

**Lepidoptera stem borers on cultivated and wild hosts plants:
implications of insect-plant interactions
for pest management**

by

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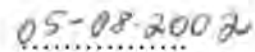
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DECLARATION

"I, Makhosandile Rebe declare that the thesis hereby submitted by me for the degree Doctor of Philosophy (Ph.D.) in Entomology at the University of Pretoria is my own work and has not previously been submitted by me at another university. All the sources used or quoted in this study have been indicated and acknowledged by means of references. I further cede copyright of the thesis in favour of the University of Pretoria"


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ABSTRACT

The aim of this study was to identify a suitable trap crop for stem borers that could be used in a habitat management system in resource-poor maize farming systems. A survey of wild host plants of stem borers was done in the Limpopo and Mpumalanga Provinces. Plant species belonging to Gramineae and Typhaceae were recorded as host plants to one or more species of stem borers. The stem borers found on host plants were *Busseola fusca*, *Chilo partellus* and *Sesamia calamistis*. The three grass species, *Pennisetum purpureum* (Napier grass), *Hyparrhenia tamba* (Blue thatching grass) and *Panicum maximum* (Guinea grass) were selected to study colonization of cultivated crops and the grasses by stem borers. This was done under field conditions from the 1998/1999 to 2000/2001 seasons and the cultivated crops were maize, sorghum, sweet sorghum and pearl millet. Natural infestation by stem borers was allowed to take place. The incidence of whorl damage, dead heart and stem damage observed indicated that all plants were attacked by stem borers. Few larvae were found on the grasses compared to cultivated crops. Since *H. tamba* and *P. purpureum* were preferred for oviposition in the presence of maize and sorghum in laboratory bioassays the absence or low number of larvae was ascribed to poor survival of stem borers on the grasses.

Host plant preference of *C. partellus* first instar larvae for cultivated and wild host plants was evaluated in two-choice and multiple-choice tests in laboratory bioassays. Larval response to leaf discs of each host plant was also determined under no-choice conditions. Results showed that the grasses were less preferred by neonate larvae compared to cultivated crops. This behavioural response could be exploited in a habitat management system since larvae would die without establishing on plants.

Sweet sorghum land races were evaluated in the greenhouse for resistance to stem borers. The plants were artificially infested with first instar larvae of *C. partellus* and *B. fusca*. Pateletso possessed low levels of larval antixenosis and antibiosis for *B. fusca* and *C. partellus*. Multiple-choice tests were conducted to determine oviposition preference for the landraces Mariri, Maatla, Motale, Pateletso, SA4481, and SA4479. The greatest number of eggs were laid on SA4481.

Two-choice experiments were conducted in the laboratory to determine ovipositional preference of *B. fusca* and *C. partellus* for maize and sweet sorghums. Results indicated that sweet sorghum plants compared to maize were not attractive enough for oviposition by both *B. fusca* and *C. partellus* moths to warrant their use as trap crops around maize fields.

The role of forage sorghum and *P. purpureum* in the control of stem borers was evaluated in field trials with maize. While forage sorghum failed to reduce stem borer infestation in maize fields, infestation of the maize monocrop was higher than on maize crop surrounded by Napier grass. It was concluded that Napier grass holds promise as a trap crop for stem borers in maize farming systems.

UITTREKSEL

Die doel van hierdie studie was om 'n geskikte vanggewas vir stamruspers te identifiseer vir gebruik in 'n habitatbestuurstelsel in hulpbron-arm boerderystelsels. 'n Opname is gemaak van die wilde gasheerplante van stamruspers in die Limpopo en Mpumalanga Provinsies. Plant spesies in die Gramineae en Typhaceae families is aangeteken as gasheerplante van een of meer stamrusperspesies. Die stamrusperspesies was *Busseola fusca*, *Chilo partellus* en *Sesamia calamistis*. Drie grasspesies, *Pennisetum purpureum* (Napiergras), *Hyparrhenia tamba* (Bloutamboekiegras) en *Panicum maximum* (Gewone buffelsgras) is gekies vir die bestudering van stamrusperkolonisasie van verboude graangewasse en grasse. Hierdie studie is gedoen onder natuurlike insekinfestasies en veldtoestande vanaf die 1998/1999 tot die 2000/2001 seisoen. Die verboude gewasse was mielies, sorghum soetsorghum en pèrlmanna. Die voorkoms van kelkskadesimptome, dooiehartsimptome en stamskade het aangetoon dat al hierdie plantspesies deur stamruspers aangeval word. Minder stamrusperlarwes is vanaf grasse as vanaf gewasse herwin. Aangesien *H. tamba* en *P. purpureum* wel bo mielies en sorghum vir eierlegging verkies is, is die afwesigheid of lae aantal oorlewende larwes toegeskryf aan swak oorlewing op grasse. Die gasheerplantvoorkeur van eerste-instar *C. partellus* larwes vir verboude en wilde gasheerplante is in twee- en veelkeusetoetse in die laboratorium bepaal. Larwale reaksie ten opsigte van blaarskywe van elke gasheerplant is ook bepaal onder geen-keuse eksperimente. Resultate het aangetoon dat larwes die verboude gewasse bo grasse verkies. Hierdie gedragsreaksie kan uitgebuit word in 'n habitatbestuurstelsel aangesien larwes op grasse doodgaan en nie suksesvol vestig nie. Die stamrusperweerstandsvlakke van soetsorghums is in glashuiseksperimente bepaal. Plante is kunsmatig besmet met eerste-instar *C. partellus* en *B. fusca* larwes. Die sorghum landras, Pateletso, het lae vlakke van antixenose en antibiose vir *B. fusca* en *C. partellus* gehad. Veelkeusetoetse is uitgevoer om eierleggingsvoorkeure vir die sorghumlandrasse Mariri, Maatla, Motale, Pateletso, SA4481 en SA4479 te bepaal. Die grootste aantal eiers is gelê op SA4481. Twee-keuse eksperimente is gedoen om eierleggingsvoorkeure van *B. fusca* en *C. partellus* vir mielies en soetsorghums te bepaal. Resultate het aangedui dat soetsorghums, in vergelyking met mielies, minder aantreklik was vir eierlegging van beide *B. fusca* en *C. partellus* motte en dat die aantreklikheid daarvan nie die gebruik

daarvan as vaggewas regverdig nie. Die rol van voersorghum en *P. purpureum* in die beheer van stamruspers is bestudeer in veldproewe met mielies. Voersorghum as vaggewas het nie die stamrusperbesmetting in mielies verlaag nie. Stamrusperbesmetting was hoër in die kontrole persele as in mielies wat deur Napiergras as vaggewas omring was. Die gevolgtrekking was dat Napiergras potensiaal het as vaggewas vir stamruspers in mielieproduksiestelsels.

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