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Insecticidal properties of cinnamaldehyde derivatives against *Musca domestica*

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Musca domestica, the common housefly, invades the home and the environment and their presence is considered a sign of unhygienic conditions. They can spread diseases including enteric, certain helminth, eye and certain skin infections. Presently, synthetic insecticides are utilized more commonly to control *M. domestica* and several were proven problematic due to their persistence in the environment, toxicity and resistance development. Derivatization of natural products, rendering them relatively more stable and toxic may be a viable strategy towards a more biorational approach to insect control. The objective of the present study is to evaluate the insecticidal activity of cinnamyl alcohol and cinnamic acid derivatives against *M. domestica* to establish the Structure Activity Relationship of compounds.

Cinnamyl alcohol derivatives, cinnamyl acetate, chloroacetate, dichloroacetate, pivalate, propionate, chloropropionate and cinnamic acid derivatives, methyl, ethyl, benzyl and phenyl ethyl cinnamates were synthesized by using literature reported procedures. Synthetic derivatives were purified by Dry Column Flash Chromatography to afford the desired compounds wherever necessary. Structures of compounds were elucidated/confirmed by ^{1}H and ^{13}C NMR spectral data. Compounds were tested against *M. domestica* by topical application method.

In the topical bioassay, the cinnamic acid derivatives, methyl, benzyl, and ethyl cinnamates showed good knock-down and mortality against *M. domestica*. Among them ethyl cinnamate is the most active compound against *M. domestica* (KD_{50} 0.31, LD_{50} 0.22 μg/insect). Benzyl cinnamate also showed good activity (KD_{50} 0.56, LD_{50} 0.28 μg/insect) against *M. domestica*. In comparison with standards chloropyrifos, deltamethrin and pyrethrins both ethyl and benzyl cinnamates are more active than pyrethrins (LD_{50} 0.94 μg/insect) but less active to chloropyrifos (LD_{50} 0.08 μg/insect) and deltamethrin (LD_{50} 0.02 μg/insect). It appeared that ester derivatives i.e. methyl, ethyl and benzyl cinnamates exhibited more enhanced insecticidal activity against *M. domestica*. Also aldehyde prove to be more insecticidal than structurally similar alcohol i.e. cinnamyl alcohol when they were topically applied to adult *M. domestica*. This study indicated that ethyl and benzyl cinnamates could be used as potential agents against *M. domestica* control.

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