Striga the bewitching weed: interdisciplinary context of control

Sarah Hearne, Fen Beed, Abebe Menkir, Baffour Badu-Apraku, Sato Muranaka, Ousmane Boukar, Christian Fatokun, Alpha Kamara
Context of Africa

Food prices set to stay high, says UN food agency

East Africa faces 'world's worst food security crisis'

The world's worst food security crisis is continuing in the eastern Horn of Africa, a US agency has warned.

The Famine Early Warning Systems Network (Fewsnet) said areas of particular concern were in Ethiopia, Kenya and Somalia.

It said large scale emergency assistance was urgently needed "to save lives and treat acute malnutrition" in the region.

Rising food prices increase squeeze on poor - Oxfam

Rising food prices are tightening the squeeze on populations already struggling to buy adequate food, demanding radical reform of the global food system, Oxfam has warned.

By 2030, the average cost of key crops could increase by between 120% and 180%, the charity forecasts.

It is the acceleration of a trend which has already seen food prices double in the last 20 years.
Utilization
- Effectiveness of control
- Ease of control
- Education & awareness
- Safety

Access
- Affordability
- Availability of credit
- Preference
- Education

Availability
- Production
- Distribution
- Exchange
- Profitability
- Labour

Women and children are here, where are the men? ..., the task is too difficult for them
Control options

**Developed and deployed (in some places)**
- Resistant/tolerant varieties of maize and cowpea
- Herbicide based control- IR maize
- Agronomic practices
  - Weeding
  - Intercropping for *S. hermonthica Desmodium* (push-pull)
  - Catch crops for *S. hermonthica asiatica* soybean, cowpea.
  - Fertilization; N form and rate
  - Soil “health”
- Some integrated packages- N and resistant varieties

**In Development**
- Resistant/tolerant varieties
- *Fusarium oxysporum* bio control
<table>
<thead>
<tr>
<th>Variety</th>
<th>Infested Gr. (kg/ha)</th>
<th>Un-infested Gr. (kg/ha)</th>
<th>Striga (No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TZL COMP1 SYNW-1 F2</td>
<td>3204</td>
<td>3545</td>
<td>40</td>
</tr>
<tr>
<td>Acr.97 TZL Comp.1-W</td>
<td>3061</td>
<td>4173</td>
<td>98</td>
</tr>
<tr>
<td>ZEA DIPLO BC4 W C3 F2</td>
<td>2673</td>
<td>3329</td>
<td>80</td>
</tr>
<tr>
<td>TZL COMP1 SYNY-1 F2</td>
<td>2667</td>
<td>3677</td>
<td>85</td>
</tr>
<tr>
<td>IWD C2 SYN F2</td>
<td>2546</td>
<td>4204</td>
<td>219</td>
</tr>
<tr>
<td>EV IWD STR C0</td>
<td>1983</td>
<td>4401</td>
<td>236</td>
</tr>
<tr>
<td>9022-13 (Tolerant)</td>
<td>2304</td>
<td>4309</td>
<td>208</td>
</tr>
<tr>
<td>TZB-SR (Common)</td>
<td>1569</td>
<td>3481</td>
<td>250</td>
</tr>
<tr>
<td>8338-1 (Susceptible)</td>
<td>698</td>
<td>3344</td>
<td>288</td>
</tr>
<tr>
<td>Mean</td>
<td>2324</td>
<td>3709</td>
<td>147</td>
</tr>
<tr>
<td>SE</td>
<td>178</td>
<td>206</td>
<td>30</td>
</tr>
</tbody>
</table>

**Germplasm**

International Institute of Tropical Agriculture – Institut international d’agriculture tropicale – www.iita.org
Herbicides
IR maize
Agronomy

Weeding- when used with burning effective for seed bank reduction (long term- and as long as your neighbour is doing the same)

*Desmodium* (icipe push-pull), effective control in E Africa, farmers with stocked systems like it

Catch crops in maize systems; soybean and cowpea. Dual benefits of lowering the density of the soil seed bank and improving soil fertility

Fertilization; base level soil fertility and N form and rate has strong influence on Striga and host response to Striga

Soil “health”; suppressive soils (many factors; fertility, mychorrhiza, Fusarium etc.)
Biocontrol

*Fusarium oxysporum f.sp. Strigae*:

- Host specific, environmentally friendly, cheap
- Controls all development stages of *Striga hermonthica*
- Production, storage and field applications optimised
- Suitability across AEZs of Kenya and Nigeria required
Biocontrol

Venne et al 2009 Pest Mgmt Sci

International Institute of Tropical Agriculture – Institut international d’agriculture tropicale – www.iita.org
Maximize impact: integrate

Innovation platform sites

Germplasm
Bio-control
IR maize
Agronomy

Sensitization
Training
Best bets
-Agroecology
-Soc econ
Long term impacts

Improved food security and poverty alleviation

Higher, more stable yields
Development... and things to keep your eye on

Resistance and tolerance found in some African maize landraces, some temperate lines and in maize wild relatives: teosinte (*Zea diploperennis*) and *Tripsacum*

- Lines developed from west African landraces
- Lines developed from *Zea diploperennis*

Eighty newly collected accessions of teosinte started to be evaluated

Characterized materials to make their way to Loren to shoot them with his laser

Menkir *et al* Crop Sci 46, 2006
Amusan *et al* New Phyt 178, 2008
If you have 20 regions under selection, freq of optimum genotype goes from 1 per trillion in cycle 0 to 1 in 5 in cycle 3.
Development…and things to keep your eye on

Striga diversity and implications for control technology effectiveness and longevity

- *S. gesnerioides*- defined races
- *S. hermonthica* outbreeding, highly heterozygous, within population diversity accounts for over 95% of variation

- New markers- SNP
- Genotyping by sequencing- enabling population level analysis
- Sample from plants AND from soil-Nigeria, Kenya, DRC
To conclude…

Outlook is bright

- Donors re-engaged with *Striga*
- Effective control technologies available
- More technologies coming down the line

- Integration of technologies now being implemented with vigor—no more silver bullet thinking