High-yielding weevil-tolerant maize is attainable for subsistence farmers in East Timor

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Abstract

The Seeds of Life program's evaluation of maize populations in East Timor now measures weevil tolerance in addition to yield. Eighteen introduced and three local maize populations were evaluated at four diverse locations during the 2004-2005 cropping season. After nine months of storage under local conditions, whole cobs were evaluated for sheath tightness and weevil damage. This first year's result shows that there are high-yielding populations which have weevil tolerance equivalent to that of the lower-yielding local populations.

Key Words

maize, weevil tolerance, East Timor, subsistence farming.

Introduction

Maize is the staple food crop of many East Timorese subsistence farmers. Current maize yields are low (1.5 t/ha) and could be increased by the use of improved maize varieties (Piggin *et al.* 2004). Although farmers know of higher-yielding maize varieties, they are reluctant to use these varieties due to the weevil susceptibility of currently available modern populations (Oxfam 2006). Seeds of Life has begun regular evaluation of weevil tolerance of approximately 20 introduced populations across four diverse locations. This paper shows the results of the first year of testing, for the 2004-2005 cropping season.

Methods

Weevil damage and sheath tightness of 21 maize populations were measured 9 months after the 2004-2005 season's harvest. These included 3 local populations, and 18 introduced populations sourced by Seeds of Life from Indonesia, CIMMYT (India) and CIMMYT (Zimbabwe).

The populations were grown in four diverse locations, in a randomised complete block field design, with three replicates, and 5m by 5m plots. At harvest, yield was estimated from the centre four rows of the plot. 20 cobs were taken from the outer 2 rows of each plot, and stored for 9 months as whole cobs in the sheath in open polybags, in a rat-proof environment.

After 9 months, cobs were separated into loose and tight sheaths at the end of the cobs. Cobs were then opened and scored for the percentage of grains with evident weevil damage. Data was analysed as a multilocation trial, using the REML subroutine in Minitab.

Results and discussion

REML analysis demonstrated a large and significant (P<0.05???)effect of population and test location on the level of weevil damage and on the percentage of cobs with tight sheaths. Surprisingly, there was no significant interaction between population and test location for these two characteristics. Although maize populations from India had a higher yield advantage than those sourced elsewhere, they also suffered the greatest weevil damage. Maize populations from Zimbabwe were generally more tolerant than the populations sourced from elsewhere, and had a superior yield to the local populations. Local maize populations had a higher percentage of tight sheaths than all other populations (Table 1).

Table 1. Average weevil damage, yield advantage and percentage of cobs with tight sheaths of 21 maize populations from four countries, tested in four locations in East Timor in 2004-2005.

Source of maize populations	Number of populations	Grains damaged by weevils (%)	Yield advantage over local populations (%)	Cobs with tight sheaths (%)
Timor (Local)	3	18	0	68
Indonesia	2	23	-7	55
Zimbabwe	9	23	9	51
India	7	32	27	45

Although there was a weak positive correlation between weevil damage and yield (Figure 1), there was a large range of weevil damage levels among the high-yielding populations (those yielding at least 50% above the local checks). One population from Zimbabwe had a high yield (over 50% above the local populations), and weevil damage at a similar level to the local populations.

Weevil tolerance was associated with tight sheaths on the cobs nine months after harvest (r^2=0.66). All three local populations had more than 60% tight sheaths, a higher percentage (significantly??) than all introduced populations (Figure 2). Many of the populations from Zimbabwe had a lower percentage of tight sheaths than the local populations, but had a similar level of weevil damage.

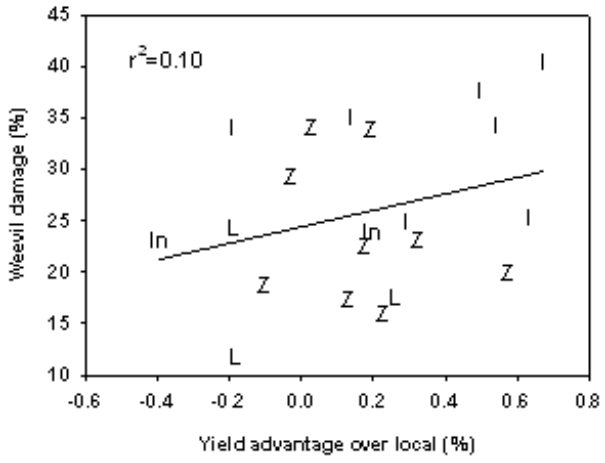

Figure 1. Weevil damage of grain on 21 maize populations versus yield advantage over the local maize populations. Data is average for maize grown and stored at 4 locations in East Timor 2004/05. (Letter indicates source of introduction: I India, In Indonesia, L Local, Z Zimbabwe)

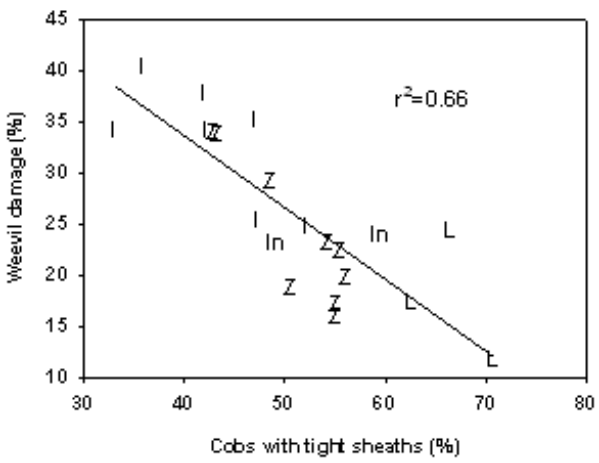

Figure 2. Weevil damage of grain on 21 maize populations versus percentage of cobs with tight sheaths. Data is average for maize grown and stored at 4 locations in East Timor 2004/2005. (Letter indicates source of introduction: I India, In Indonesia, L Local, Z Zimbabwe)

Conclusion

Maize populations from three countries have been tested for yield and weevil tolerance in trials at four locations in East Timor. Although many of the populations have a higher yield than the local populations, only a few have the same level of weevil tolerance of the local populations. However, there is a good potential that populations can be found that combine both a 50% yield increase with no increase in weevil susceptibility, especially populations from CIMMYT Zimbabwe.

References

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