# BIOACTIVE METABOLITES OF SELECTED KENYAN PLANTS USED AS BIOPESTICIDES AGAINST *ACANTHOSCELIDES OBTECTUS* IN BUNGOMA DISTRICT, KENYA

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## ABSTRACT

The post-harvest pests are known to cause severe losses of beans in particular the bean weevil (*Acanthoscelide obtectus*) necessitating immediate and long-term measures. Convectional pesticides have been used to protect stored grain but social and environmental repercussions associated with their uses and pests resistance have aroused researchers to search for newer, potent, eco-friendly, biodegradable and more convenient to use pesticides. The use of natural products derived from the metabolic activity of plants may constitute a new avenue of pest control. This thesis describes phytochemical and biological investigations of leaves, root, and stem bark crude extracts and isolated compounds of selected Kenyan plants used to control the bean weevil(*Acanthoscelide obtectus)*. The plants studied were: *Senna didymobotrya* (L.) Irwin and Barneby, *Euclea divinorum* Hiern, *and Ziziphus abyssinica* (A) Rich.

The powdered plant materials were sequentially extracted with solvents of increasing polarity starting with hexane, dichloromethane, ethyl acetate, and methanol. The extracts were concentrated using a rotary evaporator at $45^0$C in vacuo and the extracts stored in low temperatures. Isolation of biologically active compounds was done through Column Chromatography (CC) in Silica gel and Sephadex LH20, Vacuum Liquid Chromatography (VLC) and preparative thin layer chromatography monitored by Thin Layer Chromatography (TLC).

Bioassay tests of the compounds were done against brine shrimp and against bean weevil to establish their insecticidal activity. Hexane and dichloromethane, crude extracts of *Senna didymobotrya*, *Euclea divinorum* and *Ziziphus abyssinica* showed lethality against brine shrimp with $LD_{50}$ of 345.1 and 195.0; 952.0 and 689.9; 699 and 871.5 ppm, respectively.

Dichloromethane extract of *Senna didymobotrya* exhibited the highest toxicity and therefore, was the most bioactive extract. Dichloromethane extract of *Senna didymobotyra* showed the highest adulticidal activity of 95±0.06 and 100±0.0 at 750 and 1000 ppm respectively and is a potential source for novel bean protectant against bean weevil, *Euclea divinorum, and Ziziphus abyssinica* extracts had moderate adulticidal activity. Anti-bacterial activity tests for the hexane, crude extracts of *Senna didymobotrya* pods showed an inhibition zone of 10.3, 12.3, 6.0, 10.3, and 23.6 mm against *Candida albicans, Bacillus subtilis*, *Pseudomonas aureginosa, and Escherichia coli* and *Staphylococcus aureus,* respectively, while dichloromethane extract showed an inhibition zone of 9.3, 9.3, 6.0, 7.6, and 10.3 mm on the same bacteria, respectively. Both extracts showed mild to low activity towards both gram-negative bacteria and gram-positive bacteria. Structure elucidation of the isolated compounds was done using various spectroscopic techniques; Infrared (IR), Ultraviolet (UV), Mass Spectroscopy (MS) and Nuclear Magnetic Resonance (NMR). Four compounds were isolated; compound **52 (**fraction 5) and **53** (fraction 7) were isolated from hexane extract of *S. didymobotrya* root bark and compounds **54** (fraction 8) and **55 (**fraction 10) were isolated from DCM extract of *S. didymobotrya*. The isolated compounds [**52**] and [**53**] exhibited low activity (≤ 8mm) towards *P. aureus* and *S. aureus*, while compounds [**54**] and physcion [**55**] were active towards *S. aureus* but inactive towards *P. aureginosa*. The result presented in this study demonstrates a possible scientific rationale for the incorporation of the root bark of *Senna didymobotrya* into traditional medicine and methods of grain protection in Bungoma district, and are likely to have been selected after empirical demonstration of their efficacy over long period of time.