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# Survey on cowpea (*Vigna unguiculata* (L.) Walp) virus incidence and distribution in Oyo and Ogun States, Nigeria

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# Introduction

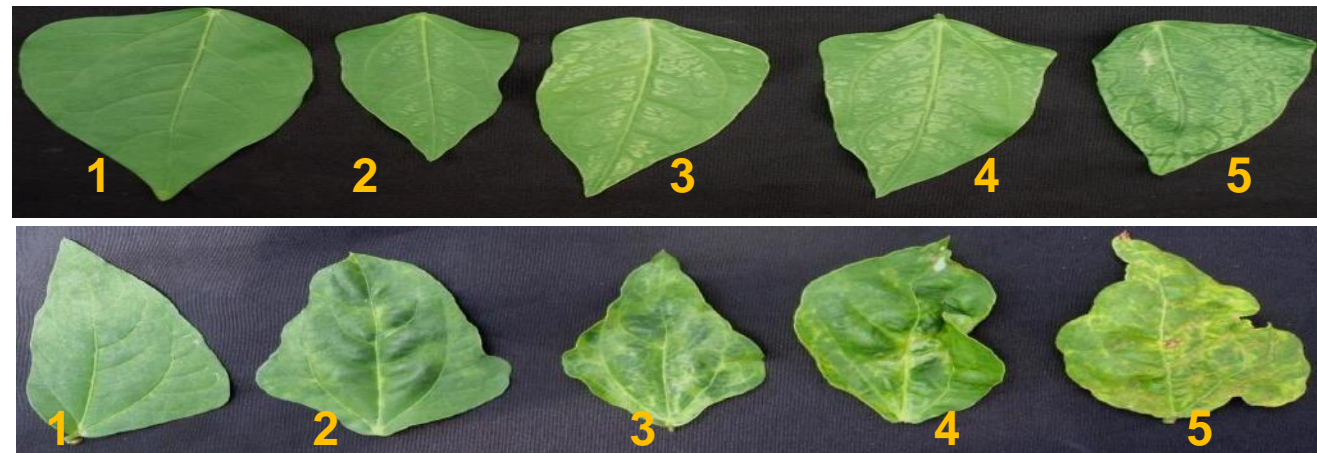
- Cowpea is the most important leguminous food crops that provides a significant portion of the dietary protein to the people in sub-Saharan Africa (Kareem & Taiwo, 2007).
- Nigeria is the world's largest producer - about 40% (2.14 million) of the world total (5.59 million tonnes) production (FAO, 2016)
- Productivity is low in Nigeria – Average seed yield  $577.6 \text{ kg ha}^{-1}$  (FAO, 2016) due to insect pests and pathogens, especially viruses (Singh, 2014)
- 5 viruses Oyo State -CABMV, CYMV, CPMoV, - BICMV, SBMV
- 5 in Ogun State - CABMV, CYMV, CPMoV, CMV, - SBMV (Shoyinka *et al.*, 1997)
- Limited up-to-date information on incidence of viruses required for effective management of viral diseases

# Objective

- ❑ To determine the incidence and distribution of cowpea viruses in Oyo and Ogun States of Nigeria

# Methodology

- Five LGAs where cowpea is predominantly cultivated were selected /state, 3 farms/ LGA, 10 plants randomly sampled/ farm, making 150 samples/state and a total of 300 samples from both Ogun and Oyo states.
- Leaf samples were collected from symptomatic and symptomless plants randomly sampled by walking the farm in a zig-zag direction.
- Coordinates of sample locations were recorded with the aid of a Geographical Positioning System (GPS).
- Virus disease incidence =  
% of infected plants over  
Total no of samples plants
- Disease severity scale  
1 – 5 (Thottapilly & Rossel, 1994)



# Experimental Setting

## □ Virus Detection

- ACP-ELISA (Antigen coated plate-Enzyme Linked Immunosorbent Assay) (Kumar, 2009).
- RT-PCR (Reverse Transcription- Polymerase Chain Reaction) by Kumar (2009) procedures
- Total nucleic acid was extracted by modified Cetyltrimethyl Ammonium Bromide (CTAB) method (Abarshiet *et al.*, 2010)
- PCR amplification was performed with Applied Biosystems (GeneAmp® PCR System 9700) Cyclor machine, using specific primers
- Amplification of each virus RNA was done using 1 cycle of 42° C (30 min); 1 cycle of 94° C (5 min); 35 cycles of 94° C (30 sec), 55° C (30sec), 72° C (30sec); 1 cycle of 72° C (5 min); and then at 4° C till the end
- Incidence and severity data were analysed by ANOVA, means separated with DMRT at p=0.05



# Results and Discussion

- Virus symptoms were observed in 6 of the 10 LGAs in both states
- Symptoms observed- mosaic, vein banding, mottling, puckering and stunted growth
- Virus incidence ranged 0 – 90%
- Severity range 1.0 – 4.8
- 7 viruses detected - CPMMV, CABMV, CMV, CMoV, SBMV, BCMV & CYMV from 79 (26.3%) out of the 300 samples
- All all seed transmitted (Hema *et al.*, 2014)



