INTEGRATING DISEASE AND PEST CONTROL WITH QUALITY TO SUSTAIN ROBUSTA COFFEE PRODUCTION IN UGANDA

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Main Collaborating Institutes
1. UCDA
2. IITA
3. CABI
4. CIRAD
INTRODUCTION

Types of coffees commercialized in Uganda

Robusta coffee (80%), mainly in central, eastern and western Uganda at altitudes 1200-1500 masl

At harvest: only ripened berries must be picked

Arabica coffee (20%) mainly in eastern, northern and western Uganda, 1500-2000 masl
MAJOR COFFEE KILLER CONSTRAINTS

- Coffee wilt disease (CWD)
- Lack of sufficient CWD resistant planting materials
- Black coffee twig borer (BCTB)
- Coffee leaf rust (CLR) – on Arabica coffee
- Water stress (effects of climate change)
- Declining soil fertility
THREE MAJOR BIOTIC KILLER CONSTRAINTS

- **Coffee wilt disease; Robusta**
  - Symptoms: Whole plants dry
  - Can lose a whole field

- **Black coffee twig borer**
  - Twigs killed and dry
  - Mistaken to be CWD
  - Spreads very fast

- **Coffee leaf rust**
  - Plants lose leaves
  - Harvested berries empty shells
Screening Robusta coffee germplasm for resistance against CWD through screen house assessment after artificial inoculation of tens of thousands seedlings using root dip method and later field evaluations (also CLR and Red blister disease)
Seven best lines were released by the national variety release committee as new varieties

<table>
<thead>
<tr>
<th>Source</th>
<th>Variety</th>
<th>Body</th>
<th>Flavour</th>
<th>100 bean weight (gm)</th>
<th>% Retained by 16/64</th>
<th>CWD-R</th>
<th>Resistance to CLR</th>
<th>Resistance to Red blister</th>
<th>Yield (kg/cc/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identified through artificial inoculation</td>
<td>E.u 20</td>
<td>Fair</td>
<td>Fair-</td>
<td>17.6</td>
<td>83.1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1125*</td>
</tr>
<tr>
<td></td>
<td>E. U 14</td>
<td>Fair</td>
<td>Fair+</td>
<td>19.1</td>
<td>87.3</td>
<td>1</td>
<td>1.5</td>
<td>1</td>
<td>1825*</td>
</tr>
<tr>
<td></td>
<td>2/22/12</td>
<td>Fair+</td>
<td>Fair+</td>
<td>19.2</td>
<td>95.8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2300*</td>
</tr>
<tr>
<td></td>
<td>J1/14/21/1</td>
<td>Fair</td>
<td>Fair+</td>
<td>21.1</td>
<td>95.4</td>
<td>1</td>
<td>1.6</td>
<td>1</td>
<td>2100*</td>
</tr>
<tr>
<td>Identified thru infected fields</td>
<td>J/1/1</td>
<td>Fair+</td>
<td>Fair++</td>
<td>-</td>
<td>92.4</td>
<td>1</td>
<td>1.5</td>
<td>1</td>
<td>2940+</td>
</tr>
<tr>
<td></td>
<td>Q/3/4</td>
<td>Fair+</td>
<td>Fair+</td>
<td>-</td>
<td>87.3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2490+</td>
</tr>
<tr>
<td></td>
<td>R/1/4</td>
<td>Fair+</td>
<td>Fair+</td>
<td>21.4</td>
<td>79.7</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2210+</td>
</tr>
<tr>
<td>Checks</td>
<td>1s/3</td>
<td>Fair+</td>
<td>Fair+</td>
<td>20.5</td>
<td>80</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2130+</td>
</tr>
<tr>
<td></td>
<td>1s/6</td>
<td>Fair+</td>
<td>Fair+</td>
<td>23.0</td>
<td>80</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2240+</td>
</tr>
</tbody>
</table>
Released varieties

R/1/4 = Kituza R1
Q/3/4 = Kituza R2
J/1/1 = Kituza R3
E. U 14 = Kituza R4
E.u 20 = Kituza R5
2/22/12 = Kituza R6
J1/14/21/1 = Kituza R7

Variety Kituza R7 (J1/14/21/1)
Enhanced multiplication of CWD-R varieties at Kituza (conventional and Kawanda (TC))

Conventional mother garden of the CWD resistant varieties intercropped with bananas at COREC.

