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Exploitation of Natural Resources for Food Security in Developing Countries

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Abstract

Common Beans (*Phaseolus vulgaris* L., Fabaceae) are among the most important food legumes worldwide, providing one of the primary sources of dietary protein, particularly in developing countries. Stored legumes are endangered by bruchids (Coleoptera) throughout the tropical belt, with the Common Bean Weevil, *Acanthoscelides obtectus* (Say) and the Mexican Bean Weevil, *Zabrotes subfasciatus* (Boheman), being the major storage pests. Post-harvest losses are particularly critical, as all investments for growing the crop have already been made at this stage. An integrated pest management strategy for safe storage could generate a better income for small-scale farmers and reduce human mal- and under-nutrition. While host-plant resistance was found to be a powerful tool against *Z. subfasciatus*, solutions for *A. obtectus* remain to be developed.

Recent studies indicate that the combination of certain bean characteristics and biological control by the parasitic wasp *Dinarmus basalis* Rond. (Pteromalidae) is a promising integrated approach to control *A. obtectus*. By studying the tritrophic system of bean, beetle and parasitoid, we investigate which plant traits are optimal in combination with the parasitoid to suppress beetle damage. The natural storage protein arcelin strongly influences the development of the bruchid *A. obtectus*. Besides the time required for completing the development of *A. obtectus*, the observation of a prolonged emergence period under arcelin regime is also valuable. In regard to biocontrol by its larval parasitoid *D. basalis* both findings implicate that suitable host stages for parasitisation are available over a longer period of time.

Our studies aim to quantify the effect of certain key parameters of dry beans on *A. obtectus* and its natural enemy *D. basalis*, and to find the combination of certain host plant features that yields best results in suppressing beetle damage due to the favourable tritrophic interactions.

Keywords: *Acanthoscelides obtectus*, *Dinarmus basalis*, *Phaseolus vulgaris*, arcelin, tritrophic interactions