Plate 2. Cowpea fields with virus infected leaves

Table 1. Incidence and distribution of cowpea viruses in Oyo and Ogun states

| State | Local government area | Farm location    | Virus detected by ELISA and RT-PCR     | Disease Incidence (%) | Disease Severity |
|-------|-----------------------|------------------|--|-----------------------|------------------|
| Oyo   | Ido                   | Omi Adio         | CPMMV, CMV                             | 30.0def               | 3.0±1.0de        |
|       |                       | Idi-amu Ido      | -                                      | 0.0f                  | 1.0±0.0g         |
|       |                       | <b>Bako</b>      | CPMMV                                  | <b>80.0ab</b>         | <b>2.5±0.5ef</b> |
|       | Ibadan Northeast      | Monantan         | -                                      | 0.0f                  | 1.0±0.0g         |
|       |                       | Iwo Road         | -                                      | 0.0f                  | 1.0±0.0g         |
|       |                       | Academy          | -                                      | 0.0f                  | 1.0±0.0g         |
|       | Akinyele              | Alabata          | -                                      | 0.0f                  | 1.0±0.0g         |
|       |                       | Elekuru          | CPMMV                                  | 30.0def               | 2.7±0.6e         |
|       |                       | Moniya           | -                                      | 0.0f                  | 1.0±0.0g         |
|       | Oyo East              | Egunbiyi         | -                                      | 0.0f                  | 1.0±0.0g         |
|       |                       | Sonku            | -                                      | 0.0f                  | 1.0±0.0g         |
|       |                       | Fashola          | -                                      | 0.0f                  | 1.0±0.0g         |
|       | Ibadan Southwest      | <b>IAR&amp;T</b> | CPMMV <sup>1</sup> , CABMV, BCMV-BICMV | <b>50.0cd</b>         | <b>4.0±0.7b</b>  |
|       |                       | <b>NCRI</b>      | CPMMV, CABMV                           | <b>90.0a</b>          | <b>3.3±.05cd</b> |
|       |                       | Odo Ona          | SBMV, CYMV                             | 30.0def               | 3.7±0.6bc        |

<sup>1</sup>detected only by RT-PCR; CPMMV, *Cowpea mild mottle virus*, CMV, *Cucumber mosaic virus*, CYMV, *Cowpea yellow mosaic virus*, CABMV, *Cowpea Aphid borne mosaic virus*, , SBMV, *Sothorn bean mosaic virus*

Table 1. continued

| State | Local government | Farm          | Virus detected                       | Disease        | Disease          |
|-------|------------------|---------------|--------------------------------------|----------------|------------------|
|       | area             | location      | by ELISA and RT-PCR                  | Incidence (%)  | Severity         |
| Ogun  | Odeda            | Alabata       | CPMMV <sup>1</sup>                   | 40.0cde        | 2.5±0.6ef        |
|       |                  | Odeda         | -                                    | 0.0f           | 1.0±0.0g         |
|       |                  | Idera         | -                                    | 0.0f           | 1.0±0.0g         |
|       | Ifo              | Onihale       | -                                    | 0.0f           | 1.0±0.0g         |
|       |                  | <b>Kajola</b> | CPMMV, SBMV, CPMoV, CMV <sup>1</sup> | <b>90.0a</b>   | <b>4.8±0.4a</b>  |
|       |                  | Oko Paki      | CPMMV                                | 20.0ef         | 2.0±0.0f         |
|       | Ipokia           | Idiroko       | -                                    | 0.0f           | 1.0±0.0g         |
|       |                  | Ilase         | -                                    | 0.0f           | 1.0±0.0g         |
|       |                  | Ihunbo        | -                                    | 0.0f           | 1.0±0.0g         |
|       | Ado Od0 Ota      | Otta          | -                                    | 0.0f           | 1.0±0.0g         |
|       |                  | Iju           | -                                    | 0.0f           | 1.0±0.0g         |
|       |                  | Atan          | -                                    | 0.0f           | 1.0±0.0g         |
|       | Yewa South       | <b>Alagbo</b> | CPMMV, CMV                           | <b>40.0cde</b> | <b>3.0±1.0de</b> |
|       |                  | <b>Owode</b>  | CPMMV, CABMV, BCMV-BICMV             | <b>60.0bc</b>  | <b>4.2±0.8b</b>  |
|       |                  | Ajilete       |                                      | 0.0f           | 1.0±0.0g         |

<sup>1</sup>detected only by RT-PCR; CPMMV, *Cowpea mild mottle virus*, SBMV, *Sothorn bean mosaic virus*, CPMoV, *Cowpea mottle virus*, BCMV-BICM, *Bean common mosaic virus- Blackeye cowpea mosaic strain*, CMV, *Cucumber mosaic virus*, CABMV, *Cowpea Aphid borne mosaic virus*



# Results and Discussion

- CPMMV has the highest (15.3%) incidence and most prevalent (33.3%) contrary to Shoyinka *et al.*, (1997) report of highest incidence and prevalence of CABMV and SBMV
- 4 (CABMV, CYMV, BICMV and CPMoV) were reported in Kwara State (Aliyu *et al.*, 2012)
- Observed 7 viruses have also been reported in Ghana (Karim, 2016)
- Highest virus incidence and severity were observed at Kajola (90% and 4.8) in Ifo, Ogun State and NCRI at Moor Plantation (90% and 3.3), Oyo State.
- Multiple infections (7.7%) of two to four viruses on individual plant observed have been previously reported in cowpea (Shoyinka *et al.*, 1997; Palanga *et al.*, 2016)
- Virus-free farms were observed at Ibadan N/E and Oyo East in Oyo State and Ipokia and Ado-odo Ota in Ogun state

# Conclusions & Recommendations

- 6 viruses in Oyo State - CPMMV, CABMV, BICMV, CYMV, CMV, - SBMV
- 6 viruses Ogun state - CPMMV, CABMV, BICMV, - CMV, CPMoV, SBMV
- This updates on cowpea virus distribution in the study area will be useful in virus disease management for improved cowpea productivity
- 7 seed transmitted viruses detected in the two States necessitates development of virus resistant genotypes and adoption of efficient seed certification systems
- There is need for occasional survey of cowpea fields in the country to identify new and emerging viruses which might be more devastating on cowpea

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# THANK YOU



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