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Rice Blast Prevalence in Smallholder Rice Farmlands in Uganda

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Abstract

Rice blast disease remains the most important contributor to low and stagnated rice yields in Uganda. However, the role of the smallholder farming system in shaping the prevalence of the disease in the country is not known. In 2015B and 2016A, we surveyed smallholder rice farmlands in 27 districts of Uganda and recorded blast incidence, severity, and symptoms expression. Infected rice samples taken from the infected plants were sub-cultured on PDA media to confirm the pathogen and obtain isolates for the establishment of a core collection for breeding work. Rice blast prevalence in the districts varied from 50-100% and the national average stood at 72.61%, higher than that recorded five years ago. Mean incidence and severity varied significantly (< 0.001) with the highest incidence (96.8%) recorded in Luwero district and the least (21.3%) was recorded in the Amuru district. However, the eastern region recorded the highest average incidence (74.5%) followed by the central, the northern, and Mid-western regions. In the rice ecologies, the highest blast incidence was recorded in the rain-fed lowland rice (72.18%) followed by irrigated lowland (59.53%) and rain-fed upland rice (47.27%). This is the first report on the prevalence of blast in smallholder rice farmlands in Uganda and showed a higher prevalence of the disease.

Keywords: incidence, rice blast, rice farmlands, severity, symptom expression

1. Introduction

Rice is increasingly becoming an important staple food in most parts of the world with hundreds of millions of people worldwide depending on it (International Rice Research Institute [IRRI], 2013; TeBeest, Guerber, & Ditmore, 2007, 2016; Oerke & Dehne, 2004) for food and household income. The crop is cultivated by both large-scale and small-scale farmers in developed, developing, and under-developed countries in every continent except in Antarctica (Muthayya, Sugimoto, Montgomery, & Maberly, 2014). In Uganda, the *O. sativa* was the most cultivated rice type until the introduction of upland rice cultivars (NERICA series) slightly over 10 years ago. In general, the production of the crop among smallholder farmers has increased steadily over the years (Food and Agriculture Organization Statistics [FAOSTAT], 2014) as more swamps and arable lands are opened-up for cultivation. Despite the increase in production often attributed to an increase in acreage rather than increased yields of the crop, the production vis-à-vis consumption is still in deficit (Ministry of Agriculture, Animal Industries and Fisheries [MAAIF], 2009). On-farm yields have remained low averaging 2 Tons/ha compared to the potential average yield of about 4.9 Ton/Ha (Lamo et al., 2010; Miyamoto et al., 2012). The low and stagnated yield of the crop despite efforts made by rice breeders to develop high-yielding varieties is due to the increasing challenges of abiotic and biotic stresses (Onaga & Asea, 2016). These include a high prevalence of pests and diseases as major constrains as well as increasing cases of drought, soil infertility, and increased urbanization (Skamnioti & Gurr, 2009). According to Séré et al. (2013), rice in Sub Saharan Africa, Uganda inclusive, succumb to three major diseases, namely: Bacterial Leaf Blight caused by *Xanthomonas oryzae* pv. *oryzae*, Rice Yellow Mottle Virus Disease caused by *Rice yellow mottle sobemovirus* and Rice Blast caused by

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