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ORIGINAL PAPER

Biochemical interactions for antibiosis mechanism of resistance to *Chilo partellus* (Swinhoe) in different maize types

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Abstract Variation in performance and abundance of herbivorous insects is attributed to variation in host plant quality, being determined by nutritional composition, allelochemistry and specific anatomical features. Present studies were undertaken to gain an understanding on the role of different biochemical factors in plant defense to *Chilo partellus* in diverse maize types with variable morphological and favorable agronomic traits. All the white and yellow kernel maize genotypes tested had significantly lower deadhearts and more adverse effects on one or the other biological parameters of *C. partellus*, as compared to the resistant check, CML 334. The phenolic acids viz., ferulic acid and *p*-coumaric acid, and the nutritional biochemical factors such as protein, oil, chlorophyll-*b*, total chlorophyll and total carotenoid showed significant negative correlations, while total sugars and starch had positive correlation with pupal period of *C. partellus*. Oil content showed significant positive correlation with larval weight, and chlorophyll-*a* negative correlation with larval and pupal weights of *C. partellus*. Iron and zinc contents in maize seedlings showed significant positive correlation with pupal weight, whereas zinc content showed negative correlation with plant deadhearts, larval survival and adult emergence of *C. partellus*. Present studies show that different maize types expressed antibiosis mechanism of resistance to spotted stem borer, while the amount of phenolic acids and the nutritional biochemical constituents were highly variable in their seedlings, suggesting that the maize plant defense against *C. partellus* could be due to concentration of particular biochemical constituent and/or interaction with different biochemical compounds.

Keywords Maize · *Chilo partellus* · Antibiosis · Phenolic acids · Ferulic acid · *p*-Coumaric acid · Nutritional factors

Introduction

Maize [*Zea mays* L.] is an important staple food for millions of people across the world. It is grown over an area of 8.12 million ha in India with annual production of 19.77 million tons, 75 % of which is being used as poultry feed and human food, and rest 25 % for animal feed and industrial purposes (Dhillon and Gujar 2013). The grain yields of traditional maize genotypes under subsistence farming conditions are quite low (2.17 t/ha) in India because of several biotic and abiotic stresses. Maize is damaged by 139 species of insects during different growth stages, of which cereal stem borers [*Chilo partellus* (Swinhoe) and pink stem borer, *Sesamia inferens* Walker in South Asia and eastern and southern Africa; *Busseola fusca* Fuller in Africa; *Diatraea* spp. in the Americas; and *Ostrinia* spp. in the Americas, Europe and East Asia] pose a great challenge to increasing productivity potential of this crop (Dhillon et al. 2014). Among these, *C. partellus* is one of the most important biotic constraints, resulting in 27–80 % crop losses in India and Africa (Kanta et al. 1997). Losses due to spotted stem borer are more pronounced under drought conditions, because of low biomass and increased propensity of poor growing plants due to

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