One of the coffee wilt disease resistant variety in the field at COREC

Progress of tissue culture

Leaf explants → Explants on Petri-dish → Plantlets in bioreactors
Black Coffee Twig Borer a new threat

- Female beetle bores into the twigs/primary branches and causes them to wilt and eventually die in a few weeks.

- Female cultivates an ambrosia (*Fusarium solani*) fungal in the infested coffee galleries for feeding its larvae.
FIELDS DAMAGED BY THE BCTB

Dry twigs seen interspersed among green twigs. Eventually all twigs are destroyed by the pest leaving a dead plant.
Efficacy tests on selected insecticides for control of BCTB in the coffee nursery

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Total cumulative infested seedlings</th>
<th>% reduction in cumulative no. of infested seedlings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (None)</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>Dursban (Chlorpyrifos)</td>
<td>29</td>
<td>0</td>
</tr>
<tr>
<td>IMAX (Imidacloprid )</td>
<td>21</td>
<td>22.2</td>
</tr>
<tr>
<td>Malathion</td>
<td>23</td>
<td>14.8</td>
</tr>
<tr>
<td>Rogor (Dimethoate)</td>
<td>29</td>
<td>0</td>
</tr>
<tr>
<td>Thionex (Endosulfan)</td>
<td>21</td>
<td>22.2</td>
</tr>
</tbody>
</table>
WHAT IS BEING DONE ON BCTB

• Community-based participatory approaches using phytosanitary methods are being implemented
• Maintain good tree vigor and health through enhanced plant nutrition and water management (e’g, in Hawaii)
• Removal infested branches and application of fertilizers (Hawai)
• IMAX (Imidacloprid ), Thionex (Endosulfan) seem effective. Orius (Tebucozanole) caused 100% inhibition of ambrosia fungi (which is feed for larvae)
• A nation-wide BCTB has been completed in the country.
• Evaluating alcohol-based lure traps for adult BCTB
• Bio-control agents: Eulophid wasps (\textit{Tetrastichus} sp), braconid wasps and \textit{Beauveria bassiana}, being investigated
Quality mapping and profiling of Uganda coffees for “FINE ROBUSTAS AND ARABICAS” (by COREC and IITA)

- 350 farms (samples collected)
- Study being done with IITA
- Yield and plant performance
- Management
- Pests and diseases at flowering and berry stage

- Quality
  - weight of 100 cherries
  - % floaters (Arabica)
  - cupping
  - chemical analysis
SOME OF UGANDA COFFEE CROPPING SYSTEMS
Banana + coffee = more revenue

USAID/LEAD-funded IITA-executed project, supported by COREC-NACCRI, Kyagalanyi, NUCAFE, NKG Alliance, the local MAAIF extension service, aBi-Trust, Africa Coffee Academy, UCDA, and others
Preliminary coffee quality results

- Weight of 100 cherries higher in north-west Uganda
- Percentage floaters higher in south-west Uganda
CURRENT RESEARCH CHALLENGES

• To produce over 4.0 million bags (or more), Uganda needs to replant with 200 million seedlings.
• Meeting the current demand for planting materials
• Lack of clear policy on exchange of planting materials
• Current weather fluctuations (climate change)
• Black coffee twig borer is highly damaging/threat
• Declining soil fertility (low use of fertilizers)
• Limited extension services on coffee
• Emerging research needs such as pests, diseases
• Declining area for traditional coffee production
• Competition with other enterprises/crops
• Limited human and infrastructural research capacity
• Lack of an irrigation system to enhance conventional multiplication of new varieties during dry season
Acknowledgement

- All scientist involved
  - COREC
  - IITA
  - UCDA
  - CIRAD
  - CABI
- Uganda Government
- Farmers’ support
- All Development partners
THANK YOU