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Relative susceptibility of different male-sterile cytoplasms in sorghum to shoot fly, *Atherigona soccata*

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Summary

The shoot fly, *Atherigona soccata* is an important pest of sorghum, and host plant resistance is one of the most effective components for managing this pest. Most of the hybrids grown in India based on *milo* cytoplasm (A_1 cytoplasm) are highly susceptible to shoot fly. Therefore, the present studies were undertaken to evaluate different male-sterile cytoplasms (CMS) for their relative susceptibility to sorghum shoot fly. Oviposition and deadheart formation were significantly lower on the maintainer lines as compared to the corresponding male-sterile lines. Among the cytoplasms tested, A_4M cytoplasm showed antixenosis for oviposition and suffered lower deadheart formation than the other cytoplasms tested. The A_4G_1 and A_4M cytoplasms suffered lower deadhearts in tillers than the other cytoplasms. Recovery following shoot fly damage in A_4M, A_3, and A_2 cytoplasms was better than in the other cytoplasms tested. The larval and pupal periods were longer and male and female pupal weights lower in A_4M and A_4VzM CMS backgrounds compared to the other CMS systems. Fecundity and antibiosis indices on CMS lines were lower than on the B-lines. The A_4M cytoplasm was found to be relatively resistant to sorghum shoot fly, and can be exploited for developing shoot fly-resistant hybrids for sustainable crop production in future.

Introduction

Sorghum (*Sorghum bicolor* (L.) Moench) is one of the most important cereal crops in the semi-arid tropics (SAT). It is grown widely in Asia, Africa, Australia, Americas, and the Mediterranean Europe (FAO, 2002). Insect pests are one of the major constraints for increasing production and productivity of sorghum, and cause a loss of over $1 billion in the SAT. More than 150 species of insects have been recorded as pests of sorghum, of which sorghum shoot fly, *Atherigona soccata* (Rondani) (Diptera: Muscidae) is an important pest in Asia, Africa, and the Mediterranean Europe. Shoot fly larvae damage the growing point of 5–30 days old sorghum seedlings. As a result, the central leaf dries up, resulting in typical deadheart symptoms (Deeming, 1971; Pont, 1972). The larvae feed on the decaying tissue of the central leaf and pupate in the soil. As a result of deadheart formation, the main shoot is killed, and the plant may produce axial tillers if sufficient moisture and nutrients are available. The axial tillers serve as a mechanism of recovery resistance if they remain undamaged, but if shoot fly infestation continues, the seedling may die or presents a rossette appearance and fails to produce any grain. The levels of shoot fly infestation in sorghum may reach as high as 90% under delayed sowings (Hiremath & Renukarya, 1966; Rao & Gowda, 1967).