), marketed as Polysulphate by ICL Fertilizers, is a naturally occurring mineral which is certified as an organic fertilizer, containing 48% SO4, 14% K2O, 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.

Materials and methods

Properties of soil

The soil is 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 P2O5 kg-1, available potassium 65.12 mg K2O kg-1, exchangeable calcium 763.25 mg Ca2+ kg-1, exchangeable magnesium 115.36 mg Mg2+ 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 m2 (1.43 m X 1.4 m); plant and row spacing were: organic matter 14.12 g kg-1, alkali-hydrolyzed nitrogen 96.45 mg N kg-1, available phosphorus 13.21 mg P2O5 kg-1, available potassium 65.12 mg K2O kg-1, exchangeable calcium 763.25 mg Ca2+ kg-1, exchangeable magnesium 115.36 mg Mg2+ kg-1.

Results and discussion

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)

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.

References: