

# Comparative study of field and laboratory evaluations of the ethnobotanical *Cassia sophera* L. (Leguminosae) for bioactivity against the storage pests *Callosobruchus maculatus* (F.) (Coleoptera: Bruchidae) and *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae)

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## Abstract

The powdered leaves of *Cassia sophera* along with hot- and cold-water leaf extracts of this plant were tested in laboratory experiments in the UK and in field trials in Tamale, Northern Ghana, using traditional storage containers, to determine their inhibitory and toxic effects against *Sitophilus oryzae* and *Callosobruchus maculatus* infestation of stored rice and cowpea, respectively. Laboratory and field experiments with cowpea showed that the use of *C. sophera* hot-water extracts was more effective at reducing *C. maculatus* infestation and adult emergence on cowpea than the traditional leaf-powder application (1% and 5% w/w) or the use of a cold-water extract of *C. sophera*. Hot-water extracts of *C. sophera* might be a more effective technique of applying the plant material on to stored cowpea than using powdered *C. sophera* leaves, the currently used application by small-scale farmers. In contrast, experiments with *S. oryzae* on rice showed that *C. sophera* leaf powder (5% w/w) effectively reduced adult emergence in the laboratory, but this could not be confirmed under field conditions. The hot and dry climatic conditions in the field might impart a natural protection against rice infestation by *S. oryzae*, making the use of protectants and pesticides less necessary for farmers. This was supported by the negligible rice grain damage after 6 months of field storage and by the failure of the *S. oryzae* population to establish itself under field conditions. The implications of using botanicals in pest control are discussed.

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## 1. Introduction

The use of species of the genus *Cassia*, such as *C. nigricans* Vahl, *C. occidentalis* L. or *C. siamea* Lam. as protectants of stored legumes has been reported by Babu et al. (1999), Dwivedi and Maheshwari (1996), and Lambert et al. (1985). *Cassia sophera* L., which is distributed throughout the tropics, is traditionally used by subsistence farmers in northern Ghana to protect stored cowpea (*Vigna unguiculata* (L.) Walp.), bambara groundnuts (*Vigna subterranea* L.),

millet (*Pennisetum glaucum* L.), sorghum (*Sorghum bicolor* L. Moench) and maize (*Zea mays* L.) against insect infestation. It is traditionally used as powder obtained by pounding the dried leaves and mixing with the stored commodity (Belmain et al., 1999). The species is abundant and widespread, grows along roadsides and on waste ground and is reported to be a common weed in uncultivated lands (Belmain and Stevenson, 2001). In laboratory experiments, dry leaf powder of *C. sophera* increased adult mortality of *Callosobruchus maculatus* (F.) and *Rhyzopertha dominica* (F.) when admixed at 5% w/w to cowpea or wheat (*Triticum aestivum* L.), respectively (Belmain et al., 2001). In the same study, 1% and 5% concentrations of the leaf powder also significantly reduced F1 adult emergence of *C. maculatus*, *R. dominica* and

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