

Distribution of wild rice species and hybridization between cultivated rice and *Oryza longistaminata* in Tanzania

By

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Declaration

I declare that this thesis is a record of original work and contains no material which has been accepted for the award of any other degree or diploma in any university. To the best of my knowledge and belief, this thesis contain no material previously published or written by another person except where due reference is made in the text.

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Preface

This research was performed over 10 months as part of a Master of Plant Biotechnology in accordance with the requirements of the program; the research is presented in the form of a manuscript for submission to a peer-reviewed scientific journal. I have chosen to follow the format of Theoretical and Applied Genetics Journal. My co-authors for the manuscript are Dr Christopher Preston, Dr Juma Kayeke Mohamed and Dr Jenna Malone. Contributions of authors: RK conceived and designed experiments and performed all estimation of hybridization frequencies, prepared tables and figures and wrote large parts of the manuscript. CP supervised my research, read and participated in editing the manuscript. JK reviewed experimental designs used for the screen house experiments, and supervised research activities in Tanzania. JM provided advice on simple sequence repeats (SSR) analysis and interpreted SSR results. All authors read and corrected the complete manuscript. The word count for the manuscript (excluding references and supplementary material) is 5555. Appendix 1 of this thesis contains morphological characteristics of the putative F1 hybrid, cultivated rice and *O. longistaminata* plants recorded from the screen house. Appendix 2 contains number of surveyed rice fields, rice fields infested with wild rice species and frequency of wild rice species in a region. I have followed these instructions. Font: Times New Roman 12. Line numbering: not present for which is similar from journal's instructions in order to satisfy the thesis guidelines for the Master of Plant Biotechnology program.

Manuscript

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Abstract

Key message: Three wild rice species were identified in Tanzania, and hybridization between cultivated rice and *O. longistaminata* confirmed. Hybridization frequencies were 2.2% from cultivated rice-*O. longistaminata* and 0.1% from *O. longistaminata*-cultivated rice.

Abstract

Wild rice species of genus *Oryza* are distributed across Asia, Central and South America, Australia and Africa. Wild rice species, such as *O. longistaminata*, with an AA genome can hybridize with cultivated rice under field conditions and produce F₁ hybrids. Such hybridization may cause ecological and evolutionary consequences. An understanding of the distribution of wild relatives of rice and hybridization between cultivated rice and its wild relatives is an important aspect for biosafety in assessing risks caused by gene escape from crop to wild relatives. Despite the presence of five wild rice species in Tanzania, little is known about the distribution of wild rice species that are weeds of rice, or hybridization between cultivated rice and *O. longistaminata* under field conditions. The aim of this study was to generate baseline data on the distribution of wild rice species and hybridization between cultivated rice and *O. longistaminata* under field conditions. A field survey was conducted in 28 rice fields from seven regions and hybridization was determined by morphological and molecular analysis. *Oryza punctata*, *Oryza barthii* and *O. longistaminata* were common wild rice species that are weeds of cultivated rice and hybridization between cultivated rice and *O. longistaminata* were detected under field conditions. Frequencies of hybridization were estimated as 2.2% for crop-to-wild and 0.1% for wild-to-crop. Wild rice species found growing proximity to cultivated rice and hybridization occurs in Tanzania under field conditions with a noticeable frequency from crop-to-wild and wild-to-crop.

Keywords: Wild rice species, cultivated rice, biosafety, *O. longistaminata*, hybridization, Tanzania