

## ABSTRACT

Studies on Resistance to Cercospora Leaf Spot (CLS) Disease and the Impact of CLS and Cowpea severe mosaic virus (CPSMV) Diseases on Productivity of *Vigna unguiculata* (L.) Walp. in Trinidad

**Helen Mary Booker**

An island-wide survey of Trinidad over two growing seasons was conducted to determine the prevalence and severity of Cercospora leaf spot (CLS) and Cowpea severe mosaic virus (CPSMV) diseases in *Vigna unguiculata* L. (Walp.) and their relationship to agro-climatic factors. The prevalence and abundance of the CLS pathogens, *Pseudocercospora cruenta* and *Cercospora apii* s.lat. were also studied. A series of investigations were conducted to study the impact of CLS and CPSMV diseases on crop growth and yield and the genetics of resistance to CLS of cowpea, with the objective of developing varieties of cowpea resistant to these diseases.

The survey showed that CLS and CPSMV diseases were prevalent in all cowpea growing areas, despite pesticide usage by farmers, and were considered the major constraints to cowpea production. *P. cruenta* was the only pathogen associated with CLS in all farming locations except the University Field Station. In the latter, *C. apii* s.lat. was found in mixed infection with *P. cruenta* in three out of the eight seasons sampled. Regression models explaining the prevalence and severity of the two diseases are presented.

The effect of time of inoculation with CPSMV on three cultivars differing in growth habit was studied in wet and dry season field trials. This study, for the first time, showed that yield loss associated with CPSMV infection can vary from as little as 2% to as much as 85%, compared to the control depending on time of inoculation, season and

cultivar. Overall, stage of inoculation had the greatest impact on yield. At any given time of inoculation, yield losses were much higher in the dry season in the determinate- compared to the indeterminate- or semi-determinate- cultivars. The physiological determinants underlying yield loss and strategies to reduce yield loss associated with the disease in wet and dry seasons are discussed. The effect of CLS on yield development in cowpea was studied for the first time using near isogenic lines over three seasons. The onset of CLS in the susceptible variety (H8-8-27) occurred at 35, 42 and 55 days after planting (DAP) in the early-, late- wet and early dry seasons, respectively and was negatively associated with yield reduction. Fungicide protection seems to have no effect on yield, particularly in the wet season. The near isogenic lines of (H8-8-27) with resistance to CLS and CPSMV diseases performed consistently and possess potential as black-eye pea with resistance to CLS and CPSMV diseases.

Screening of twelve cowpea lines for resistance to CLS under an artificial epiphytotic in a replicated field trial showed that the proportion of nodes infected and leaf spotting score at crop maturity were the best measures of resistance. This study also showed for the first time that there was differential resistance to *P. cruenta* and *C. apii s.lat.* The cowpea variety, VRB 10 was the only cultivar highly resistant to both pathogens.

$P_S$ ,  $P_R$ ,  $F_1$ ,  $F_2$ , BC1.S, BC1.R populations generated from four resistant x susceptible crosses of cowpea genotypes were screened for resistance to CLS caused by *P. cruenta*. Genetic analysis revealed that the mode of inheritance of resistance to *P. cruenta* can be oligogenic or polygenic depending upon the cross. This is the first report of polygenic inheritance of CLS resistance. Breeding cowpea resistant to CLS and CPSMV diseases using the information gained is discussed.

Keywords: Resistance; Cercospora leaf spot; CPSMV; *Vigna unguiculata*

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