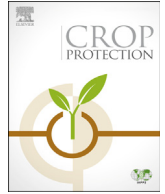




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journal homepage: www.elsevier.com/locate/croproCowpea scab disease (*Sphaceloma* sp.) in UgandaEmmanuel Afutu^{a,*}, Eric E. Agoyi^a, Robert Amayo^b, Moses Biruma^b,
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ABSTRACT

Cowpea (*Vigna unguiculata* L. Walp) is the third most important legume food crop in Uganda. It is the main legume food crop in the Eastern and Northern regions of the country, however, its mean yield is less than 400 kg ha⁻¹. Scab (*Sphaceloma* sp.) which is a seed-borne disease is one of the major constraints of cowpea production in the country, capable of causing yield losses of up to 100%. Cowpea scab is the anamorph of *Elsinoe phaseoli* in common bean (bean scab). The disease affects all the above ground parts of the cowpea plant. A study was conducted in the country to determine the incidence, severity and distribution of scab disease in 17 cowpea growing districts across three agro-ecological zones over a two year period. The results indicated that scab disease was widespread in all the districts with mean incidence ranging between 35 and 70% and mean severity 2–4. Tororo and Amuria districts had the highest incidence and severity, while Bukedea and Arua districts recorded the least disease incidence and severity. Cowpea fields located at altitudes above 1200 m.a.s.l had the highest mean disease incidence (82%) and severity (score = 3.4), while fields located on altitudes lying between 771 and 990 m.a.s.l registered the least disease incidence (64.7%) and severity (score = 2.7). The type of cultivar grown and cropping system practiced influenced the incidence and severity of the scab disease. The results of this study also showed that scab had high incidence and severity across districts and altitudes in Uganda suggesting the need to develop resistant cultivars. This indicates the need to establish the variability of the pathogen to inform the breeding programme for development of resistant varieties.

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1. Introduction

Cowpea (*Vigna unguiculata* L. Walp) is the most economically important indigenous African legume crop (Langyintuo et al., 2003). It is grown in more than 60 countries either as a food crop or cash crop (Davis et al., 1991) occupying parts of Asia and Oceania, the Middle East, Southern Europe, Africa, Southern USA, Central and South America (Singh et al., 2003). According to Ba et al. (2004), Africa is the main area of production, where the crop is very important for low input agriculture which is a characteristic of most parts of the continent.

In Uganda, cowpea is the third most important legume food crop after the common beans (*Phaseolus vulgaris* L.) and ground-nuts (*Arachis hypogaea* L.), however, it is the main legume food crop

in the Eastern and Northern regions (Nabirye et al., 2003) where it accounts for most of the production in the country (FAO, 1997). The mean yield of the crop is less than 400 kg ha⁻¹ (CCRP, 2012) with annual production estimated at 20,000 t/yr.

Cowpea farmers face several adverse factors in growing the crop (Asiwe et al., 2005) for example, in Nigeria (Singh et al., 2003) and Uganda (Rusoke and Rubaihayo, 1994) where diseases are a major production constraint. Insect pests have also been reported as a major production constraint in Uganda (Karungi et al., 2000) and Nigeria (Singh et al., 2003). According to Allen (1983), about 40 species of fungi are pathogens of cowpea. Mbong et al. (2012), described scab as one of the most destructive diseases of cowpea that was capable of causing yield losses of up to 100% in epidemic infections. Cowpea scab (*Sphaceloma* sp.) is the anamorph of *Elsinoe phaseoli* in common bean (bean scab). Allen (1983) suggested that scab of cowpea is widespread in Tropical Africa and is a major disease in Savannah areas, and is seed-borne. The disease affects all the above ground parts of cowpea (Plate 1). Symptoms of leaf infection include the appearance of spots on both leaf surfaces and

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ecologies may be attributable to the fact that there is not much difference in climatic conditions among these three ecological zones. Mugisha (2008) indicated that these zones in general record similar temperatures and relative humidity. The significant differences across districts and sub-counties could be due to the different cowpea varieties grown ranging from local to improved cultivars. Furthermore, different husbandry practices were observed across the locations. For example, moving from one sub-county to another, it was observed that different cropping systems were employed and even where similar cropping systems were carried out, different crop combinations were involved (Table 1). Similar results were reported by Hemannavar (2008) who observed that the occurrence of a disease in a location may greatly be due to provenance effects.

The 17 districts were categorized into 3 statistically significant groups by the cluster analysis (Fig. 3). These groups were obtained on the basis of the incidence levels, severity scores and the prevalence of the disease in the districts for two years. Tororo and Amuria districts were categorized as being similar and the two districts were found to be the worst hit by the scab disease during the study. The high occurrence and severity of the disease in Tororo could partly be due to its altitude (mean altitude = 1221 m.a.s.l.) as compared to districts such as Palisa and Kumi which lie between mean altitudes of 1089 and 1093 m.a.s.l. Therefore, Tororo district recorded a relatively high relative humidity (>70%) coupled with high temperatures which were favourable for the development of the disease. According to Yáñez-López et al. (2012), this condition causes prolonged periods of leaf surface wetness and therefore favours the development of disease. Secondly, it is partly due to the varieties found to be cultivated in the district (WC 29 and WC 36). Within the whole of the district, no field was found to be cultivated with any improved variety, and this was the same for Amuria district (Sunshine and WC 39). Amuria also recorded high occurrence of the disease because most of the fields in the district were found to be intercropped with other leguminous crops such as common beans which have been reported to be greatly affected by scab (*Elsinoe phaseoli*) (Phillips, 1994). Also, the intercropping of cowpeas with cassava could partly account for the high incidence and severity of the disease in these districts as the scab fungus has also been reported in cassava (*Sphaceloma manihoticola*) and scab fungus isolates obtained from the weed *Euphorbia heterophylla* has been reported to be pathogenic on cassava (Alvarez et al., 2003), therefore, suggesting possibilities of cross infections from both common beans and cassava to the cowpea crop.

On the other hand, Apac, Arua, Bukedea, Lira, Nebbi, Pader, and Yumbe districts were found to have clustered together because all these 7 districts recorded incidence rates less than 50% and had mean severity scores between 2 and 2.5 which was rated as mild infection. The results were partly accounted for by the particular varieties being cultivated and the planting densities observed in these districts (Table 1). Most of the fields in these districts were observed to have planted the local cultivar known as “Alegi” which has moderate resistance to the disease. Also, the planting distance observed during the study in most of the fields especially for between rows were between 30 and 45 cm which is less than the standard 50–70 cm for the erect and semi-erect varieties (Dugje et al., 2009). Districts such as Serere, Soroti and Bukedea recorded low occurrence of the disease because most of the fields within these districts were found to be cultivating the SECOW 3B and SECOW 2W varieties (Table 1) which are moderately resistant to the disease. Although, districts such as Apac, Arua, Lira, Nebbi and Yumbe were found to be predominantly growing unimproved varieties it was observed that the between row distance in most of the fields in these districts ranged between 60 and 70 cm which is the recommended planting distance (Dugje et al., 2009). Gautam et al.

(2013) reported that an increase in biomass modifies the microclimate by increasing the duration of leaf surface wetness and regulating temperature, thereby making infection by foliar pathogens more likely.

5. Conclusion

The study revealed a wide occurrence of cowpea scab disease in the major cowpea growing areas of Uganda at different altitudes. Altitude, the type of cultivar grown and cropping system practiced influenced the occurrence of the scab disease. Amuria and Tororo districts were found to be hot spots of cowpea scab disease in the country. Future work is needed to establish the variability of the pathogen to better inform breeders working to develop resistant varieties as a management strategy to control the disease.

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