A survey of sorghum panicle-feeding Hemiptera in South Africa

M Kruger[1]*, J van den Berg[1] and **H Du Plessis[2]**

1. North-West University, Potchefstroom Campus, Potchefstroom 2520, South Africa
2. ARC-Grain Crops Institute, Private Bag X1251, Potchefstroom 2520, South Africa

*Corresponding author: marlene.kruger@nwu.ac.za

Introduction

Very little attention has been paid to panicle feeding insects of sorghum (*Sorghum bicolor*) in South Africa. The panicle-feeding bug complex is important on sorghum in Central and West Africa. It is not known if there are any similarities in species complex or damage caused by these pests between the two regions. A study was therefore conducted to investigate the diversity of the panicle feeding Hemiptera complex in South Africa and to address the shortage of information on these insects and their interactions with sorghum. The objectives of this study were to determine the abundance and diversity of sorghum panicle-feeding Hemiptera that occur in South Africa and to determine the temporal distribution of different Hemiptera species on panicles and to assess resistance levels of sorghum varieties to head bug damage.

Materials and methods

Field surveys were conducted between November 2004 and June 2006 at 26 sites in four provinces in South Africa. Two methods of collection were used. Whole panicles were sampled by closing them with plastic bags and removing them from the field, while a D-Vac was used to sample large numbers of panicles in fields without removing panicles. An experiment to compare the efficacy of the two collection methods showed that there were no significant differences between the head bug numbers collected using the two different methods. These two sampling methods can therefore be considered to be equally efficient for collection of panicle-feeding Hemiptera on sorghum. Sorghum seeds of different varieties were investigated for head bug feeding damage symptoms and damage quantified as feeding lesions/seed or percentage seeds with rotten germ. Due to the lack of Hemiptera identification expertise in South Africa, many species could only be identified to family level.

Results and discussion

The total number of adults and nymphs collected during this study was 23798 (14590 adults and 9208 nymphs). Forty-three species of herbivorous Hemiptera were collected. This diversity is surprisingly high compared to the 57 species of panicle-feeding Hemiptera which Harris (1995) reported to occur in the world and the 42 species reported on sorghum in Africa. In this study the majority of species did however occur at very low infestation levels (<8 individuals/100 panicles) and therefore cannot be considered as pests of sorghum in South Africa. However, many of these species reach pest status on sorghum in West Africa, North and South America, and India. In only a few instances the infestation level of some species was 12–30 individuals/100 panicles. Six species occurred in high numbers that could be considered as possible pest outbreaks. These were *Nezara viridula* Linnaeus, two *Eurystylus* spp, *Campylomma* sp, one *Mirid* sp and *Nysius natalensis* Evans. The *Eurystylus* complex that was collected during this study consisted of five different species of which the most abundant occurred at mean infestation levels of 67.9/100 panicles. Some of the *Eurystylus* species have the possibility to become pests of sorghum in South Africa. The head bug complex on sorghum in Africa is dominated by the genus *Eurystylus*, of which several species have been reported (Ratnadass et al. 1994). *Eurystylus oldi* Odiambo is the most abundant and injurious among *Eurystylus* species (Ratnadass et al. 1994). Studies in West Africa showed that *E. oldi* can occur at damaging levels of 3–11/panicle during the milk stage and 9–100/panicle during the dough stage (Ajayi et al. 2001). In India and West Africa *Eurystylus* spp, *Calidea dregii* Germar, *Campylomma* sp, *Creontiades pallidus* Rambar and *N. viridula* are major hemipteran pests of sorghum (Harris 1995).

Sorghum panicles are infested by a wide range of insect pests from flowering stage to grain maturity. However, only a few species have been reported to cause severe damage. Studies on the population dynamics of head bugs in the sorghum production areas showed no clear distinctions between species and the plant growth stage during which panicles were infested. The general tendency was that nearly all species were present during the period from the flowering stage onwards and that numbers declined when grain became hard. However, *N. viridula* seemed to infest panicles at slightly later stages and it was never recorded before the soft dough stage. *Campylomma* sp

and *C. pallidus* numbers usually peaked during the flowering stage, and *Eurystylus* spp and *N. natalensis* during the milk stage. Numbers of *Campylomma* sp, *C. pallidus*, *Eurystylus* spp, *N. viridula* and *N. natalensis* peaked during the soft dough stage. According to the literature *Campylomma* spp are associated with panicles during the first week after panicle emergence (Nwanze 1985), while *N. viridula* feeds on sorghum from the soft dough stage until maturity (Meksongsee and Chawanapong 1985).

The relationship between the incidence of Hemiptera infestation and sorghum yield or quality has not yet been established in South Africa. This study indicated that Hemiptera feeding damage resulted in an increase in incidence of seeds with rotten germ, therefore contributing significantly to reduction in grain quality. This aspect of Hemiptera damage is not accounted for in the visual grain mold damage rating system that is commonly used to do field ratings of mold infections. The presence of rotten germ cannot be detected unless grain has been threshed. This part of the seed is covered by the glume and this parameter is therefore not accounted for during visual ratings in the field. The feeding lesions and the oviposition punctures that are sometimes observed on developing grains, can lead to secondary fungal infection of the seed that in turn could lead to higher percentage of rotten germ. The levels of resistance to head bug damage, based on the incidence of feeding lesions on kernels, was observed to differ significantly between varieties.

Future studies should be aimed at establishing the relationships between head bugs and their early-season and winter host plants, since this could lead to development of habitat management systems for these insects. The relationship between different Hemiptera and fungal species should also be elucidated in future research to assess the importance of direct damage caused by the head bug complex, as well as its role in grain mold infection of sorghum in South Africa.

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