

Amino acid profiling of *Sorghum bicolor* vis-à-vis *Chilo partellus* (Swinhoe) for biochemical interactions and plant resistance

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Abstract Amount of certain amino acids required by herbivores, and their availability in host plants are of crucial importance for insect growth, development, and life processes. Therefore, we carried out profiling and quantification of 17 amino acids in diverse sorghum genotypes, and on the *Chilo partellus* larvae reared on them, to understand the association and contribution of different amino acids in plant resistance to insects. Sorghum germplasm lines IS 2205 and IS 2123 had severe detrimental effects on the development and survival of *C. partellus* followed by varieties ICSV 700 and ICSV 708 in comparison to susceptible check, Swarna. Profiling of sorghum seedlings, seeds, and the *C. partellus* larvae fed on these genotypes for 17 amino acids revealed that Arginine, Glycine, Isoleucine, Leucine, Proline, and Valine in sorghum seedlings and the *C. partellus* larvae had significant and positive association, suggesting their role in the development and survival, while negative association of Cystine indicated its contribution in plant defense. Furthermore, *C. partellus* acquired less of cyclic and aliphatic amino acids per unit amount from the test resistant genotypes, while more from the susceptible check, than their presence in the seedlings. Present studies suggest that Alanine, Cystine, Glycine, and Proline contents in *C. partellus* larvae; Cystine and Proline contents in sorghum seedlings; and Methionine content in sorghum

seeds, have significant and negative association, and contribute to explain >93% and >96%, respectively, of the variability in antibiosis mechanism and overall resistance to *C. partellus*. These studies have implications for antibiosis and nutritional mechanism of host plant–insect interactions in sorghum against *C. partellus*.

Keywords Sorghum · *Chilo partellus* · Amino acids · Antibiosis · Host plant resistance · High performance liquid chromatography

Introduction

Sorghum [*Sorghum bicolor* (L.) Moench] is one of the most important cereal crops in the semi-arid tropics, and insect pests are one of its major yield-reducing factors. Among the 150 insect species infesting sorghum, spotted stem borer, *Chilo partellus* (Swinhoe) is most predominant stem borer species in Indian subcontinent and South and eastern Africa, causing serious damage to sorghum, maize, and pearl millet, being US\$ 334 million annual loss to sorghum alone in the semi-arid tropics (Sharma et al. 2007). Host plant resistance has often been used for successful management of several insect pests in sorghum (Huang et al. 2013). All the three mechanisms of resistance to insect pests viz., antibiosis, antixenosis, and tolerance are although operational in sorghum, the interactions between the insects and plants are dependent upon mechanism of resistance. Antibiosis affects the biology of the insect so that pest abundance and subsequent damage is reduced as compared to that feeds on a susceptible crop variety. Antibiosis resistance often results in increased mortality or prolonged development and reduced fecundity.

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