UNIVERSITI TEKNOLOGI MARA

PHENOTYPIC AND GENETIC ANALYSIS OF GRAIN ELONGATION TRAIT FOR HIGH QUALITY RICE

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ABSTRACT

A high quality rice is defined by good aroma, long grain and moderate amylose content. Thus, the purpose of this study are to determine the grain elongation trait of rice samples from the local market and selected varieties. Together with the phenotypic variation of grain elongation trait especially on elongation ratio and alkali spreading value. The effects of artificial and natural ageing also determined on the selected rice varieties. Rice samples were bought from local market. And paddy varieties were obtained from MARDI Genebank Seberang Prai, Penang. From the results obtained, selected varieties were treated under artificial and natural ageing condition. The best artificial ageing is at the range of 1-3 hours and temperature between 100°C-120°C. Furthermore, natural ageing at third month resulted in the highest elongation ratio compared to other storage duration. Lastly, selected varieties were used as parental materials to breed local variety with elongation trait. Normal rice elongates at elongation ratio of 1.4 whereas special quality rice usually elongates more than 1.6, and often reach more than 2.0. Inheritance study was conducted on the elongation ratio in 4 crosses of F_2 generations namely; MRQ74/MR219, MRQ76/MR219, Mahsuri Mutant/MR219 and Basmati 370/MR219. From the observed grains elongation ratio of all the 4 crosses, all the ratio fulfilled the expected ratio of 3:1 in F_2 generations. Additional observation from the score of alkali spreading value in the F_2 generations showed that all grains after 23 hours being soaked in the alkali solution in the MRQ74/MR219 and Basmati 370/MR219 were low ASV and high GT. While grains from MRQ76/MR219 and Mahsuri Mutant/MR219 crosses were in high ASV and low GT.

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TABLE OF CONTENTS

CHAPTER ONE
INTRODUCTION

1.1 RESEARCH BACKGROUND

1.1.1 Overview of Rice Breeding Program

Rice breeding program was initiated many years ago by various organizations widely over the world. International Rice Research Institute, IRRI for an example is one of the international organizations that has their own breeding program since 1961. At first, rice breeding were focused on the production of varieties with high yield production, short growth duration, superior grain quality, nutritional quality and high resistance to diseases and insects. Nowadays, many released rice varieties have overcome the main breeding objectives but lack in quality and nutritional value (Acquaah, 2012; IRRI, 1972). In Malaysia, rice breeding program has started since 1915 with the objective to improve local rice varieties. As the time goes, Malaysia started to take part in the international breeding program at India, in 1950 (Parthasarathy, 1971). The result of this program was the release of Malinja (1964) and Mahsuri (1965) varieties (Chew and Sivanaser, 1971). Today, all rice breeding programs are officially conducted by Malaysian Agricultural Research and Development Institute, (MARDI) since 1971. From one of the breeding program, a variety namely Mahsuri Mutant had been discovered. It is a variety with a good grain elongation trait (Hadzim et al., 1994).

Malaysia government is encouraging local rice production to achieve 100% self-sufficiency by 2020 (Rafii et al., 2014). Although, Malaysia is producing rice at around 70% of local consumption, the remaining 30% is still being imported from other countries and this includes specialty rice like long grain and fragrant rice. So, there is an urgent need to find our own specific local quality rice with focused on long grain elongation trait as other qualities trait like having pleasant aroma have been released.

1.1.2 Prospect of Quality Rice

In general, a good quality rice will possess three main characters; presence of pleasant aroma, intermediate amylose content and long grain elongation (Cheng et al.,