

Response of Sugarcane and Sugarcane Stalk Borers *Sesamia* spp. (Lepidoptera: Noctuidae) to Calcium Silicate Fertilization

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Abstract

Sugarcane is grown extensively throughout the world including more than 100,000 ha in Khuzestan province, Iran. The pink stalk borers *Sesamia* are key pests of sugarcane in this region, while other stalk borers will occur in sugarcane worldwide. Application of silicon as a soil amendment has provided plant mitigation to both biotic and abiotic stresses. Silicon has been shown to enhance resistance of sugarcane against stalk borers. Field trials were conducted to determine the effects of calcium silicate against infestations of stalk borers *Sesamia* spp. and on yield quality. Experiments were conducted with three sugarcane varieties CP69-1062, IRC99-01, and SP70-1143 and two rates of calcium silicate (400 and 800 kg/ha). Percentage of stalk damaged, percentage of bored internodes, length of borer tunnel (mm), number of larvae+pupae per 100 stalks, number of exit holes, and cane yield quality were determined. We demonstrate significant reduction on borer population and damage under silicon treatment, but greater reduction in the percentages of stalk damage, bored internodes, moth exit holes, and length of borer tunnel and number of larvae and pupae per 100 stalks were observed in the susceptible variety CP69-1062. Silicon treatment positively affected cane and sugarcane juice quality of for the variety CP69-1062, but not for SP70-1143. We conclude that the benefits of silicon to sugarcane quality and sugarcane resistance to stalk borers are dependent on the sugarcane variety.

Introduction

Sugarcane is a strategically important crop that has economic and social impact in many countries, but it is vulnerable to many biotic stressors and among them, lepidopteran stalk borers are the most destructive in many sugar-producing countries, including Brazil (Volpe *et al* 2014), South Africa (Keeping 2006), Indonesia (Goebel *et al* 2014), Reunion Island (Nibouche & Tibère 2008), the USA (Showler & Reagan 2012), Mexico (Vejar-Cota *et al* 2008), Iran (Jamshidnia *et al* 2010), Colombia (Vargas *et al* 2013), India (Srivastava *et al* 2012), and Papua New Guinea (Kuniata & Sweet 1994).

Two species of stalk borers are important in the province of Khuzestan, the major sugarcane producer in Iran

(Sadeghzadeh-Hemayati *et al* 2011), *Sesamia cretica* Lederer and *Sesamia nonagrioides* Lefebvre (Lepidoptera: Noctuidae). Both are capable of causing economic losses to commercial varieties and affect the sugar industry by both direct and indirect crop damages (Leslie 2004, Askarianzadeh *et al* 2008, Showler & Reagan 2012). Management of stalk-boring lepidopterans in sugarcane is multi-tactic, and several control options are used around the world, including biological control (Kuniata & Sweet 1994, Nikpay *et al* 2014), cultural practices (Reay-Jones *et al* 2005, Beuzelin *et al* 2011, Sandhu *et al* 2011), varietal resistance (Keeping 2006), and insecticide treatment (Legaspi *et al* 1999). One relatively new approach to manage stalk borers is the application of silicon as a nutritional amendment. This approach is classified as a

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