Breeding for rust resistance in Kenya: Successes, setbacks and future approaches

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Ug99 a challenging race to beat

- Mutating and migrating (2012: 8 races identified in group, present in 11 countries)
- Race TTKSK (original “Ug99” [red]) only predominates in Ethiopia
- Other Ug99 race group races predominate e.g., Sr24 variants in Kenya
The critical screening facility in Njoro

1. 12 Hectares of land available for screening
2. Irrigation facility
3. Greenhouse underway
4. Trained personnel
5. Room for expansion available

- Over 300,000 accessions have been evaluated so far
- Ability to evaluate 50,000 accessions every year
- Winter wheat are vernalized and screened in the field
Breeding for Resistance

New mutants of the Ug99 race easily overcome the deployed genes as was experienced in 2007.

National Breeding Programme plays an important role in incorporating the resistant gene in the commercial varieties.
Mexico (Cd. Obregon-Toluca/El Batan)- Kenya International Shuttle Breeding: a five-year breeding cycle

- Cd. Obregón 39 masl
  - High yield (irrigated), Water-use efficiency, Heat tolerance, Leaf rust, stem rust (not Ug99)

- Toluca 2640 masl
  - Yellow rust
  - Septoria tritici
  - Fusarium
  - Zero tillage

- El Batán 2249 masl
  - Leaf rust, Fusarium

- Njoro, Kenya 2185 masl
  - Stem rust (Ug99 group)
  - Yellow rust

- F1 and F1top/backcross developed at CIMMYT, and advanced to F2.
- F3 and F4/F5 evaluated in Njoro.
- Advanced F6 and initial observation in Mexico
- Observation and selection in Njoro where lines with suitable adaptation are retained
# Varieties developed

<table>
<thead>
<tr>
<th>Commercial Name</th>
<th>Pedigree</th>
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<tbody>
<tr>
<td>Kenya Wren</td>
<td>THELIN # 2/TUKURU</td>
</tr>
<tr>
<td>Robin</td>
<td>BABAX/LR42//BABAX*2/3/TUKURU</td>
</tr>
<tr>
<td>Kenya Tai</td>
<td>ND643/2*WBLL1</td>
</tr>
<tr>
<td>Kenya Sunbird</td>
<td>ND643/2*WBLL1</td>
</tr>
<tr>
<td>Eagle10</td>
<td>EMB 16/CBRD//CBRD</td>
</tr>
<tr>
<td>Kenya Kingbird</td>
<td>TAM200/TUI/6/PVN//CAR422/ANA/5/BOW/CROW//BUC/PVN/3/YR/4/TRAP#1</td>
</tr>
<tr>
<td>Kenya Hawk12</td>
<td>URES/JUN//KAUZ/3/BABAX/4/TILHI</td>
</tr>
</tbody>
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The Seed System and seed production
Our focus

• In future, breeding for rust resistance will focus on combining both major and minor genes for maximum protection and durability.

• The use of molecular markers to increase efficiency will aid selection of complex resistances.

• KARI is collaborating with CIMMYT and National Institute of Agricultural Botany (NIAB) in a BBSRC funded project to improve molecular laboratory facilities in Kenya so as to implement marker assisted breeding strategies.
Training and capacity building

Training and capacity building activities.
This work is funded by the BMGF through Cornell University under the DRRW project.

- Training
- Breeding/seLECTION
- Breeder seed and certified seed production and distribution
- Screening of regional advanced wheat lines