

2015-11-23

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<https://doi.org/10.1371/journal.pone.0143530>

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# Extracts from Field Margin Weeds Provide Economically Viable and Environmentally Benign Pest Control Compared to Synthetic Pesticides

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DOI: <https://doi.org/10.1371/journal.pone.0143530>

## Abstract

Plants with pesticidal properties have been investigated for decades as alternatives to synthetics, but most progress has been shown in the laboratory. Consequently, research on pesticidal plants is failing to address gaps in our knowledge that constrain their uptake. Some of these gaps are their evaluation of their efficacy under field conditions, their economic viability and impact on beneficial organisms. Extracts made from four abundant weed species found in northern Tanzania, *Tithonia diversifolia*, *Tephrosia vogelii*, *Vernonia amygdalina* and *Lippia javanica* offered effective control of key pest species on common bean plants (*Phaseolus vulgaris*) that was comparable to the pyrethroid synthetic, Karate. The plant pesticide treatments had significantly lower effects on natural enemies (lady beetles and spiders). Plant pesticide treatments were more cost effective to use than the synthetic pesticide where the marginal rate of return for the synthetic was no different from the untreated control, around 4USD/ha, compared to a rate of return of around 5.50USD/ha for plant pesticide treatments. Chemical analysis confirmed the presence of known insecticidal compounds in water extracts of *T. vogelii* (the rotenoid deguelin) and *T. diversifolia* (the sesquiterpene lactone tagitinin A). Sesquiterpene lactones and the saponin vernonioside C were also identified in organic extracts of *V. amygdalina* but only the saponin was recorded in water extracts which are similar to those used in the field trial. Pesticidal plants were better able to facilitate ecosystem services whilst effectively managing pests. The labour costs of collecting and processing abundant plants near farm land were less than the cost of purchasing synthetic pesticides.