

ABSTRACT

The importance of the African plant *Securidaca longepedunculata* was evaluated for its ability to protect stored maize, cowpea and wheat from damage caused by *Sitophilus zeamais*, *Prostephanus truncatus*, *Callosobruchus maculatus* and *Rhyzopertha dominica* under laboratory conditions. Bioassays revealed that commodity treated with dried powdered roots of *S. longepedunculata* reduced the number of live *R. dominica*, *S. zeamais*, *C. maculatus* and *P. truncatus* adults in the F₁ generation and that plant compounds present in the methanol extract were responsible for this effect. Different methods for applying a methanol extract of *S. longepedunculata* to the commodity illustrated the importance of the application of the correct concentration of the active material onto the commodity. Behavioural studies showed that the effect of the methanol extract to reduce F₁ generation was caused by the repellent, antioviposition and feeding deterrent properties of the active compounds. Insects were not killed directly by these compounds although other phenomena such as toxic effects suffered sometime after ingestion or starving could be responsible for the reduction in the F₁ generation. Bioassay guided fractionation of the methanol extract of *S. longepedunculata* roots facilitated the identification of different active chemicals. GC-MS analysis of the volatile components in the methanol extract and comparison with synthetic compounds showed that the main volatile compound in the roots was methyl salicylate with minor components of methyl 2-hydroxy-6-methoxybenzoate and benzyl 2-hydroxy-6-methoxybenzoate. Choice and no-choice bioassay results using volatile compounds showed that methyl salicylate acted as a repellent and a fumigant or volatile toxicant against stored grain insect pests. Analysis of the non-volatile polar compounds in the methanol extract using UV/Vis HPLC, MS, 1D and 2D NMR (¹H and ¹³C) indicated that the extract contained a mixture of saponins including two novel bisdesmosidic saponins. The two compounds **1** and **2** were identified as 3-*O*-β-D-glucopyranosyl-2β,3β-dihydroxy-olean-12-ene-23,28-dioic acid 28 - *O* - α - L - arabinopyranosyl (1-3) - β - D- xylopyranosyl (1-4) [β-D-apiofuranosyl (1-3)] - *O*-β-D-rhamnopyranosyl (1-2) - 4 - *O*- P - methoxycinnamoyl - β - D - fucopyranosyl ester occurring in the E and Z forms. Choice bioassays using **1** and **2** treated cowpea showed that the compounds reduced the oviposition of *C. maculatus*. No-choice bioassays using **1** and **2** treated maize indicated that the compounds deter feeding by and were toxic to *S. zeamais*. The potential of **1** and **2** as new control agents for stored grain insect pests is discussed. Several other compounds whose physical, chromatographic and chemical properties were similar to **1** and **2** were detected but remained unidentified indicating a potential additive effect of structurally similar compounds in the plant against *S. zeamais* and *C. maculatus*. The results of all the experiments are discussed in the context of improving on-farm use of *S. longepedunculata* for stored product pest control in developing countries.