

Identification of Aphid and cowpea aphid borne mosaic virus disease resistance sources for introgression into farmer preferred cowpea varieties in Malawi

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BACKGROUND

- No active cowpea breeding program in Malawi
- Varieties sourced from IITA and released in Malawi (currently 4 released varieties)
- Introduced varieties deficient in a number of areas
- Low productivity
 - Susceptible to a spectrum of pests and diseases (aphids, thrips, Maruca, viral, bacterial and fungal diseases)
- Farmers unable to pick them up (10% adoption levels for improved varieties)
- These varieties have not been a solution to the various challenges farmers encounter
- Our current breeding work is initially looking at grain yield, quality traits (seed size, cooking time, nutritional quality), early maturity and drought tolerance
- There is realisation that pests and diseases should be a major component of our breeding work-KT

Why APHIDS AND Cowpea Aphid-Borne Mosaic Virus (CABMV)

- Aphids' infestation reportedly cause up to 20% to 40% yield losses
- CABMV infections cause 15% to 87% cowpea yield losses (Bashir, Ahmad & Ghafoor, 2002; Thottappilly & Rossel, 1992)
- Translating to current production of 300 kg/ha in Malawi
- Despite these statistics, there has been no clear attempt to improve resistance to Aphids and CABMV in the cowpea varieties grown in Malawi
- The use of CABMV resistant cultivars has been cited as one of the major strategies among other options to increase cowpea yields (IITA, 1998).
- To achieve this, there is need to identify sources of resistant genes in the cowpea germplasm which in the past and current studies have shown to have some levels of resistance



Aphids infesting cowpea



CABMVD

OBJECTIVES

The goal of the project

To identify sources of resistance to cowpea Aphid and Cowpea aphid-borne mosaic virus disease to improve cowpea productivity in Malawi

Specific objectives

1. To evaluate/screen cowpea genotypes for resistance to cowpea Aphid in Malawi
2. To evaluate/screen cowpea genotypes for resistance to Cowpea aphid-borne mosaic virus disease in Malawi

Research Approach

Objective 1: To evaluate/screen cowpea genotypes for resistance to cowpea Aphid in Malawi

Activity 1.1: Field screening of cowpea germplasm for aphid resistance

- 50 genotypes under field screening (28 genotypes from IITA, 4 from Ghana & local collections which previously had showed some levels of resistance)-planted 3rd February
- Screening at Chitala research station-hot spot
- Incomplete block design- 10 blocks of size 5, & 3 reps
- Each plot separated by an aphid spreader row to increase pest pressure in the experiments.



Research Approach

Activity 1.2: Screen-house screening of cowpea germplasm for aphid resistance

- This experiment will be conducted using a validated artificial screening method as described by Kusi *et al.* (2010).
- 1st, Aphids rearing in an insect proof insectary using susceptible genotypes
- 2nd, Test genotypes will be planted in pots in screen house and at least five aphids will be placed on each plant.
- The seedlings will be scored on a scale of 1 – 5 where 1 and 5 represent highly resistant and highly susceptible, respectively.



Research approach

- **Activity 1.3. Molecular screening for aphid resistance using SSR and SNP markers**
 - The cowpea genotypes exhibiting some level of resistance from both field and greenhouse screening will further be screened for presence of markers conferring resistance to cowpea aphids using SSR and SNP markers linked to aphid resistance.
 - For the SSR marker, the study will use CP171/172 as reported by Kusi et al. (2010).
 - The SNP marker assay will be done using SNP1_0912 that flank a major QTL region for aphid resistance on LG 7 (Vu02) (Huynh et al., 2015).
 - The identified resistant lines will be used in a backcross breeding program to incorporate aphid resistant genes into locally adapted cultivars but lack resistance to aphids.

Research approach

Objective 2: To evaluate/screen cowpea genotypes for resistance to CABMVD in Malawi

Activity 2.1. Screen-house screening of cowpea germplasm for CABMVD

- CABMV will be mechanically inoculated using the procedure as described by Hull (2009).
- Viral disease incidence and severity will be scored based on disease symptoms described by Gumedzoe et al. (1997).
- The severity will be assessed using a 1-5 visual scale, 1 and 5 represent highly resistant and highly susceptible, respectively.

Activity 2.2: Field screening of cowpea germplasm for CABMV disease resistance

- The experiment has been designed as explained for the aphid field screening trial

Expected outputs of the project

- Cowpea germplasm thoroughly evaluated, characterized and documented for aphids and Cowpea aphid borne mosaic virus disease resistance traits
- Better understanding of the germplasm that possess aphids and Aphid borne mosaic virus disease resistance traits
- Publication of at least one scientific journal article
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End of the presentation
Thank you!

