Climate change and orphan crops in West Africa

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IITA is part of CGIAR
CGIAR is a global partnership that unites organizations engaged in research for a food secure future.

Vision:
To reduce poverty and hunger, improve human health and nutrition, and enhance ecosystem resilience through high-quality international agricultural research, partnership and leadership

What we do
We work with partners in Africa and beyond to reduce producer and consumer risks, enhance crop quality and productivity, and generate wealth from agriculture.

Where we are

Soil degradation

More than 40% of West Africa soils are under moderate to very high degradation
Farming systems

Population density

• Population pressure affects the labor intensity of agriculture by affecting the land/labor ratio
• Influences innovations in technology
• Markets & institutions /investments in agric
• Population density is high in the coastal belt of WA
• Medium are scattered all over
• Low density are more in the northern belt of the WA region

Children Malnutrition

Climate change

• Conservation and use of genetic resources
• Breeding
• Improved agricultural practices
• Integrated pest management

Over 32,800 Accessions of African major food crops

- Cowpea (Vigna unguiculata L.)
- Soybean (Glycine max L. Merr)
- Cassava (Manihot esculenta Crantz)
- Yam (Dioscorea spp.)
- Bambara groundnut (Vigna subterranea L. Verdc)
- Maize (Zea Mays L.)
- Miscellaneous legumes
- Wild Vigna (Vigna species L.)
- Beans (Phaseolus spp.)
- African yam bean [Sphenostylis stenocarpa (Hochst. Harms)]
Bambara groundnut

- Indigenous African legume
- Widely grown in semi arid areas of sub-Saharan Africa
- Drought tolerant
- Performs well on poor soils
- 1973 accessions—many countries of SSA
- Constraints: processing characteristics, markets

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Characterisation of 300 Bambara groundnut accessions

1973 accessions in the IITA genebank
300 selected for analysis

<table>
<thead>
<tr>
<th>S/N</th>
<th>Seed colour</th>
<th>Plant height (cm)</th>
<th>No of leaves</th>
<th>Flower pigmented</th>
<th>No of pods/ plant</th>
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<td>1</td>
<td>TVSU – 514 (Brown)</td>
<td>19</td>
<td>96</td>
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<td>TVSU – 516 (Black)</td>
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Preliminary studies on variation in nutrient content in Bambara Groundnut

John Atoyebi

Analysis of 20 accessions of Bambara groundnut
Variation in:
Iron (180-39ppm)
Zinc (7-12.3ppm)
On going studies of other nutritional and anti-nutritional and processing characteristics
Links to value chain

Collaboration with Crops for the Future Research Centre (CFFRC)

• DArT markers
• Association mapping
• Drought tolerance
• Sequencing and resequencing: African Orphan Crops Consortium

Winged bean

• The genus contains nine species, eight of which are wild, *P. tetragonolobus* is the cultivated type
• Not native or widely grown in Africa but performs well in other tropical regions
• High nutritional potential: seed and tubers
• Constraints: awareness, adapted varieties processing, value chain

Genetic diversity of Winged bean

• 8% of the 38 accessions conserved are tuber forming types while 29% nodulates.
• Numbers of pods per peduncle ranged from 1 in TPt-1 and 4 pods in TPt-7.
• The mean pod length ranged from 6cm in TPt-7 to 23cm in TPt-125
• Number of seed per pod ranged from 6 seeds in TPt-7 to 14 seeds in TPt-153.
• The highest protein content (39.8%) was recorded from TPt-2A while the least (28.7%) was from TPt-21
Winged bean expresses a wide range of inter and intra accessional variability in pod length, seed types, seed sizes and seed coat colors, pod and number of seeds per pod, tuber sizes and density of underground nodular carpet formation.

Ongoing studies on winged bean

- Genetic and phenotypic diversity - 47 accessions
- Nutritional content of seeds and tubers
- N fixation

African yam bean

Attributes of African Yam Bean

- Crude protein content in the seeds and tubers up to 29% and 19% respectively
- Methionine and lysine present in seeds
- Rich in potassium, iron and zinc but low in sodium and copper
- High nitrogen fixing ability
- Hard seed coat
- Seeds contain secondary metabolites, such as tannins, trypsin, hydrogen cyanide, saponins and phytic acid
- Long cycle of maturity.
Ongoing work on African yam bean

- Genetic and phenotypic diversity of 160 accessions (SSR markers from cowpea, AFLP)
- Evaluation in multi-locational trials
- Regeneration and indexing
- High level of distribution within SSA

Conclusions

- Use varies but is not well known
- Potential but limitations e.g. processing, products, value chain
- Germplasm and adapted varieties part of the answer
- Important to give farmers options in the face of climate change