

Inter Simple Sequence Repeat (ISSR) Analysis of *Neolamarckia cadamba* in Sarawak

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Abstract

Sarawak state government's aspiration to establish one million hectares of planted forests by the year 2020 has only achieved 25 % thus far. It is estimated that at least 30 million of seedlings are needed for annual planting and reforestation. One of the problems causing the slow rate in the establishment of planted forest, despite of the huge number of seedlings needed, is the availability of quality planting materials. To overcome this problem, a tree improvement programme focusing on *Neolamarckia cadamba* or locally known as Kelampayan was initiated in July 2007. The Kelampayan tree improvement programme is a long-term investment to increase the productivity of forest plantations by providing a source of improved planting stock that will improve the tree growth, better form and wood quality as well as pest and disease resistance. To date, two Kelampayan provenance trials have been established since 2008 in Landeh and Niah, Sarawak. This study is directed at the understanding of the genetic diversity and relatedness of the Kelampayan planted in Block 4 at the Landeh provenance trial using inter simple sequence repeat (ISSR) markers. A total of 34 ISSR markers commonly used in plant genotyping were screened using Kelampayan DNA. Out of these markers, 11 were found to be polymorphic and reproducible. PCR optimizations were carried out on these selected 11 ISSR markers. Genotyping of the Kelampayan using the selected ISSR markers is performed at optimal temperatures (Ta) varying from 44 to 61°C. The optimum conditions for these ISSR are as follow: 2ng of DNA template, 2mM MgCl₂, 0.5 U *Taq* DNA polymerase, 0.2mM dNTPs and 10 µM primer. The genetic information obtained from this study will be used as one of the parameters for the selection of genetically diverse and nonrelated plus trees from the Landeh provenance trial for future tree improvement programme.

Introduction

Establishment of commercial forest plantation is seen as a solution to meet the increasing global demand for wood and at the same time to reduce the degradation on natural forest caused by logging (Fenning and Gershenzon 2002). Planted forests accounted for about 5% of all forests, but produce a quarter of the global wood resource. The Sarawak state government's aspiration to establish 1 million hectares planted forest by 2020 has only achieved 25 % of the target to date. The shortage of quality seedlings in terms of good health, faster-growth, better wood quality and higher wood volume as well as lack of research findings in respect of most indigenous timber tree species have contributed to the slow rate of forest plantation establishment. In order to meet the target, an estimation of 30 million quality seedlings is needed annually. A tree improvement programme focusing on *Neolamarckia cadamba* (Kelampayan) was implemented to provide solutions in addressing the shortage of quality planting materials. The Kelampayan tree improvement programme is a long-term investment to increase the productivity of forest plantations by providing a source of improved planting stock that will improve the tree growth, better form and wood quality as well as pest and disease resistance. To date, two Kelampayan provenance trials have been established since 2008 in Landeh and Niah, Sarawak.

Neolamarckia cadamba (Roxb) Bosser or locally known as Kelampayan of the family Rubiaceae is a large deciduous and fast growing tree species native to Australia, China, India, Indonesia, Papua New Guinea, Philippines, Vietnam and Malaysia. Kelampayan has been selected as one of the promising fast growing tree species for planted forest development in Sarawak. Under normal condition, this species was reported to grow vigorously, reaches 3-4 m height and 30 cm diameter at breast height (dbh) in first two years. With wood density of 290-560 kgm⁻³, Kelampayan is categorized as lightweight hardwood. It is one of the best materials for plywood industries besides pulp and paper production. Apart from that, Kelampayan has been traditionally used as antidiuretic in the treatment of fever, anaemia and tumour (Umichigi et al. 2007).