

Declaration

This dissertation was supervised by Prof. M.J. Byrne and Prof. E.T.F. Witkowski

I declare that this dissertation, submitted for the degree of Master of Science, at the school of Animal Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, is my own work except where I have explicitly indicated otherwise in the text.

Signature:.....Date:.....

A dissertation submitted to the Faculty of Science, University of the Witwatersrand, in fulfillment of the requirements for the degree of Master of Science.

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Abstract

The release of the seed eating beetle *Sulcobruchus subsuturalis* for biological control of *Caesalpinia decapetala* in South Africa has been ongoing since 2000. This is the first post release evaluation of the efficacy of the agent against the weed. The study assessed the phenology of *C. decapetala* and *S. subsuturalis* at two sites and included determining the establishment of the beetle on the target weed at 25 study sites. In addition, the effects of *S. subsuturalis* on seed densities as well as seed germination and seedling recruitment were examined. Furthermore predation by native ants and attacks by native parasitoids were also examined at two release sites. Mature filled pods were available on the tree from September (spring) to March (summer) when the beetle is expected to be reproductively active. The majority of beetle releases by Working for water took place in summer. However the proportion of beetle infested seeds, which were only recovered inside pods in the tree canopy at study sites, was low (0 to 15.5%). Consequently high seed densities and seedling recruitment were observed in the field. In the laboratory, *S. subsuturalis* did not lay eggs on buried seeds, however seed infestation levels were generally high. Only 8.3% of the seeds containing adults germinated and 6.3% emerged into seedlings. Of the seeds containing larvae, only 14.6% germinated and 2.1% emerged into seedlings. Thus far, *S. subsuturalis* has failed to maintain high populations on the target weed, possibly due to egg predation by native ants (*Crematogaster* species, *Pheidole megacephala*, *Messor natalensis* and *Tetramorium avium*) and attacks by native parasitoids. Egg predation reached 100% within 10 days. Egg parasitism by unknown parasitoids ranged between 80 and 93.1% in Limpopo. The parasitic wasp *Dinarmus altifrons* was recovered once developing inside a *C. decapetala* seed infested with *S. subsuturalis*. Further investigations regarding attacks by indigenous parasitoids on *S. subsuturalis* are required to determine the extent of this problem. Meanwhile releases of *S. subsuturalis* against *C. decapetala* should continue. However release efforts need to be improved by (a) using inundative rather than inoculative releases (b) Releasing every year between September and March (summer) and (c) involving land owners, farmers and nature reserve authorities in release activities. Ultimately an additional agent should be sought for release against *C. decapetala* as the weed may not be the preferred host for *S. subsuturalis*.

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