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**Bioefficacy of Three Selected Plant Species against the Cowpea Bruchid (*Callosobruchus maculatus* F.): A Green Paradigm for Post-Harvest Pest Management**

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**Abstract**

*Callosobruchus maculatus* (Coleoptera: Bruchidae) is the most damaging insect pest of storage legumes and pulses. Control of this insect pest infestation primarily relies upon the extensive use of synthetic insecticides. However, the increasing serious problems associated with these chemical compounds have led to the need for more effective biodegradable natural products. In this context, plants appear to play a much greater role as a new class of eco-friendly products for the controlling of populations of this post-harvest insect pest. Therefore, three plants, *Pimenta dioica* (allspice), *Ruta graveolens* (garden rue) and *Piper betle* (betel) were evaluated with the intention of finding the most effective plant species as a desirable alternative to synthetic insecticides in suppressing *C. maculatus* populations in storage. Potential contact and fumigation repellent properties of leaf powders were assessed using a modified single-choice cup bio assay technique. Twenty laboratory reared one day old adult insects were exposed to 1, 3, 5, 7, and 9 g doses of the three leaf powders separately. All the repelled insects were counted after a three hour exposure period. Observations on both contact and fumigation repellency, for *P. dioica* leaf powder revealed an exceptionally high effect of 99% whereas *P. betle* and *R. graveolens* exhibited only 41% and 42% repellent effects respectively for the highest dose (9 g). When three doses (1, 5, and 9 g) of *P. dioica* leaf powder were tested separately to evaluate its effect on F1 progeny production and duration for adult emergence, the highest dose produced extremely high reduction ( $p < 0.05$ ) in F1 adult emergence ( $6.78 \pm 3.25$ ) compared with that of the control ( $55.60 \pm 8.16$ ). Time duration for adult emergence showed that the two higher doses significantly differed with that of the control ( $21.90 \pm 1.24$  days) indicating significantly high toxic effect of the powder. With the highest dose,  $37.45 \pm 3.02$  days were required for adult emergence, which was indicative of a growth regulatory effect. Following standard procedures, phytochemical constituents of aqueous, methanol, ethyl acetate and n-hexane extracts of *P. dioica* leaf powder were determined and the highest number of constituents (Alkaloids, saponins, flavonoids, tannins, and phenols) was obtained with methanolic extract. It can be suggested that one or many of these constituents may be responsible for its very high repellent, toxic and growth regulatory properties. The overall results of the present study clearly indicate that *P. dioica* leaf powder could be utilized quite successfully to suppress *C. maculatus* populations with the longstanding objective of developing an eco-friendly green pesticide.

**Keywords:** *Callosobruchus maculatus*, *Pimenta dioica*, *Ruta graveolance*, *Piper betle*, Repellency