PHYTOCHEMICAL STUDIES OF SOME INDIGENOUS PLANTS AS GRAIN PROTECTANTS AGAINST *SITOPHIlus zeamaIs* (MAIZE WEEVIL)

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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This thesis has been submitted for examination with our approval as the University appointed supervisors.

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Maize farming, though successful in some parts of Africa is greatly hampered by the post harvest handling procedures. Resource farmers in developing countries like Kenya use different plant materials to protect stored grains against pest infestation by mixing grains with protectants made up of plant products. Dry ground plant material, were tested for their activity against the maize weevil; *Sitophilus zeamais*; (Coleoptera: Curculionidae). All showed no reasonable protectant ability. Essential oils extracted were analyzed by gas chromatography–mass spectrometry (GC–MS) and evaluated for repellent and insecticidal activities against *Sitophilus zeamais* using the area preference and contact methods. Most oil components identified by analyzing their mass spectra to the NBS library of mass spectra using computer routing were oxygenated monoterpenoids or phenolic compounds and the oils were active in repelling at doses between 0.005 and 0.125 ppm. The mean mortality values for *Lippia kituiensis* and *Chrysanthemum cinerariaefolium* (pyrethrum) was not significantly different after 24 hrs of exposure with an average activity of 79 %. *Chenopodium chenopoides, Ajuga remota* and *Ricinus communis* were not significantly different after 24 and 48 hrs of exposure with a mean of 18 and 20% activity, respectively. The mortality rate of *S. zeamais* by contact increased with the exposure time and the concentrations of the essential oils. The most active oil extracts of plants were those of *Eucalyptus globulus, Rosemarinus officinalis, Lantana camara, Lippia kituiensis, Azadirachta melia* and *Azadirachta indica* with LD$_{50}$ values as 0.609, 0.199, 0.171, 0.220, 0.399 and 0.333, respectively. These oil extracts were reasonably comparable to the already known adulticidal and repellent pesticides such as pyrethrum with its LD$_{50}$ being 0.245. The constituents which may be more responsible for the maize grain protectant ability includes 1,8-cineole, limonene, α–pinene, β-pinene, α-terpineol, terpinen–4-ol, and globulol. Blends of plants whose activity is known were made and tested against the maize weevil. A blend of *Eucalyptus globulus* and *Rosemarinus officinalis* at 1.0 % concentration gave a PD and WPI of 3.5 and 7.2, respectively. These values are far much lower than their individual PD and WPI values of 15.3 and 12.3, 25.2 and 21.3, respectively. This therefore gives the impression that blend effects in the bioactivity of plant products may well be the norm to follow. Mortality tests by inert dusts were also carried out. Wood ash, Kaolin and Bentonite showed high activities of upto 70 % at 5 % concentration after 168 hours. Gypsum Whiting dusts was not comparatively active since they only exhibited activities below 40 % even at 10 % concentrations after 168 hours. This implies that a conclusive research carried out using standard conditions could reveal all the responsible components for such high activities in all the tests carried out.