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Comparison of the Susceptibility of Six Eucalyptus Tree Species to *Leptocybe Invasa*-Fisher & La Salle (Hymenoptera: Eulophidae) Attack in a Forest Nursery in Zomba District

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Research Article

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Abstract

This study was conducted in August 2014 to test the relative susceptibility of six eucalyptus tree species *Eucalyptus camadulensis, E. grandis, E. microcorys*, *E. tereticornis*, *E. maidenii* and *E. saligna* to *Leptocybe invasa*, a recently introduced pest of blue gum trees In Malawi. Based on calculated Average Damage Indices (ADI), significant differences were observed between species (P=0.001) and *Eucalyptus grandis* was the most susceptible (ADI= 2.13) followed by *E. camadulensis* and *E. saligna* (ADI= 1.46 and 1.55 respectively) in that order. *Eucalyptus microcorys, E. teretocornis* and *E. maidenii* were the least susceptible (ADI=0.75, 0.66 and 0.65 respectively). The findings presented an early indication of levels of possible resistance differences among the various eucalyptus species at the early stage of growth.

Keywords: Gall-forming; Dedza Forest Plantation; Polythene tubes; Insecticides

Introduction

Malawi like all other countries in Southern, Central and Eastern Africa grows eucalyptus trees widely in plantations and woodlots to provide wood resources for economic and social benefits. Eucalyptus species are preferred due to their fast growing characteristics as well as their adaptability to a wide range of environmental and site conditions. Unfortunately the region is now infested with a range of invasive insect pests, such as the eucalyptus gall-forming wasp, *Leptocyb invasa* Fisher & LaSalle (Hymenoptera: Eulophidae) [1].

Leptocybe invasa is a native insect species of Australia which has spread to many parts of the world where its host trees are found [1-4]. The first record of *L. invasa* in Southern Africa was in South Africa in 2007 [5]. The pest was first recorded in Malawi in 2013. A typical infestation by *L invasa* causes galls on the midribs and petioles of young leaves and on the tender bark of twigs. Severely infested trees have a gnarled appearance and show stunted growth, lodging, and twig dieback. Heavily infested trees sometimes die prematurely [1,6].

It has been observed that *L invasa* infestation in the field is not uniform among host species. The study was therefore conducted to test the hypothesis that some host species are more susceptible to *L.invasa* than others. Six eucalyptus species were tested.

Materials and Methods

Eucalyptus seeds were collected from Dedza Forest Plantation and seedlings raised in the Forest Research

Institute of Malawi nursery (35° 19' E, 15°26' S). Six species were raised; *Eucalyptus grandis, E. microcorys, E. camadulensis, E. maidenii, E. saligna* and *E. tereticornis*. At the age of one month, the seedlings were transplanted into 10cm x 15cm (lay flat) black polythene tubes that were filled with nursery soil [7]. For each species, seedlings were laid out on a nursery bed in a randomized complete block design with three replications and fifty (50) seedlings per replication. The seedlings were exposed to *L. invasa* infestation by placing heavily infected *E. grandis* seedlings amidst them.

After three months of exposure, each seedling was assessed to record presence of galls on the leaves. The number of galled leaves was recorded as a percentage of the total leaves on the plants. Gall severity was scored for each seedling as follows; 1= No leaves with galls; 2=1 to 25% of leaves with galls; 3= 26-50% of leaves with galls; 4=51-75% of leaves with galls and 5=more than 75% of leaves with galls [3]. An average damage index (ADI) was calculated as the product of the incidence (proportion of plants infested) and mean severity (percentage infestation/100) [8]. Based on the average damage indices, damage severity levels were identified as none for ADI=zero, Low for ADI<1, Medium for ADI=1.1-2.0, Severe for ADI= 2.1-3.0, and very severe for ADI>3 [9]. The ADIs were then analyzed using Analysis of Variance (ANOVA) to determine differences between species.

Results and Discussion

Average damage indices and associated damage severity levels for the six eucalyptus species are presented in Table 1. The results indicate that *L. invasa* caused some level of damage in all the six species suggesting that all of the tested species are susceptible to infestation at least during the early stage of their development. Thu et al. (2009) and Mendel et al. (2004) [9,1] observed that *L invasa* has a wide range of host eucalyptus species. There were significant differences among the six species (P=0.001, F=46.86.09) in terms of damage by the pest, with *Eucalytus grandis* being the most susceptible, followed by *E. camadulensis* and *E. saligna*. *Eucalyptus microcorys, E. teretocornis* and *E. maidenii* were the least susceptible. It is worrying that *E. grandis* which is one of the most dominant species in the region is severely infested by *L invasa* in the nursery.

Species name	Average Damage Index*	Damage Severity Scale
Eucalyptus grandis	2.13 ± 0.01a	Severe
Eucalyptus saligna	1.55 ± 0.23b	Medium
Eucalyputs camadulensis	1.46 ± 0.03b	Medium
Eucalyptus microcorys	0.75 ± 0.03c	Low
Eucalyptus tereticornis	0.66 ± 0.12c	Low
Eucalyptus maidenni	0.65 ± 0.25c	Low

*average damage values that are followed by the same letter are not significantly different at (P=0.05)
Table 1: Eucalyptus species tested in the study showing *Leptocybe invasa* Average Damage Indices.

Exploitation and use of natural resistance is becoming one of the main environmentally acceptable and sustainable solutions to prevent and control insect pest species in forestry, replacing frequent use of insecticides. The current results demonstrate the potential existence of natural resistance in some eucalyptus species which could be further exploited. Studies in Uganda and Kenya [6,10-12] indicate that *L. invasa* infestation on eucalyptus is not only influenced by natural resistance, but several other ecological factors such as age of the trees, altitude, etc. Additional studies are therefore necessary to compliment the current studies.

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